BEFS Module 1 – Biomass Potential: Assessing the Biophysical Potential for Bioenergy Crops in Tanzania

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Structure of the Presentation

- Mandate of the MAFC and DLUP
- The intuition of the biomass potential
- The methodological framework
- Biomass potential in Tanzania
- The results
- How to use the results for policy
- What has to be addressed through policy
Mandate of MAFC and the DLUP

- Biomass from crop sub-sector is a major source of feedstock to bioenergy industry.
- The MAFC is working to assure that agriculture becomes modernized, commercialized, highly productive and profitable, and utilizing natural resources in sustainable way.
- The DLUP was instituted to cater for, among others; land suitability assessment in order to have sound agricultural land use planning and management.
- The training that conducted by BEFS enabled the Ministry and other supporting institutions to enhance more capacity in land assessment for biomass/feedstock production.
- Other institutes involved in the training were Sokoine University of Agriculture and Mlingano Agricultural Research Institute.
Questions on Bioenergy from Policy Makers

• Where should we have bioenergy crop production?
• How much could the country produce sustainably?
• Where trade-offs between food, environment and bioenergy crop production could occur?
• How bioenergy is more likely to support national policies and strategies such as investment potential, opportunities for rural development and poverty reduction?
Intuition of the Biomass Potential as a Result of the Assessment

- Identify the amount of suitable land, and the potential amount of bioenergy crops that can be produced;
- Determine the advantages and disadvantages of different production systems and levels of input, in terms of productivity and long-term sustainability;
- Identify areas with:
  - risks (food-feedstock competition and environmental issues);
  - opportunities for rural development and poverty alleviation on the basis of policy priorities;
- Analyse the accessibility to the market of the potential areas for bioenergy crops, taking into account the existing infrastructure.
Part I: Land Resource Inventory
- Inventory of the climatic information
- Inventory of the soil information
- Inventory of the landform information

Part II: Land suitability assessment
- Definition of the Land Utilization Type (LUT)
- Formulation of the criteria

Land with environmental limitations
- Protected areas
- Biodiversity hotspot

Land with conflict in the use
- Agricultural areas
- Population centers
Land Resource Inventory

Thermal zones
  LGP zones
  LGP-Pattern zones

Climatic inventory

Soil unit
  Soil phase
  Soil texture
  Slope

Soil and Landform inventory
Land Utilization Types (LUTs)

LUT is defined as combination of crop and the agricultural management system, including production techniques and inputs, used to produce the crop.

- The identification of the important factors which affect the production potential, such as limits to mechanization on sloping lands, and soil requirements for irrigation.
- The production scenarios to be modelled and the level to which production constraints are assumed to be overcome in each scenario.
- The quantification of input levels (labour, materials, capital, etc.) associated with various production scenarios. This is used for:
  - estimation of the likely levels of input which correspond to the anticipated outputs;
  - estimation of total input demands in relation to actual or anticipated resource availability at country/province level.
Suitability Assessment Criteria

- Are based on the crop requirements, the production system and the level of input.
- Are the core information: agronomists and soil scientists expertise is required.
- Are formulated as expected yield reductions (in %) of the agronomically attainable yields.
- The agronomically attainable yield is defined as the full potential yield achievable in the specific location being studied under a specific agriculture system and input level.
Biomass Potential in Tanzania

In Tanzania the land suitability assessment was carried out for 5 crops, identified with Tanzanian stakeholders during the first consultation:

- Cassava, Sugar Cane, Sweet Sorghum, Palm Oil and Sunflower

Two production system were tested to offer a portfolio of options and taking into account the sustainability in the agricultural sector:
- Conventional Tillage-based
- Best Practice Conservation Agriculture

Two level of inputs:
- Low and High
An example of results: the maps
An example of results: the tables

Suitable land area available for expansion and potential production for dry cassava

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Highly suitable area (HS)</th>
<th>Moderately suitable area (MS)</th>
<th>Total available suitable area (HS+MS)</th>
<th>Total dry production *</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(ha)</td>
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<td>(ton)</td>
</tr>
<tr>
<td>Tillage, low</td>
<td>1,153,431</td>
<td>2,274,811</td>
<td>3,428,242</td>
<td>7,194,296</td>
</tr>
<tr>
<td>Tillage, high</td>
<td>1,744,818</td>
<td>2,343,195</td>
<td>4,088,013</td>
<td>35,888,320</td>
</tr>
<tr>
<td>Conservation, low</td>
<td>3,965,195</td>
<td>5,584,261</td>
<td>9,549,456</td>
<td>26,634,709</td>
</tr>
<tr>
<td>Conservation, high</td>
<td>4,324,562</td>
<td>5,680,992</td>
<td>10,005,554</td>
<td>102,805,158</td>
</tr>
</tbody>
</table>

* Note that this is an aggregate of areas diversely suitable
The results in few words

- There is potential to increase cassava and sunflower production under rainfed conditions
- Sweet sorghum is a new challenge with great opportunity mainly in the semi-arid area
- Sugar cane and palm oil don’t have great potential and the main limiting factor is the irrigation
- This mainly could happen improving agriculture practices (conservation agriculture).

Issues

- Cassava: insufficient market outlet and pest diseases
- Inadequate infrastructure
- Limited knowledge of sustainable production management
Supporting Tool for Policy Makers

Policy makers will know:

• The potential of the country for bioenergy crop
• The most suitable locations for the development of bioenergy crop production;
• Where bioenergy could represent an opportunity...
• ... but also where risks of food insecurity are high and where bioenergy could negatively impact the environment;
• Best practices in agricultural management will help to improve the agricultural sector and favor a long-term sustainable use of the natural resources;
• Agricultural areas “marginalized” by the lack of infrastructure.
How Policy Makers Could Use the Results

• An informed decision of land planning for agricultural and bioenergy expansion
• Targeting intervention in the infrastructure and supporting the investments in specific areas
• Promoting best agriculture practices
• Identifying specific issues for the development of the bioenergy crop production for specific area:
  – Extensions services in improving agricultural practice (yields);
  – promotion of market outlet;
  – improvement of the infrastructure (irrigation, roads etc).
• Prioritizing environment, food security and bioenergy development in hotspot areas
What BEFS Can Recommend

• Issues like land tenure and security should be tackled and incorporated in the approach.
• Land databank with information on bioenergy crops should be created
• The assessment done is based on old information of land cover and limited knowledge on the potential for the land
• Suggestions:
  – an update of the land cover information is highly required
  – soil information should be consolidated to have detailed information on the potential for agriculture to be use in conjunction with the district land use planning
Asante sana!

www.fao.org/bioenergy/foodsecurity/befs