What FAO Thinks and Does about Sustainable Bioenergy

Olivier Dubois, FAO
IEA Bioenergy ExC077 Workshop, Rome, 17 May 2016
What is not true!

• Sweeping statements on bioenergy sustainability - Food crop feedstock always bad / Energy crops and residues always good - **Not that simple**!

• Simple solutions to reconcile food and fuels are available - **You must be joking**!
Food-based feedstocks always bad??

• **Not necessarily the case** (e.g. sugarcane ethanol in Brazil, outgrower palm oil in Indonesia)

• **Flex crops (that produce food and fuel) do not compete with food if fuel adds to food** – Possible but challenging through:
  
  – *Yield increase* (e.g. sugarcane in Brazil)
  
  – *Substitution of export crops* (e.g.: cassava ethanol study in Tanzania)
  
  – *Integrated food-energy systems* (IFES)
  
  – *Outgrower schemes*
By-products/residues – Panacea??

- Agricultural/wood/fisheries by-products/ residues becoming commodities as increasingly used (IEA predicts residues 25-30% of biofuel feedstock energy by 2050)

- Use of by-products allows for 10-30% reduction in land needs

**BUT**

Watch out for:

- competing use of agricultural residues (soil management – feed – bioenergy)
  - Cheapest fertiliser and soil protection for small-scale farmers
  - Often more than 40% animal feed in developing countries

- Handling costs!
Energy crop’/second generation - The silver bullet?

• More conversion efficient (uses all parts of the plant)
• Less DIRECT competition with food security

BUT

• Less edible by-products as whole plant is used for bioenergy
• Possible negative environment effects
• Possible INDIRECT competition with food security
  – Regarding land use
  – Regarding the use of agricultural residues (soil, feed, energy)
• No flexibility between food and energy markets
• Not ready on large scale yet and for some more
Certification is the cure for all ills!?

BASIC CONDITIONS
- Secure and equitable tenure conditions
- Favourable market and investment
- Institutionalised participatory decision-making mechanisms
- Formal recognition of primary actors and institutions (government, private sector and civil society)

1. Actors’ roles
   Roles (Rights, Responsibilities, & Benefits) of concerned actors and institutions defined and agreed upon

2. Policies
   Policies, standards, regulations for sustainable bioenergy

3. Tools
   Incentives and disincentives for policy implementation

4. Monitoring, evaluation, verification
   Audit, certification or participatory review

5. Other elements

Only works if many other things are in place

Most address poorly food security + Challenge for smallholders

Source: Dubois, 2008
What is true

• Sustainable bioenergy is complex and
• One should embrace this complexity rather than oversimplifying things
• Assessment of bioenergy sustainability must be:
  – evidence-based,
  – contextualized, and
  – integrated
Enough Land? Most people think Yes

- **Not so much about How much land**
  - Biofuels currently use only 2-3% of all arable land
  - Percentage could rise to 5-8% in the next decades.
  - It depends on many factors (intensification, use of by-products)

- **Often more about Whose and What Land**
## WHOSE land

Source: Dubois, 2008

<table>
<thead>
<tr>
<th>Land belongs to</th>
<th>Size of bionergy production unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large</td>
</tr>
<tr>
<td></td>
<td>Small/community type</td>
</tr>
<tr>
<td>Company (private or public)</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Small producer or community</td>
<td>B</td>
</tr>
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<td></td>
<td>D</td>
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</table>

Outgrower schemes

Source: [www.fao.org/energy](http://www.fao.org/energy)
And WHAT land

- “No go areas” (high carbon, high biodiversity) – Relatively easy to define; more difficult to enforce

- “Best bet areas” Often so-called degraded/marginal/abandoned land: But controversial/dynamic concepts that need to be *locally* defined

  + What is more Interesting for investors !?
There can be an **ILUC risk**

**Models** to assess the ILUC risks **oversimplify the reality**

There are **ways to reduce the ILUC risk**, so more constructive to focus on these
Key messages on land

Often more about “Whose” and “What” Land

A lot to do with land and natural resources governance

Voluntary guidelines on sustainable tenure governance of land, forests and fisheries

ILUC can be an issue but there are ways to minimize ILUC risks
Biofuels and food prices

• Based on global studies biofuels cause 3 to 75% increase on international food prices - Jury out for ever!

+ 

• Need to assess price transmission from commodity to food and from international to national and local levels

• Price changes impact different people in different ways
Impacts will vary for net sellers and net buyers of food

Key message on food prices

There is a link

BUT

Bioenergy is one amongst many other factors that influence food prices

Need to look at it at country and household levels where it matters!
Sustainable Bioenergy: What is needed

• **An in-depth understanding** of the situation and related opportunities and risks as well as synergies and trade-offs;

• **Implementation of good practices** by investors/producers in order to reduce risks and increase opportunities;

• **An enabling policy and institutional environment** to promote the implementation of good practices;

• **Appropriate monitoring and evaluation** of impacts and performance of good practices and policy responses;

• **Political will, capacities** and **good governance** to implement the above.

**FAO’s Sustainable Bioenergy Support Package**
## Typology of FAO Tools for Sustainable Bioenergy

<table>
<thead>
<tr>
<th></th>
<th>Before project implementation: Screening and risk prevention</th>
<th>After project implementation: Assessment and monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Local Impact</strong></td>
<td>BEFS Operator Level Tool</td>
<td>IFES analytical framework</td>
</tr>
<tr>
<td><strong>Regional/National impact</strong></td>
<td>BEFS Rapid Appraisal</td>
<td>GBEP indicators</td>
</tr>
</tbody>
</table>

**BEFS**: Bioenergy Economic and Financial Studies
BEFS Sustainable Bioenergy Assessment

- **Country Context**
- **Natural Resources:** Biomass Potential Assessment
- **Energy End Use Options:** Technoeconomic Analysis
  - Socioeconomic Analysis

**Biofuel Supply Chain**

**Country Specific Evidence**
BEFS Operator Level Tool (OLT) for Investments

Key environmental and socioeconomic issues to consider in assessing operator level impacts on food security:

1. **Change in the supply of food** (crops and livestock) to the domestic market

2. **Resource availability and efficiency of use** (land, water and fertilizers)

3. **Land and income displacement** and related compensation
## Operation Overview

<table>
<thead>
<tr>
<th>Name (Company/Sponsor/Organization)</th>
<th>ABC Tanzania Ltd.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioenergy Feedstock</td>
<td>Sunflower</td>
</tr>
<tr>
<td>Total hectares</td>
<td>15000</td>
</tr>
<tr>
<td>Latitude</td>
<td>-6.328125</td>
</tr>
<tr>
<td>Longitude</td>
<td>34.1455078125</td>
</tr>
</tbody>
</table>

Country: United Republic of Tanzania

### Key

- Potential Benefit for Food Security
- No Significant Influence on Food Security
- Potential Risk to Food Security

## 1. CHANGE IN THE SUPPLY OF FOOD TO THE DOMESTIC MARKET

### 1.1 Former/Current land-use (prior to operation)

<table>
<thead>
<tr>
<th>Land Use</th>
<th>hectares</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsistence agriculture</td>
<td>2000</td>
</tr>
<tr>
<td>Commercial agriculture</td>
<td>7000</td>
</tr>
<tr>
<td>Livestock grazing</td>
<td>5000</td>
</tr>
<tr>
<td>Fallow land</td>
<td>3000</td>
</tr>
</tbody>
</table>

### 1.4 Change in the supply of food

<table>
<thead>
<tr>
<th>Item</th>
<th>tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals and tubers</td>
<td>2000</td>
</tr>
<tr>
<td>Sugar crops</td>
<td>-4200</td>
</tr>
</tbody>
</table>

## 2. RESOURCE AVAILABILITY AND EFFICIENCY OF USE

### 2.1 Land and/or water scarcity

No land and water scarcity

### 2.2 Land Use Management

Up to two practices

<table>
<thead>
<tr>
<th>Crop</th>
<th>Land use efficiency</th>
<th>Fertilizer application efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunflower</td>
<td>More efficient than national average</td>
<td></td>
</tr>
<tr>
<td>Maize</td>
<td>More efficient than national average</td>
<td></td>
</tr>
</tbody>
</table>
Complementary OLT on crop and livestock residues

- **Crop residue**
  - Crop residue collection
  - Storage I
  - Transport
  - Storage II
  - Pellet/briquette plant
  - CHP

- **Livestock residue**

- **Initial questions**

- **Environmental indicators**
  - Atmosphere
  - Water
  - Waste
  - Biodiversity
  - Energy efficiency
  - Health & Safety
  - Labour conditions

- **Indicators**
  - Social indicators
Addressing competing use of residues

- **At territorial level** – The BEFS-RA module on residues

- **At Farm level**: The OLT + Energy module of the FarmDesign optimization algorithm to assess tradeoffs in use of resources in farming systems (with Wageningen)
Examples of good practices

• Agro-ecological zoning
• Outgrower schemes
• Integrated food energy systems
  – Optimizing land use efficiency by mixing energy and food crops (e.g. rotations, agroforestry systems)
  – Optimizing biomass use through cascading uses (e.g. biogas from livestock manure)
# How to do it? GBEP Sustainability Indicators

<table>
<thead>
<tr>
<th>PILLARS</th>
<th>INDICATORS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental</strong></td>
<td></td>
</tr>
<tr>
<td>1. Life-cycle GHG emissions</td>
<td>9. Allocation and tenure of land for new bioenergy production</td>
</tr>
<tr>
<td>2. Soil quality</td>
<td>10. Price and supply of a national food basket</td>
</tr>
<tr>
<td>3. Harvest levels of wood resources</td>
<td>11. Change in income</td>
</tr>
<tr>
<td>4. Emissions of non-GHG air pollutants, including air toxics</td>
<td>12. Jobs in the bioenergy sector</td>
</tr>
<tr>
<td>5. Water use and efficiency</td>
<td>13. Change in unpaid time spent by women and children collecting biomass</td>
</tr>
<tr>
<td>6. Water quality</td>
<td>14. Bioenergy used to expand access to modern energy services</td>
</tr>
<tr>
<td>7. Biological diversity in the landscape</td>
<td>15. Change in mortality and burden of disease attributable to indoor smoke</td>
</tr>
<tr>
<td>8. Land use and land-use change related to bioenergy feedstock production</td>
<td>16. Incidence of occupational injury, illness and fatalities</td>
</tr>
<tr>
<td><strong>Social</strong></td>
<td></td>
</tr>
<tr>
<td>9. Allocation and tenure of land for new bioenergy production</td>
<td>17. Productivity</td>
</tr>
<tr>
<td>11. Change in income</td>
<td>19. Gross value added</td>
</tr>
<tr>
<td>12. Jobs in the bioenergy sector</td>
<td>20. Change in consumption of fossil fuels and traditional use of biomass</td>
</tr>
<tr>
<td>13. Change in unpaid time spent by women and children collecting biomass</td>
<td>21. Training and re-qualification of the workforce</td>
</tr>
<tr>
<td>14. Bioenergy used to expand access to modern energy services</td>
<td>22. Energy diversity</td>
</tr>
<tr>
<td>15. Change in mortality and burden of disease attributable to indoor smoke</td>
<td>23. Infrastructure and logistics for distribution of bioenergy</td>
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Agreed by 23 countries & 13 international organizations involving a total of 46 countries and 24 int. organizations
FAO’s key messages on bioenergy

• **Sustainability of bioenergy is context specific.** Therefore its assessment must be based on reality not models and global studies
  • **Tools and knowledge are now available** to help governments and operators reduce risks and enhance opportunities of bioenergy development
  • *Per se* biofuels are neither good nor bad. What matters is the way they are managed
  • **Bioenergy** should be viewed as another opportunity for responsible investment in sustainable agriculture and rural development.
Thank you for your attention!

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www.fao.org/energy/