



Sustainable Biofuels Production & Use

With focus on Africa

Fatin ALI MOHAMED
Energy and Clean Production Branch
UNIDO



Outlines

- **The issues**
- **Sustainability Dimensions of Biofuels**
 - **Economic**
 - **Environmental**
 - **Social**
- **Towards sustainability standards- Reflections**
- **Concluding remarks**



The issues

- In developed and developing countries, fossil fuel price **fluctuations** and **climate change** are drive to the increasing interest in biofuels
- Most developed countries are moving from **voluntarily** to **obligatory legislations** imposing **market share** of biofuels in the transport sector
- To meet these market share, EU in 2010, for example, will have to **import** feedstock (or biofuels) from elsewhere, due to **lack of sufficient arable land** for energy crops (and the well established regulations safeguarding forests and governing land use)



1966



2006
UNITED NATIONS
INDUSTRIAL DEVELOPMENT
ORGANIZATION

The issues

- African countries (**AfCs**) are at the various stages of initiating **large scale biofuels** production to capture the benefits of its value chain, eg, Ethiopia, SA, Egypt,..
- At same time, an increasing number of AfCs found themselves becoming ‘potential’ **suppliers of feedstock** from large scale plantations of energy crops driven by **demand in EU** and USA.



The issues: Why Africa needs to act now

- In itself **this is an opportunity** for agric. and rural development in AfCs, however, **uncertainties** about the environmental and social impacts of these plantations are **causing growing concerns**
- Biofuels have many **benefits to AfCs** that have **land** to devote to energy crops, a **favorable climate**, and **labour**
- By **adding** the **lessons learned** in industrialized world and putting in place **sustainability standards**, **AfCs** are well placed to **establish efficient biofuels** industry without compromising the sustainability
- Therefore, UNIDO and several international orgs, are **responding to this challenge**



UNIDO Response

With increasing number of MS considering the Biofuels option, UNIDO is providing a **package of project activities** that covers the economic, and environmental sustainability and the competitiveness of the Biofuels value chain, e.g, Senegal, Croatia, Albania,..

UNIDO is in the process of finalising its **Biofuels Strategy** indicating the focus and the outline of UNIDO vision to promote economically and environmentally sustainable Biofuels production and use

UNIDO is organizing, in 2007, a series of **Global forum activities** in **Africa, CEE & Latin America**, designed to address the issues of Biofuels as a possible solution for Energy Security, Environment & Rural Development, in its **regional specificities** and assist MS in maximize the benefits of biofuels value chain and minimize sustainability risks.

In the pipeline: Analytical work documented in **publications**



Purpose of this presentation...

- ...is to share experience and reflects on the need for sustainability standards that ensure the sustainable development of Biofuels value chain in AfCs and lead to removing one of the potential trade barriers.



Sustainability of Biofuels

- Is often described as comprising **3 dimensions**
 - Economic
 - Environmental
 - Social

} Inter linked
- Most of on-going or completed work so far focus on defining **Environmental & Social** sustainability issues
- It is the understanding that **themes, criteria & indicators of E & S** will be translated by **Govs** into **policies and instruments** that shape the Economics viability of biofuels



1966



2006
UNITED NATIONS
INDUSTRIAL DEVELOPMENT
ORGANIZATION

Sustainability of Biofuels

However, the reality on the ground is that:

- **Biofuels/Economic activities** are already established -in different levels and regions of Africa
- Its is predicted to increase considerably in near future
- But, for now **Africa biofuels production** is the **lowest** world wide
- Therefore, sharing knowledge on **what it takes to establish an Economically viable biofuels** production in the context of **AfCs** is equally **important** at this stage
- This will contribute to establishing efficient industry of biofuels - which is widely known to be **not economically sustainable without support measures**



Key Factors Affecting Economic Viability of Biofuels Production and Use

Ensuring involvement of all stakeholders

All stakeholders relevant to the growing, processing, distributing and using biofuel should be involved, have common understanding on their respective complementary roles:

- Ministries in charge of Agric, Environment, Energy, finance...
- Refineries and fuels distributors
- Fuel Quality control
- Farmers unions,
- Car industry
- Private entrepreneurs & banks



Key Factors Affecting Economic Viability of Biofuels Production and Use

Policies framework & incentive mechanisms

Needed to be put in place :

- In order to identify & set targeted market share
- Ensure the financial attractiveness of crop plantations to farmers
- Market creation by tax exemption or other measures to enable competing with fossil fuel
- De-taxation should be designed to direct the market to the segment selected
- Promote investment and private sector participation
- ...



Key Factors Affecting Economic Viability of Biofuels Production and Use

Feedstock availability, price,..

- Devise an agriculture strategy to ensure availability & avoid price fluctuations
- Longer-term storage, multi-feedstock technology,..
- Breeders, agric. researchers, extensions workers, farmers & unions are important Stakeholders to ensure best practice leading to selection of best varieties & higher yield
- Private enterprises encouraged to participate



Key Factors Affecting Economic Viability of Biofuels Production and Use

Marketing strategy, segment

- Determining options :
 - pure 100% for certain market segment (agr. Machinery's or city bus fleet)
 - blend, in all engines without modifications, does not need separate distribution system
- Which segment?
 - City transport: less harmful emissions
 - Lakes & rivers: protection due to fast biodegradability
 - Drinking water areas: protection due to zero toxicity



Key Factors Affecting Economic Viability of Biofuels Production and Use

Process technology & quality control

- Highest & guaranteed quality to the standard
- Ability to process multi-feedstock to accommodate fluctuation of feedstock price by selecting the least expensive
- Highest efficiency = 100% conversion of oil (the most expensive input) to biodiesel
- Integration the use of by-product in the process or marketing it, will add up to economic viability



Key Factors Affecting Economic Viability of Biofuels Production and Use

Plant site selection

- To lower transportation costs of feedstock & products
 - E.g., near water transport facilities for large scale, in vicinity of oil mills, etc.
- Access to technical services
- Local investments lows, taxes, labor market/regulations
- ...



Key Factors Affecting Economic Viability of Biofuels Production and Use

Optimum/maximum capacity of production within the constrains

- The larger the capacity the less the production cost / unit, thus more profitability or **less need for incentives**
- The larger the capacity the less the cost associated with quality control
- E.g., for biodiesel, from 10-15 '000t/y it is feasible to invest in installation to purify glycerin up to pharmaceutical level, thus, extra income



Environmental and Social Sustainability

- Several initiatives are going on to define the themes, criteria and indicators
- They draw on existing similar sustainability standards and certification schemes, eg, for wood and wood based industry
- Attempt to fill in the gaps from the knowledge accumulated so far, eg, on GHG
- In following slides an overview of the status – based on reports of these initiatives, specially WWF work



Environmental Sustainability

Key Environmental Concerns

- Land use, land availability and land-use conflicts
 - Priority for food supply and food security
 - Avoiding negative impacts from bioenergy-driven changes in land use
 - Clarification of land ownership
- Loss of biodiversity and deforestation
 - No additional negative biodiversity impacts



Environmental sustainability

Key Environmental Concerns

- GHG- emissions : biofuels should result in lower GHG compared to fossil fuels when analyzed via LCA, w-to-w
 - Minimization of greenhouse-gas emissions
- Soil erosion and other forms of soil degradation
 - Minimization of soil erosion and degradation
- Water use and water contamination
 - Minimization of water use and avoidance of water contamination resulting, e.g., from pesticides, process effluent, ...
- Air pollution
 - Biomass production should not result in air pollution, e.g, burning of sugarcane and applying pesticides by plane



Social sustainability

Socio-economic Impacts

- Biomass production should contribute to the well-being of communities, workers and prosperity rural populations
 - Should not aggravate food insecurity
 - Positive contribute of private companies to increasing the productivity of other ‘food’ crops cultivated by the farmers producing bioenergy
 - Avoiding human health impacts and risks through regular training and awareness
 - ...



Towards Sustainability standards - Reflections

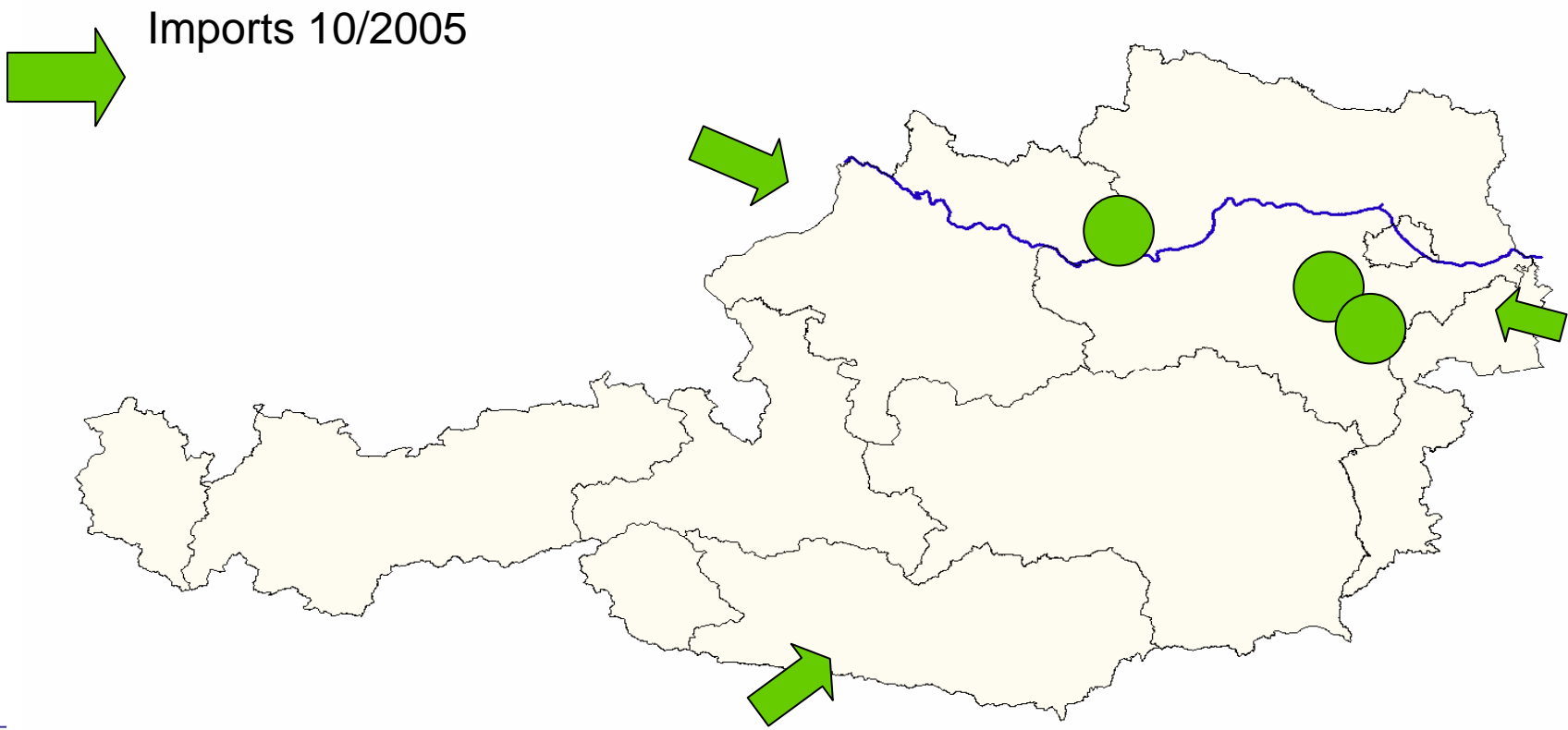
- **Economic sustainability**

- Factors and criteria affecting the econ. viability have national/local scope & specificity
- It is a mature approach- depends on economic & industrial rationales
- Econ. Sust. is strongly influenced by the govts translation of the environmental and social standards into policies and legislations promoting sustainable biofuels value chain



Towards Sustainability standards - Reflections

Shortly after enforcing of binding legislations the market reacted
Biodiesel production 100.000 t/a starting at middle of 2006





Towards Sustainability standards - Reflections

A tool to diagnose & define specific needs: A typical country-wide biodiesel feasibility

Stakeholders: awareness and capacity building on the multi-sectoral nature and benefits of the biofuels value chain.

Feedstock: As recognized bottle neck issue- a clear definition of the feedstock volumes available from a secure supply at the lowest possible cost will determine the final size, process technology & location of the biodiesel plant; agricultural Best practice, policies and financial measures to increase oilseeds production/availability and to ensure the biodiversity and socio economic impacts

Markets: A definition of the target markets and segments; whether to go for 100% biodiesel or 5% blend, potential distribution partners and competitors to allow a successful start up of market penetration.

Legislations: based on a macro economic input-output analysis, advising on appropriate legal framework and incentive mechanisms to allow marketing into well-defined segments; Harmonization with the EU directives

Advice on **Process technology:** A plant with a multi-feedstock processing capability, high yield, proven reliability, and able to produce quality biodiesel will allow the market entry strategy to be successfully implemented.

Linking up with **Corporate Social Responsibility** matters.



Towards Sustainability standards - Reflections

Environmental and Social sustainability

- GHG and –impacts of changes in land use are global concerns and do not need further adjustment to regional level. Studies identify developing methodologies and data as the next step towards operationalisation related standards
- Food security and biodiversity are regional and local concerns. Still they need further development of adjusted criteria and indicators to become operational standards
- Same for soil- and water protection
- Socio economic concerns, depending on prevailing system and practice, could be more readily operational standards, as adjustments from intern.standards need to be made to capture the local scope and specificities.



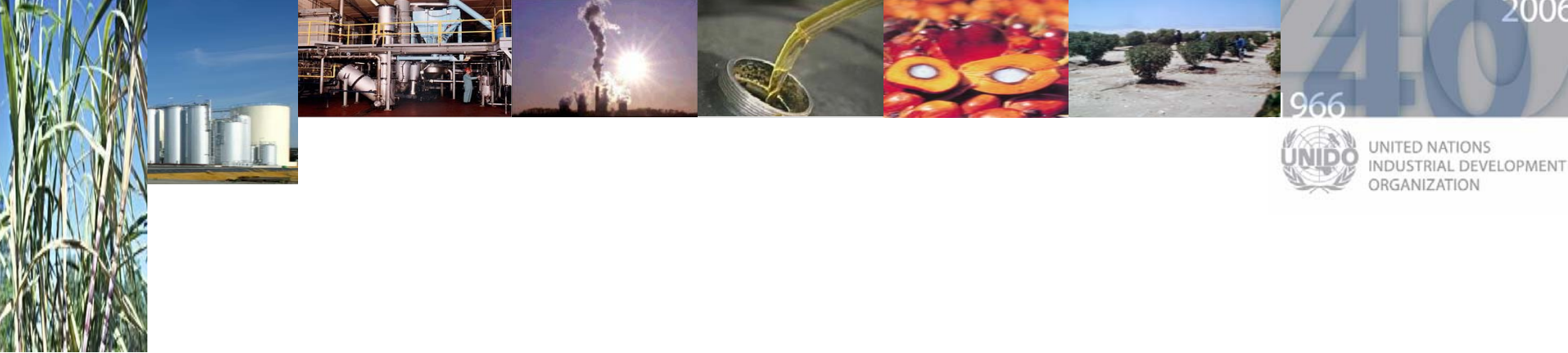
In conclusion...

- To remove environmental and social concerns associated with biofuels, **data and methodologies** have to be **developed** for certain themes, others, eg, **food security**, need even the definition of criteria and indicators relevant to the local context, before proceeding to data and methodologies
- To generate the needed data and to define indicators, **extensive work on prioritised pathways of biomass growing, conversion and use**, should be undertaken for the different regions in Africa



In conclusion...

- However, this might take, for a ‘fully’ developed set of criteria for, eg, biodiversity, up to 20 years. Thus time frame matters
- Meanwhile, it is not expected that the market demand for biofuels, initially geopolitical- & climate change-driven, and now institutionally-endorsed, will wait that long
- Obviously, things will have to advance in parallel
- A final note, the **involvement** of all relevant stakeholders including the **industrial** partners, **international organisations** is essential to ensure the **practical feasibility** of sustainability standards and instruments.



UNITED NATIONS
INDUSTRIAL DEVELOPMENT
ORGANIZATION

Thank you!

Fatin ALI MOHAMED
Rural and Renewable Energy Unit
Energy and Clean Production Branch
UNIDO

F.alimohamed@unido.org

Tel. +43 1 26026 3279