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ClimDev-Africa

AGRO-INDUSTRIAL LOW-CARBON DEVELOPMENT OPTIONS IN SOUTHERN AFRICA: THE CASE OF BIOENERGY FROM SUGARCANE

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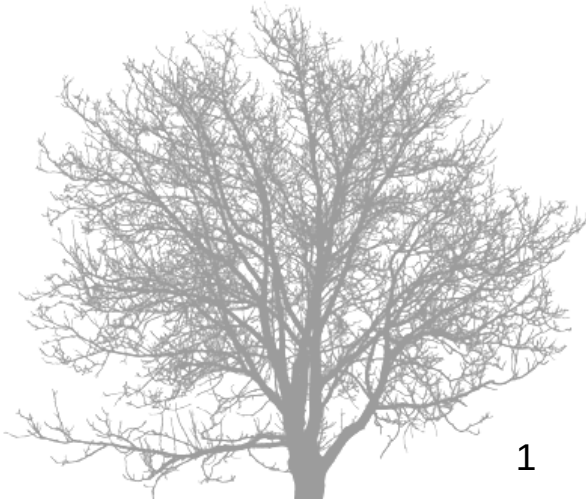


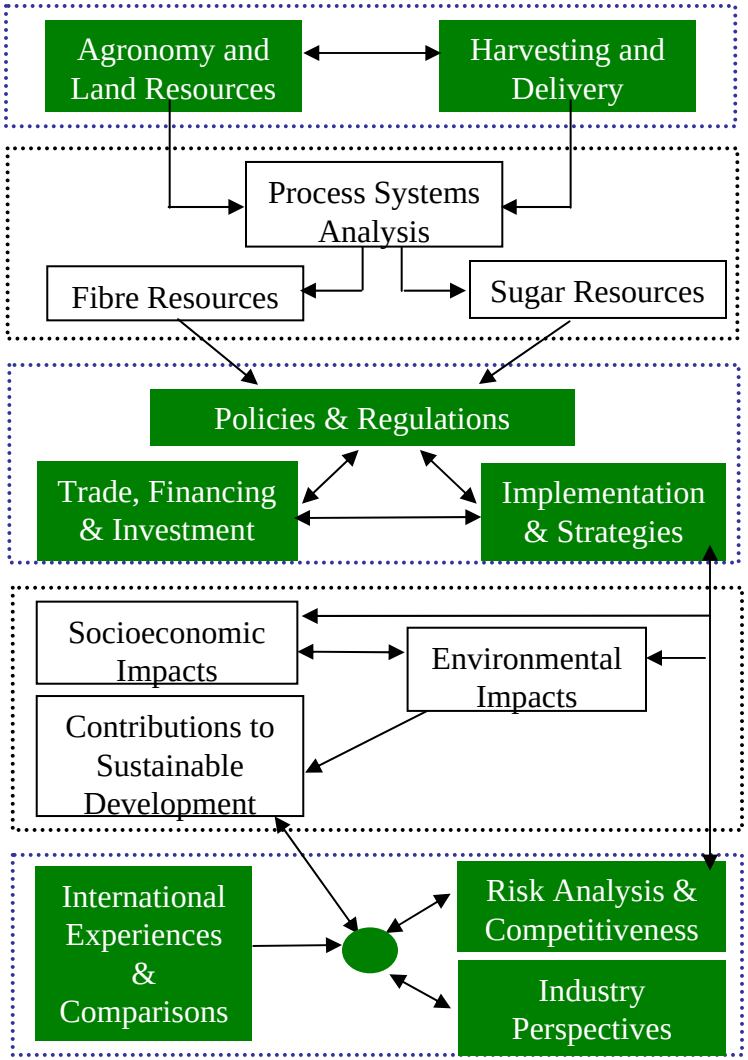
Contents of presentation

- The African sugarcane network and its key outcomes
- Growing sugarcane in Africa
- Sugarcane resources and utilizations
- Socio-economic impacts
- Environmental impacts
- International trade
- Climate change

The Network and its Key Outcomes

www.carensa.net

14 international partners, 5 thematic reports, 6 journal articles, workshops, etc.



Agriculture

Industry

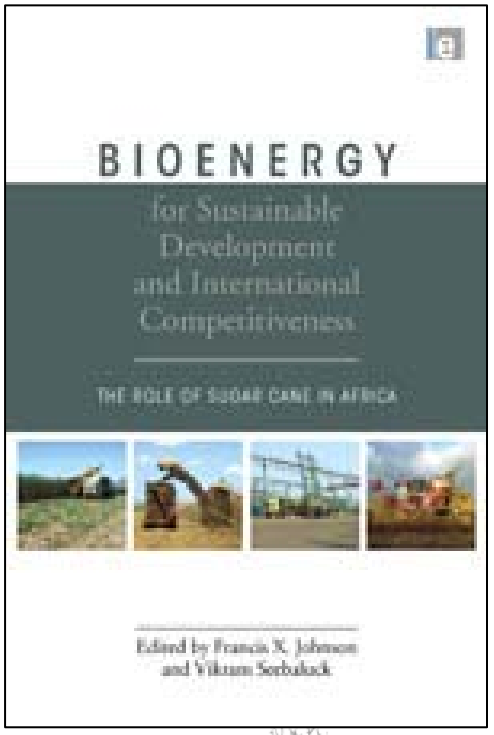
Markets

Impacts

Integration

2-3 years,
44 contributors,
18 chapters

EARTHSCAN book - in press

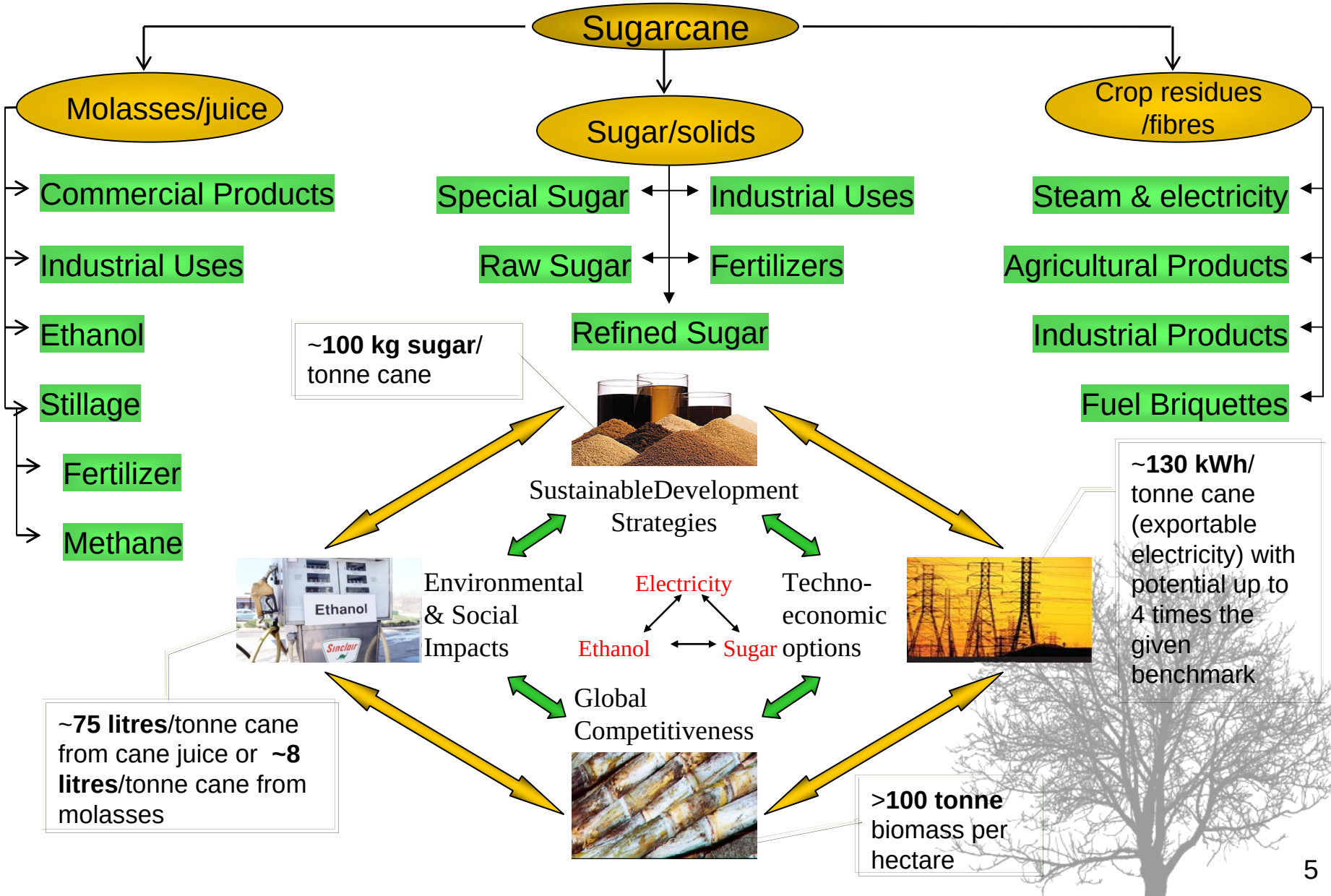


Growing Sugarcane in Africa

- **Most promising agricultural source of biomass energy** in the world: *photosynthetic efficiency of 1-3.3% - high energy-to-volume ratio*
- **Wide adaptation** in different environment and geographic locations: *C4 crop and genetically improved*
- **Greatest bioenergy potential in sub-Saharan Africa** among the major world regions
- Average area under agricultural cultivation of about 6% in the region is low by international standard: ***abundant land availability & well-suited for expansion***
- **Suitable and available land** – with few detrimental environmental and socio-economic impacts: *many models – ACRU-Thompson, FAO, MARI, IGBP/IHDP, BAEZP, ….)*

	Angola	Malawi	Mozambique	Tanzania [a]	Zambia	Zimbabwe
Country land area	1 246 700	94 080	784 090	878 690	743 390	386 670
Potentially suitable	16 260	7 420	49 060	16 940	35 460	29 350
Protected areas	13 950	5 950	46 020	12 230	24 330	18 600
Slopes > 16%	13 890	5 800	45 300	12 170	24 270	18 550
Available and suitable	**11 270**	2 060	**23 380**	4 670	**11 780**	6 200
% of country land area potentially suitable	1.30	7.89	6.26	1.93	4.77	7.59
% of country land area available and suitable	0.90	2.19	2.98	0.53	1.58	1.60

Sugarcane Resources & Utilizations



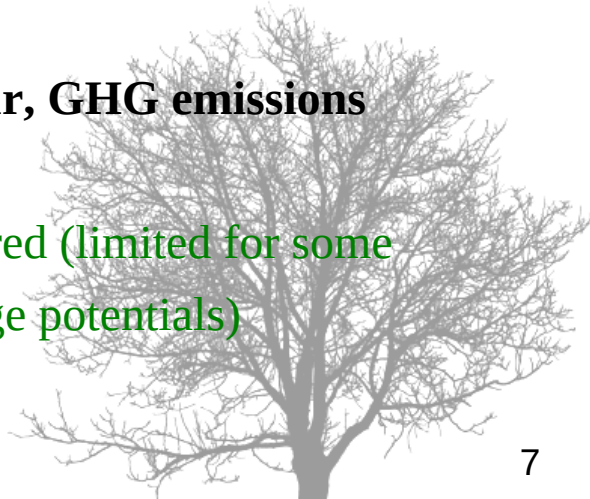
Socio-Economic Impacts

- **Key drivers** are **energy access/security** and **agro-industrial development**: *geared towards local needs and appropriate scales (small, large or decentralised)*
- **Small-scale uses** and **alternative markets**: *transportation fuel(domestic/export), cooking fuel, rectified spirits, pharmaceutical products*
- **Employment** and **income generation**: *rural jobs (agro-industrial, commercial, new products), rural income and industry, access to modern energy services, improved assess to health and education, curbing urbanisation*
- **Other benefits**: *agricultural diversification to biofuels, savings in fuel bill and foreign exchange, diversified energy mix, less vulnerable to supply disruptions, improved reliability*

Drivers	Co-product	Strategies	Impacts	Indicators
High oil prices Pressure on foreign currency reserves	Ethanol: large scale	Fuel blending Export	Foreign exchange savings Lead emissions	Quantity petrol imported % Ethanol in blend Lead level in soil, air
Limited energy access	Ethanol: large/small scale	Decentralised production, local appliances	Improved access to modern energy	Lower particulates % Reliance on traditional fuels
Need for greater energy security	Ethanol: small scale	Kerosene substitute in liquid and gel form	Cleaner indoor air Health risk – abuse Land use changes	Incidence of upper respiratory complaints
Power shortage in SADC region	Electricity (bagasse)	Sell to grid Local mini grid	Facilitates productive activities (welding, power tools, cooling….)	Range of income generating activities, incomes

Environmental Impacts

- Main ones relate to **GHG benefits, water use, water pollution, soil impacts, air pollution and land use change**
- **Good agricultural practices, use of better technology, local regulations and zonings** can address these impacts
- Compared to other commodity crops, **pesticides use is relatively low** and **chemical application is restricted to herbicides**
- **Land use change** as a result of expansion can be viewed in **comparison to alternative land-use activities**
- Cane biomass possesses **excellent energy balance for electricity/ ethanol production**
- Bioethanol is a **cleaner burning fuel** with fewer hydrocarbon emissions, mitigating local air pollution
- Efficient cogeneration systems result in **low fly ash, sulphur, GHG emissions** compared to fossil based systems
- Impacts are however very localised and needs to be monitored (limited for some impacts such as fertilisers uses and run-off or land use change potentials)



International Trade

- Biofuels programmes tend to target **local markets** and to **substitute expensive imported oil**, but can also be **export-oriented**
- **Economies of scale** are important to lower costs and become internationally competitive: *energy balance and environmental impacts of market expansion need to be evaluated*
- **Policy decisions** easier at national level but more complex at global scale for international trade
- **Inadequate/inconsistent policy measures and unstable markets:** *investors looking for long-term investment/contract/stability to ensure economic return, high-volume contracts leading to efficient low cost logistics*
- **International biofuels trade barriers**: *tariffs in large markets (US, EU & Japan), can result in incentives to promote export of feedstock (e.g. unprocessed cane molasses)*
- **Specifications and classification systems**: *lack of technical specifications and import regulations for biomass and, lack of clear classification of biofuels within multilateral trading system*
- **Logistical barriers**: **high transport costs, bulkiness of feedstock (e.g. molasses)**
- **Standards and certification** - key in ensuring sustainability: *a number of available voluntary schemes, 'Bonsucro' in line with ISO 65 for sugarcane products (sugar, ethanol & electricity), SADC-specific framework for sustainable biofuel development in Member States*

Climate Change

- **African countries** face impacts of **climate change** and concurrently need to look for **development pathways** less constrained by **rising oil prices and scarcity of the resource**
- **No full assessment of climate impacts and scenarios** for sugarcane in Africa exists, given that there is no fully integrated bioenergy/sugarcane production facility in the region
- **Brazilian experience**: *ethanol average net GHG emission 34.5 kg CO2 eq/tonne cane*
- **Prototype baseline emissions assessment in South Africa** using Brazilian methodology:

	Rain-fed areas (CO2/tc)	Irrigated areas (CO2/tc)
Farming	12.1	50.2
Burning	4.7	5.1
Soil emissions	17.6	12.2
Agrochemicals inputs	17.6	14.3
Cane transport	4.3	4.3
Total	**56.3**	**86.2**

- **Net GHG emissions higher in South Africa**; but potential GHG savings much higher because of coal electricity in irrigated areas – potential savings of 160 kg CO2/tc
- **Climate impacts** relate to **crop productivity, water scarcity** and the likelihood of **drought** in the future: *will require management strategies including breeding of more resistant varieties, water use, similar alternative crops (e.g. sweet sorghum)*
- **Adaptation is less explored**: for example, how *increased energy access can improve adaptive capacity*

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&

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MERCI

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