Selected Results from the Thematic Research Network:
Cane Resources Network for Southern Africa
(CARENSA)

Project Meeting, 21 June 2007
Competence Platform on Energy Crop and Agroforestry Systems for Arid and Semi-arid Ecosystems – Africa (COMPETE)

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SEI STOCKHOLM ENVIRONMENT INSTITUTE Climate and Energy Programme

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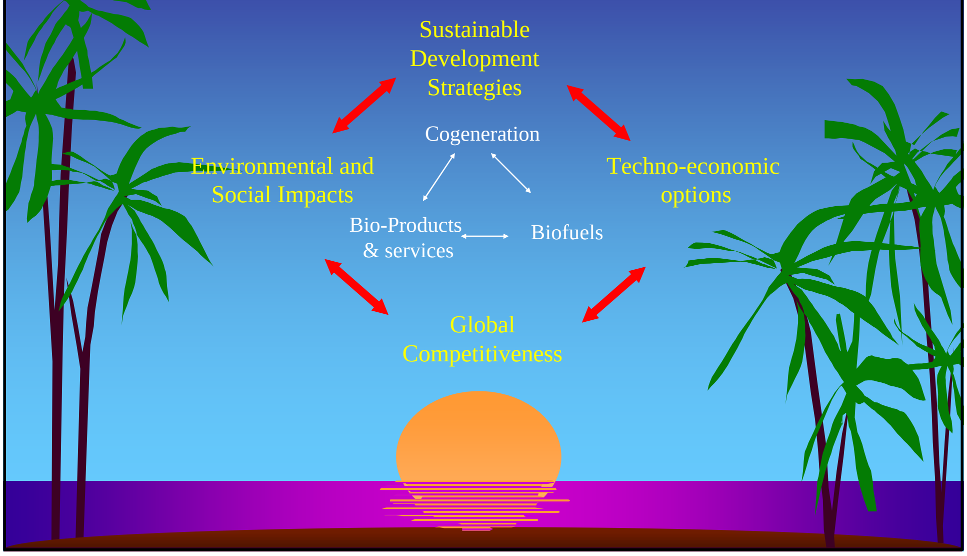
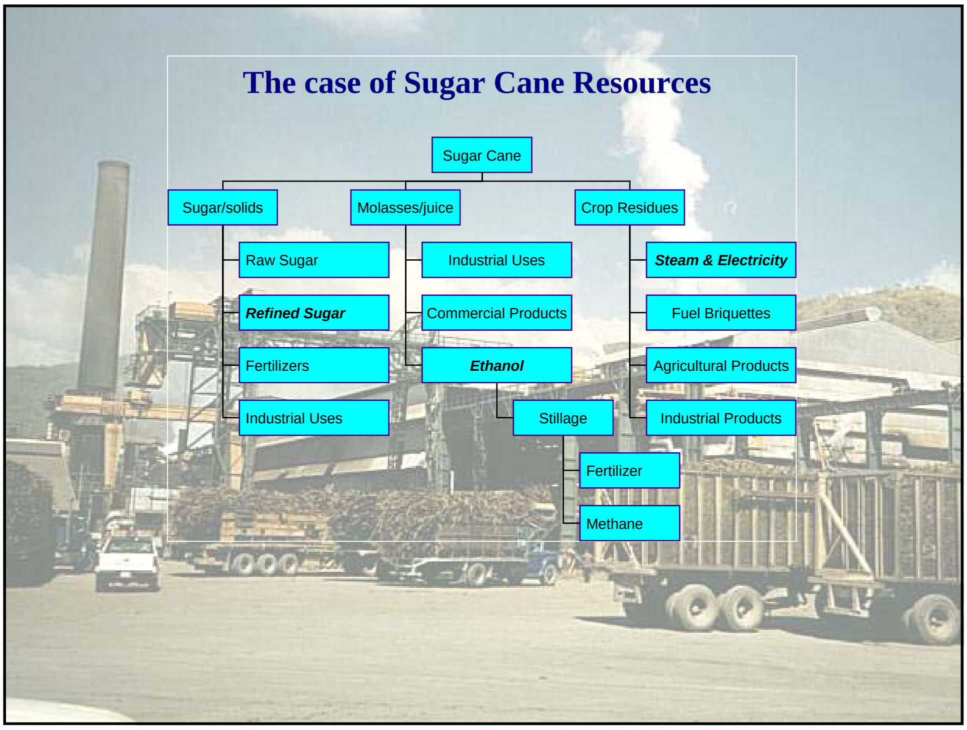
Multi-product, multi-sector strategies to promote sustainable development and enhance global competitiveness





Components of Work Programme

Agriculture
Agronomy & Land Resources
Harvesting and Delivery

Industry
Process Systems Analysis
Fibre Resources
Sugar Resources

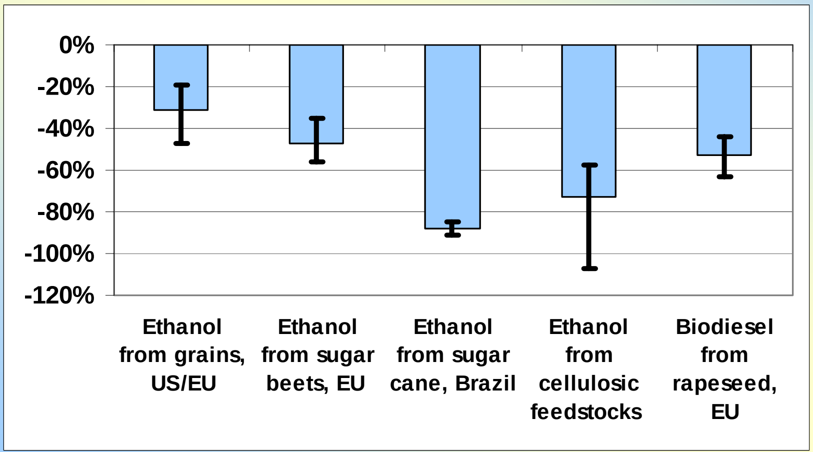
Integration
Risk Analysis & Competitiveness
Sustainable Development
International Experiences
Industry Perspectives

Markets and Policies
Policies and Regulations
Trade, Financing, & Investment
Implementation and Strategies

Impacts
Socio-economic Impacts
Environmental Impacts

GHG Emissions Impacts of Biofuels

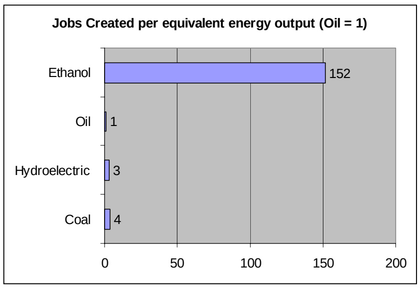
Well-to-wheel CO2-equivalent GHG emissions from biofuels, per km, relative to base fuel

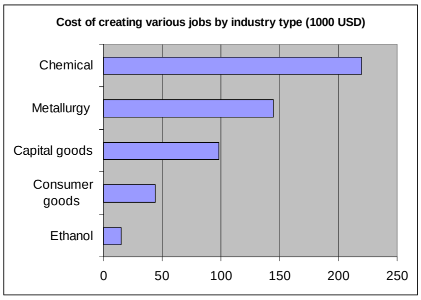


Comparison of biofuel yields

Crop	Seed yield (t/ha)	Crop yield (t/ha)	Biofuel yield (litre/ha)	Energy yield (GJ/ha)
Sugarcane (juice)		100	7500	157.5
Palm oil	9800	70	3000	105.0
Sweet sorghum		60	4200	88.2
Maize		7	2500	52.5
Jatropha	740		700	24.5
Soybean	480		500	17.5

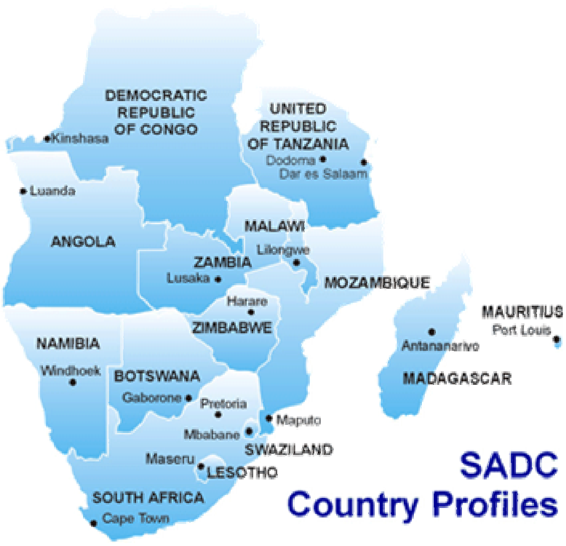
Employment Generation and Sustainable Livelihoods (calculations are for Brazil)





Source: Goldemberg, Jose (2002)

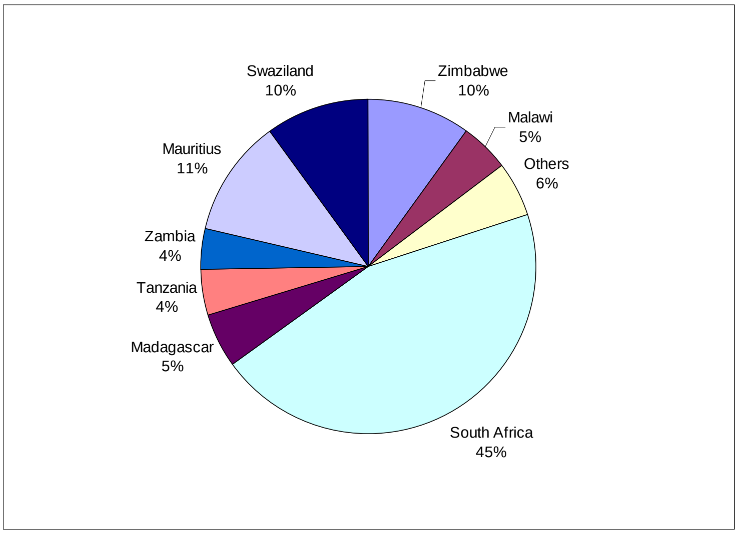
Southern African Development Community (SADC)



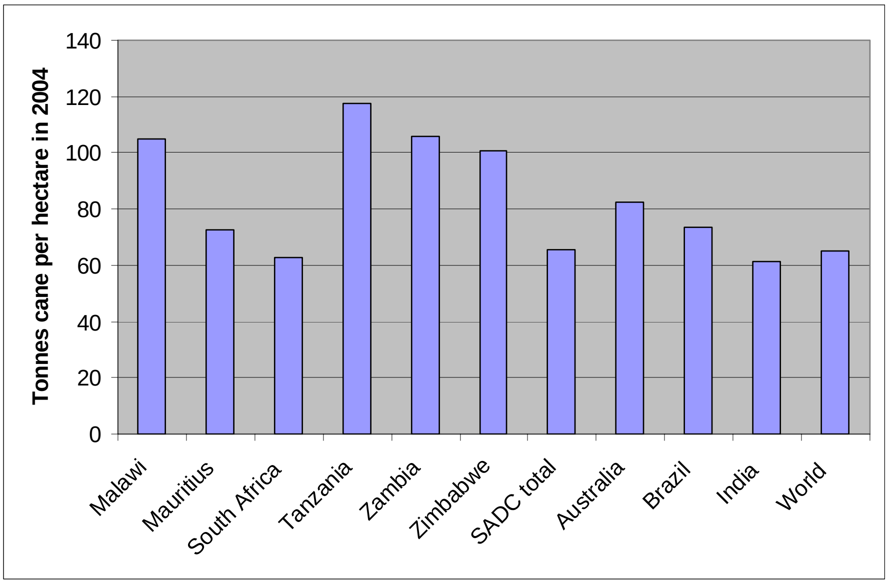
Land Use Summary for SADC and other selected countries/regions

Country/Region	Total Land Area	Forest Area		Agricultural Areas		Cultivated Area	
UNITS:	Million ha	Million ha	share of total land area	Million ha	share of total land area	Million ha	share of total land area
Total SADC	**964**	**368**	**38%**	**433**	**45%**	**53**	**5,5%**
Brazil	846	544	64%	264	31%	67	7,9%
China	933	163	18%	555	59%	155	16,6%
India	297	64	22%	181	61%	170	57,1%
United States	916	226	25%	409	45%	176	19,2%
EU-15	313	116	37%	140	45%	85	27,0%

Shares of SADC sugarcane production, 2004



High crop productivity in some SADC countries



Estimated Potential Surplus for Bagasse Cogeneration for various configurations

Country	Total TC crushed annually x 10^6	Power @ 20 bar 325°C (GWh)	Power @ 31 bar & 440°C (GWh)	Power @ 45 bar & 440°C (GWh)	Power @ 82 bar & 525°C (GWh)
Angola	0.360	9.0	16.2	27.0	46.8
DR Congo	1.669	41.7	75.1	125.2	217.0
Malawi	1.796	44.9	80.8	134.7	233.5
Mauritius	5.800	145.0	261.0	435.0	754.0
Mozambique	0.397	9.9	17.9	29.8	51.6
South Africa	22.103	552.6	994.6	1657.7	2873.4
Swaziland	4.103	102.6	184.6	307.7	533.4
Tanzania	1.289	32.2	58.0	96.7	167.6
Zambia	1.600	40.0	72.0	120.0	208.0
Zimbabwe	4.535	113.4	204.1	340.1	589.6
Total/Avg.	***43.652***	***1091***	***1964***	***3274***	***5675***

Areas **suitable** and **available** for sugarcane in Malawi, Mozambique, Tanzania, and Zambia

Source: UKwZN 2005, South Africa

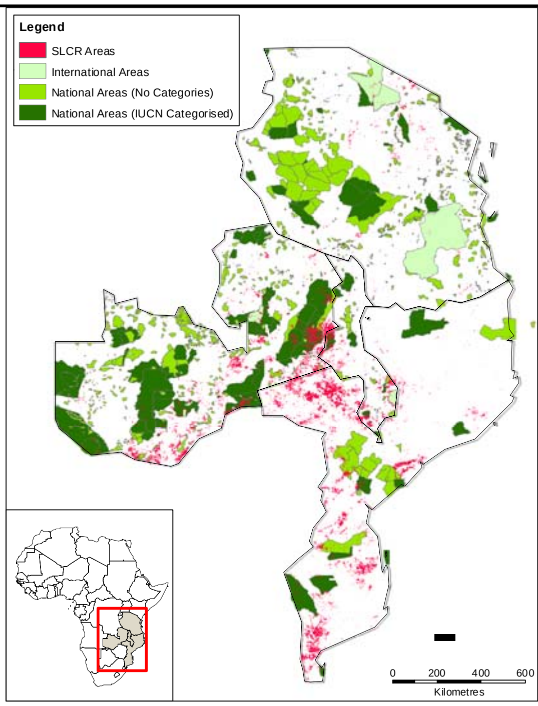
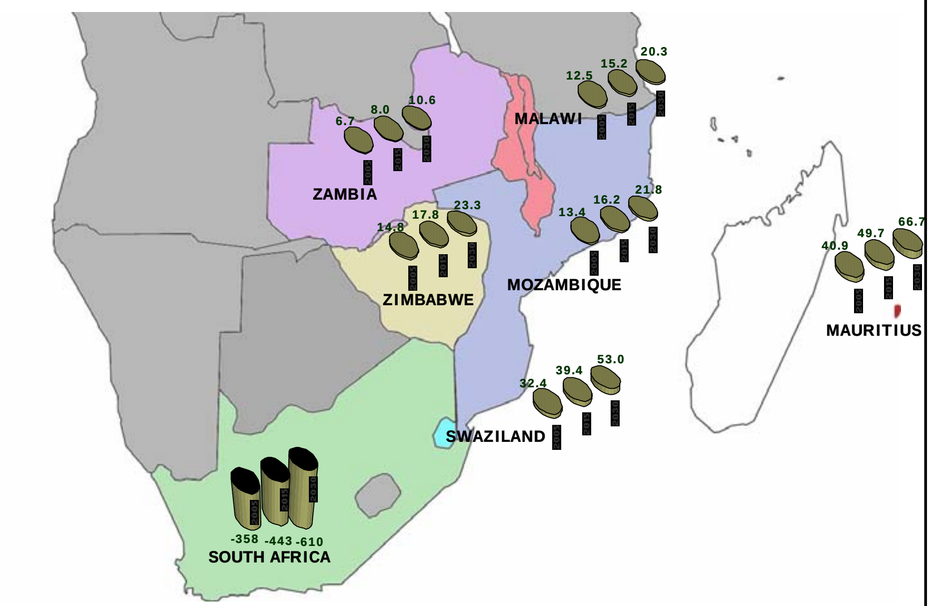
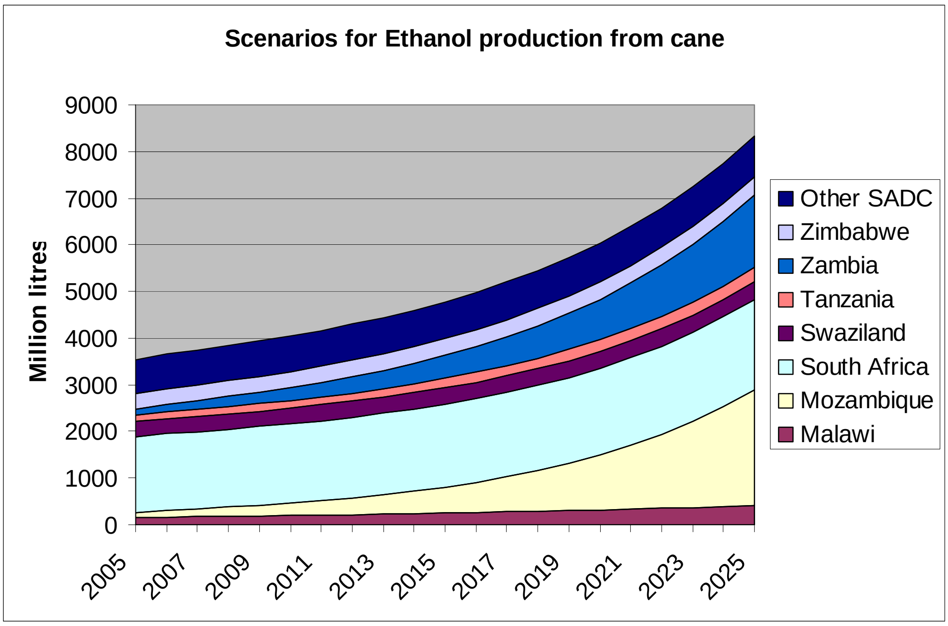


Figure 5.3: Distribution of Protected Areas and SLCR Pixels

Existing Factories: Ethanol Surpluses/deficits with Production from C-molasses only and E5 Ethanol Demand (million litres)





Characteristics of existing sugar factories and potential ethanol supply

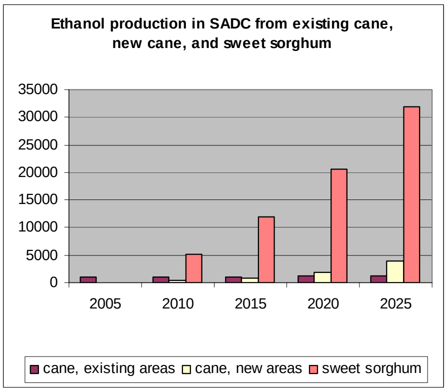
Factory characteristics and/or feedstock supply					*Ethanol Production (Million litres) from*		
Size Category	***Number of factories***	***Avg. Capacity tc/hr***	***Total prod. ktc/yr***	***Avg. ann. Prod. ktc/yr***	***C-molasses***	***A/B molasses***	***Cane juice***
> 2 mtc/year	4	469	9244	2311	83	185	693
1-2 mtc/year	16	305	23064	1538	208	461	1730
< 1 mtc/year	20	167	8852	521	80	177	664
Total	***40***	***258***	***41159***	***1143***	***370***	***823***	***3087***
Additional cane as feedstock			***40085***		***361***	***802***	***3006***
Total potential supply			*81244*		*731*	*1625*	*6093*
Gasoline Equivalent					***512***	***1137***	***4265***

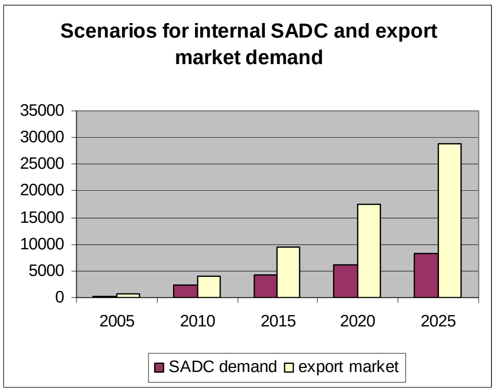
Good growth of sweet sorghum 1

Land suitability for sweet sorghum

Country	Total land (1000 ha)	Suitable Share	
		Low-inputs	High-inputs
Malawi	9408	11%	26%
Mozambique	78409	16%	28%
South Africa	121447	0%	1%
Tanzania	88359	4%	13%
Zambia	74339	8%	34%
Zimbabwe	38685	0%	3%

Scenarios for SADC ethanol supply and demand





Potential supply for export (million litres)

YEAR	2005	2010	2015	*2020*	*2025*	*Average Annual Increase*
Scenarios for ethanol production in SADC	939	6443	13787	23650	36996	20,16%
SADC petrol demand - projections (energy basis)	203	2475	4315	6155	8195	20,30%
assumed % ethanol:	***1%***	***10%***	***15%***	***20%***	***25%***	
Remaining allocation for export market	**736**	**3968**	**9472**	**17495**	**28801**	**20,12%**
relative to demand in other regions (volume basis)						
China	1%	4%	9%	15%	21%	
Japan	1%	7%	16%	29%	48%	
United States	0%	1%	2%	3%	4%	
EU15	0%	2%	6%	10%	16%	
Sources: demand projections from IEA 2005, U.S.DOE/EIA 2005						

Area required for cane and sweet sorghum (kha)

Country/Year	*2010*	*2025*	*Average Annual Change*
Malawi	89	302	9%
Mozambique	859	3484	10%
South Africa	311	285	-1%
Swaziland	43	42	0%
Tanzania	212	802	10%
Zambia	385	1555	10%
Zimbabwe	47	60	2%
Other SADC	208	282	3%
SADC total	**2155**	**6813**	**9%**

Attitudes of Stakeholders with respect to expanding production and trade of biofuels (informal summary)

- Private Industry: positive, waiting for policy signals
- Investment Community: positive, hedging strategies
- Sugar Industry: somewhat hesitant
- Bio-industries: positive; include bio-chemicals as well as fuels
- Governments/Regions:
  - Brazil: world leader, willing to support global market development
  - China: positive, investment in producing countries
  - EU: somewhat positive, biofuels strategy based on 50% import; but lacking in concrete actions
  - U.S.: negative near-term; some potential for openings
  - Japan: positive, energy/resource diversification
- Environmental NGOs: negative, limit to domestic markets
- Development NGOs: somewhat positive
- Farmers/Agriculture groups: positive to production, negative to trade

Cane Resources Network for Southern Africa (CARENSA)

Funding: European Commission Fifth Framework Research Programme (EC FP5)

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SEI, Stockholm Environment Institute (SCIENTIFIC COORDINATOR)
IC, Imperial College Centre for Energy Policy and Technology, UK
UM, University of Mauritius, Chemical and Sugar Eng. Dept.
UND, University of Natal, Durban, South Africa
AUA, Agricultural University of Athens, Greece
CIRPS, Interuniversity Research Centre on Sustainable Development, Italy
BUN, Biomass Users Network, Zimbabwe
CEEEZ, Centre for Energy, Environment, and Engineering, Zambia
ISO, International Sugar Organisation
FAO, Food and Agricultural Organisation (FAO), United Nations
WII, Winrock International India
CENBIO, National Reference Centre for Biomass, Brazil
UNICAMP, University of Campinas
SADC, Southern African Development Community

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and our International Partners – for their hard work

CEEEZ
Centre for Energy, Environment and Engineering Zambia Limited

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