



LACAf BIOENERGY 2014 WORKSHOP

Sustainable bioenergy production in Southern Africa

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Traditional role of bioenergy/ biofuels in southern Africa



Bioenergy value to southern Africa

1. Energy plays a key role in the development of nations and provides vital services and means that improve quality of life, the so-call engine of economic progress.
2. With the sub-Saharan Africa population of about 800 million bound to reach >1.2 billion by 2020, living in poverty cannot be reduced *without major improvements* in the quality and magnitude of energy services in Africa.
3. Renewable bioenergy, particularly biofuels, has played a pivotal role in Africa and could again help address the need for energy expansion and critical human needs in the foreseeable future.

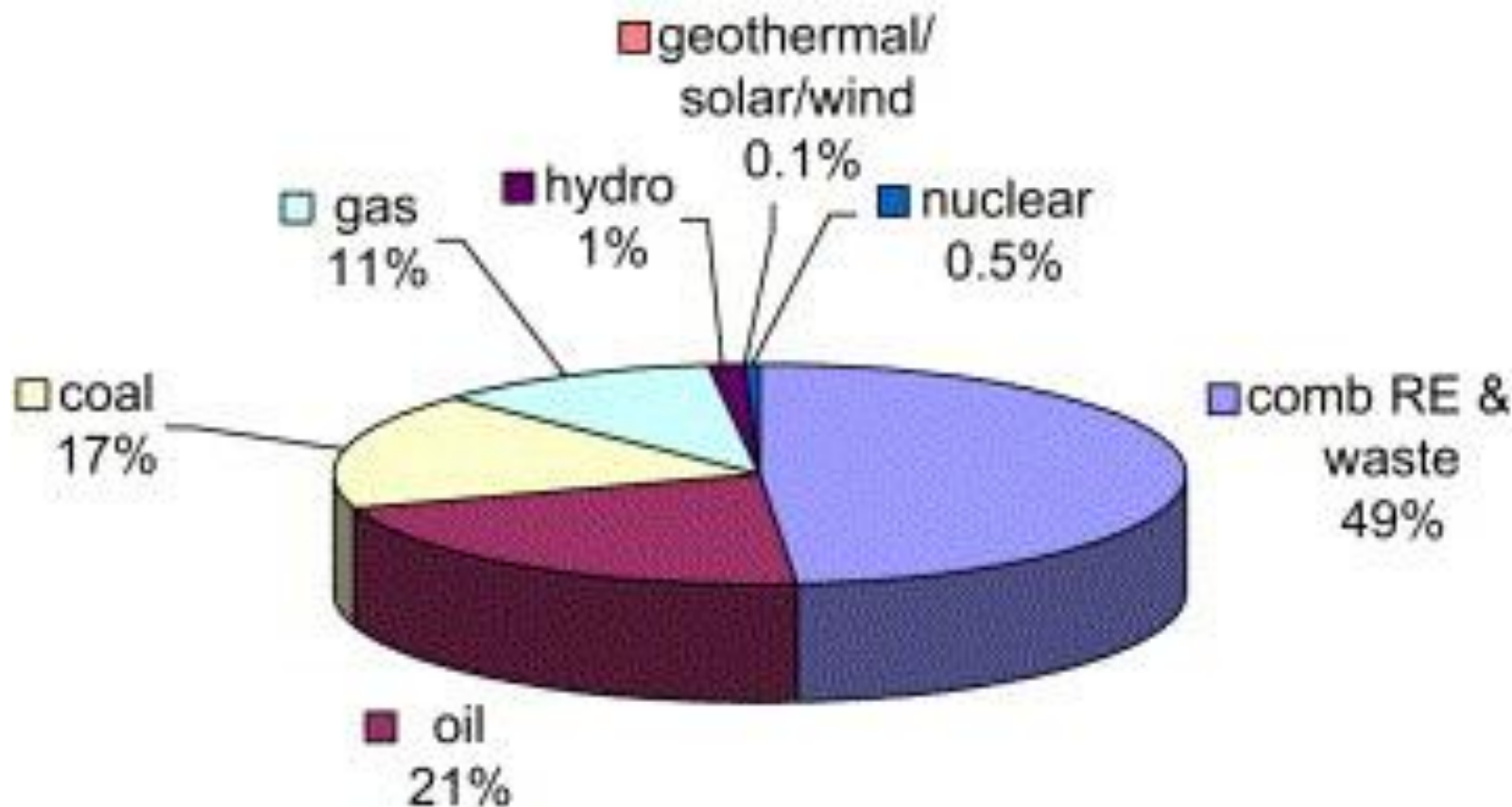


Biofuel production in southern Africa

1. In developed countries, the main thrust for ethanol production is the replacement of fossil fuels in the transportation sector.
2. Africa has a great potential to produce and meet the growing demand to phase-out fossil fuels for transport.
3. *However*, the situation is different for developing countries, such as the SADC region because of their unique socio-economic needs, especially:
 - a) the chronic food and energy insecurity;
 - b) extreme poverty;
 - c) high unemployment rate, and
 - d) degradation of the natural environment.



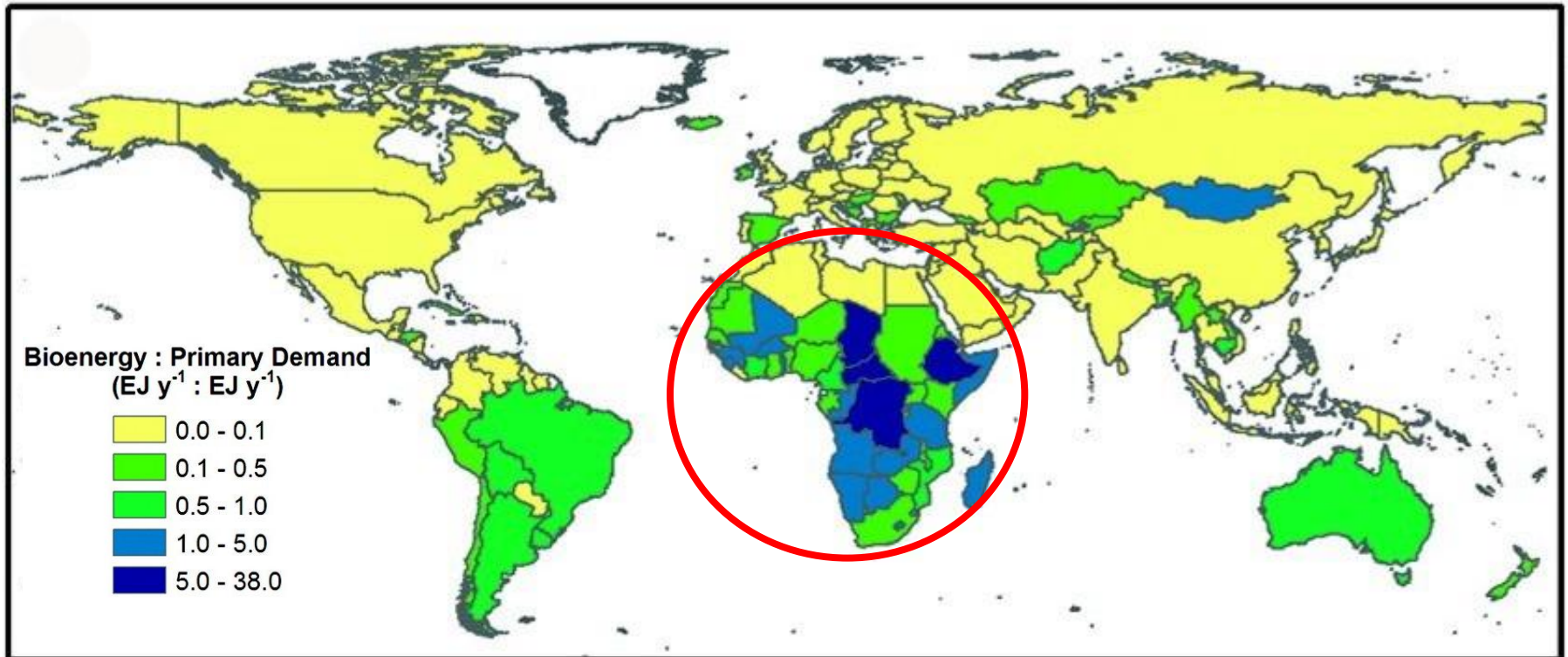
Traditional bioenergy production in Africa



Share of total primary energy supply in Africa (2001)
[Amigun et. al., 2006. Renew. Sust. Energ. Rev. 12:690-711]



Biomass potential of Africa at large



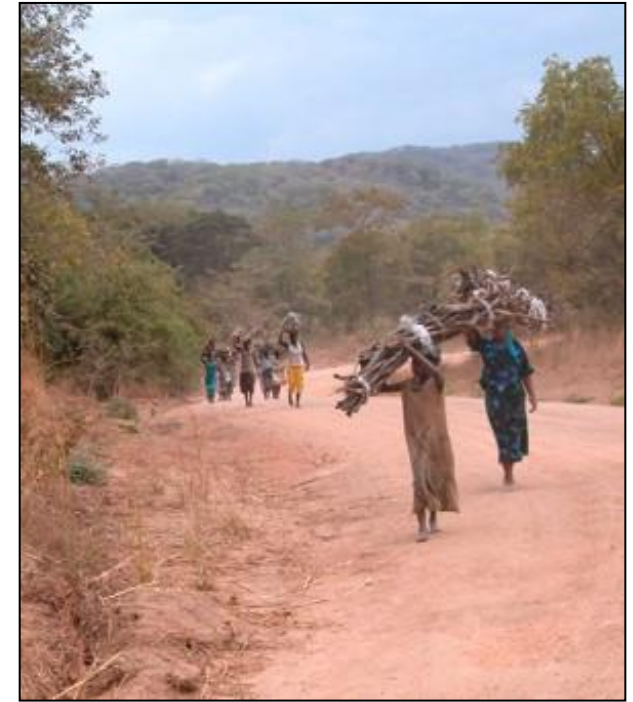
Ratio of the energy content of the biomass on abandoned agriculture lands relative to the current primary energy demand at the country level. The energy content of biomass is assumed to be 20 kJ g⁻¹. Source: Campbell et al. (2008)



Collecting and availability of biomass (Malawi)



Grass collection for roofs and fences



Firewood collection



Malawi today



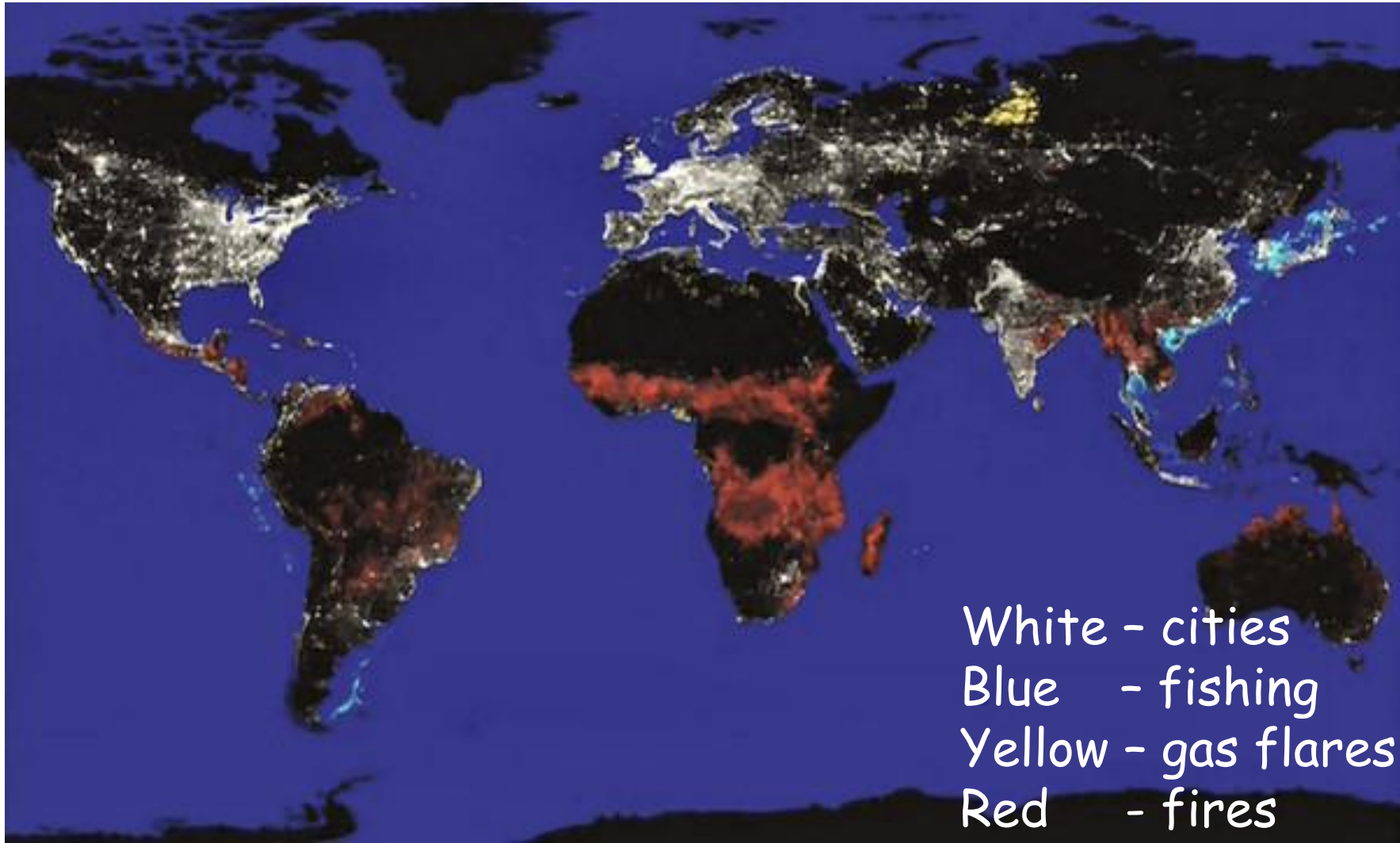
Malawi in the past



Brick-making using woody materials



Charcoal



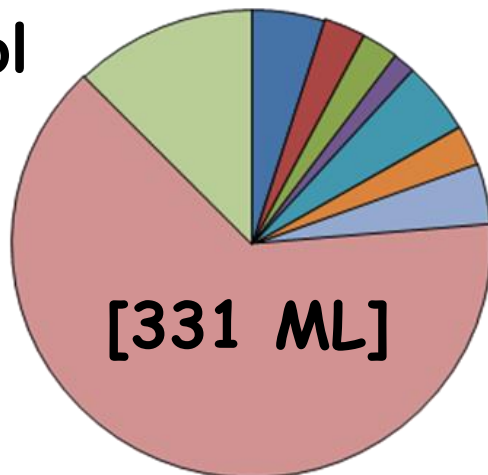
From Al Gore: *"The Inconvenient Truth"*



Integrating 1st and 2nd generation technologies could create opportunities for sub-Saharan Africa

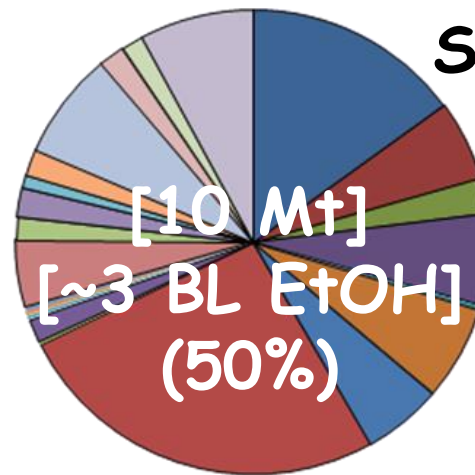


Ethanol



- Egypt [30 ML]
- Kenya [17 ML]
- Malawi [15 ML]
- Mauritius [9 ML]
- Nigeria [30 ML]
- Swaziland [17 ML]
- Zimbabwe [25 ML]
- South Africa [388 ML]
- Other Africa [75 ML]

Sugar



- | | |
|--------------------------|-------------------------|
| ■ Egypt [1600 Kt] | ■ Madagascar [32 Kt] |
| ■ Kenya [600 Kt] | ■ Male [32 Kt] |
| ■ Malawi [261 Kt] | ■ Morocco [505 Kt] |
| ■ Mauritius [685 Kt] | ■ Mozambique [170 Kt] |
| ■ Nigeria [30 Kt] | ■ Reunion [210 Kt] |
| ■ Swaziland [700 Kt] | ■ Senegal [95 Kt] |
| ■ Zimbabwe [585 Kt] | ■ Somalia [200 Kt] |
| ■ South Africa [2780 Kt] | ■ Sudan [800 Kt] |
| ■ Angola [31 Kt] | ■ Tanzania [187 Kt] |
| ■ Cote d'Ivoire [170 Kt] | ■ Uganda [160 Kt] |
| ■ Guinea [25 Kt] | ■ Other Africa [830 Kt] |

Sources: RAF Outlook (2007) and Hassan (2008).

[Ambali *et al.* 2011. A review of sustainable development of bioenergy in Africa: An outlook for the future bioenergy industry. *Sci. Res. Essays* 6: 1697-1708]



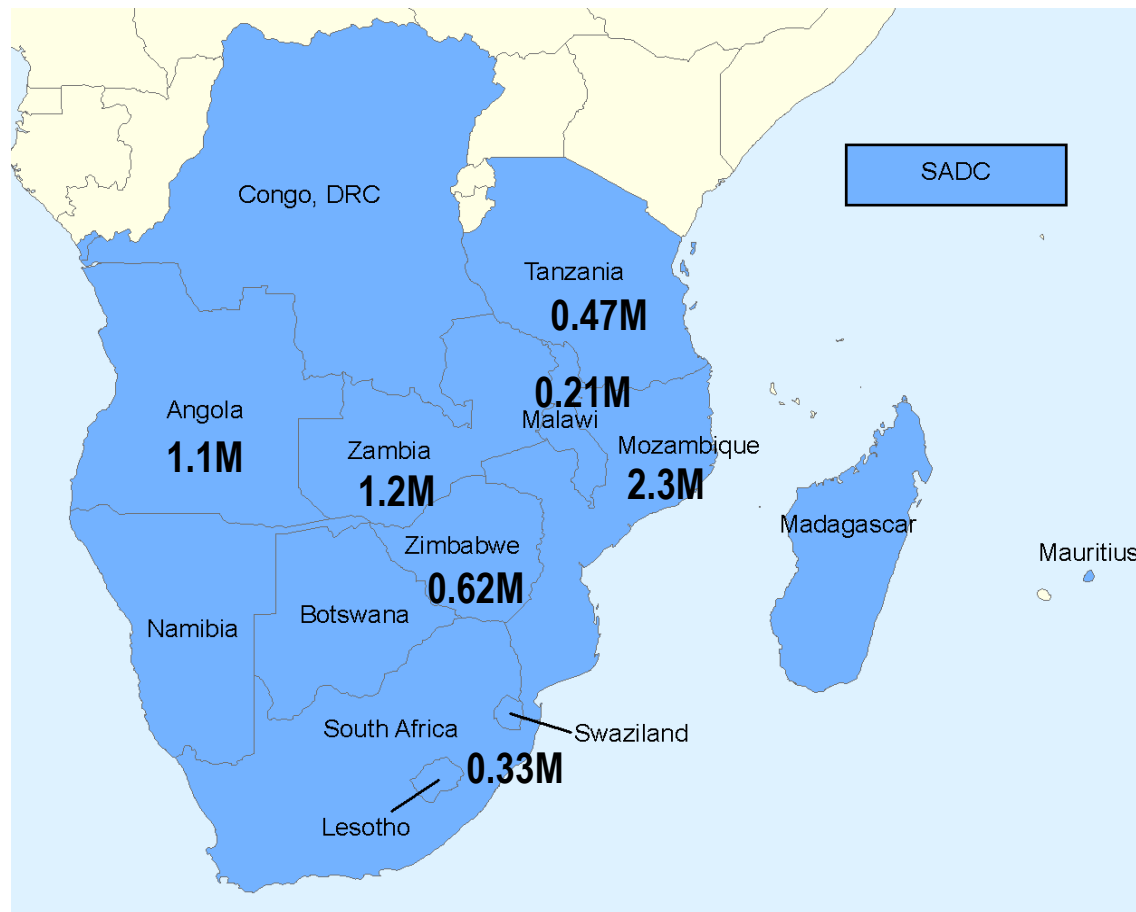
Opportunities for sugarcane in SADC

1. Currently, Africa only produce a fraction of the world ethanol, and even Africa's sugar production is rather modest with South Africa been the biggest producer, producing about half of the sugarcane in SADC (~20 Mt/annum), using an area of ~325 000 Ha!
2. However, a recent study (Watson, 2011) estimated that about 6 MHa of arable land in SADC countries (primarily Mozambique, Angola, Tanzania, Zambia, Zimbabwe and Malawi) are suitable for sugarcane production at an average yield of >65 t/Ha or more.
3. Conservatively, this means that the total South Africa sugar industry can be replicated every year for at least 15 -20 years in southern Africa!

[Watson, HK. 2011. Potential to expand sustainable bioenergy from sugarcane in southern Africa. *Energy Policy* **39**: 5746-5750.]



Potential sugarcane production in southern Africa



[Watson. 2011. Potential to expand sustainable bioenergy from sugarcane in southern Africa. *Energy Policy* in press (doi: 10.1016/j.enpol.2010.07.035).]



Opportunities for sugarcane in SADC

1. Currently, Africa is producing 331 ML;
2. If 50% of the total current sugar production is converted to ethanol, Africa can producing 3 BL, five time more!;
3. However, if optimal sugarcane is produced in 6 SADC countries only and about 50% of total biomass converted to biofuels, the potential can increase with another order of magnitude, +35 BL, *representing ~10-13% of Africa's total petroleum consumption!*
4. Theoretically, Africa is producing at present only 1% of its potential and can, together with Brazil, be a major player in the future!



Strategic partnership with NEPAD



Dr. Ibrahim Mayaki
CEO: NEPAD

Jeremy Woods

Mosad Elmissiry





Strategic partnership with Brazil/GSB

Luis Cortez
(UNICAMP)



Brito Cruz
(Executive Director,
FAPESP, SP, Brazil)

Lee Lynd
(Dartmouth)





Future for Africa??





Enjoy the workshop!