

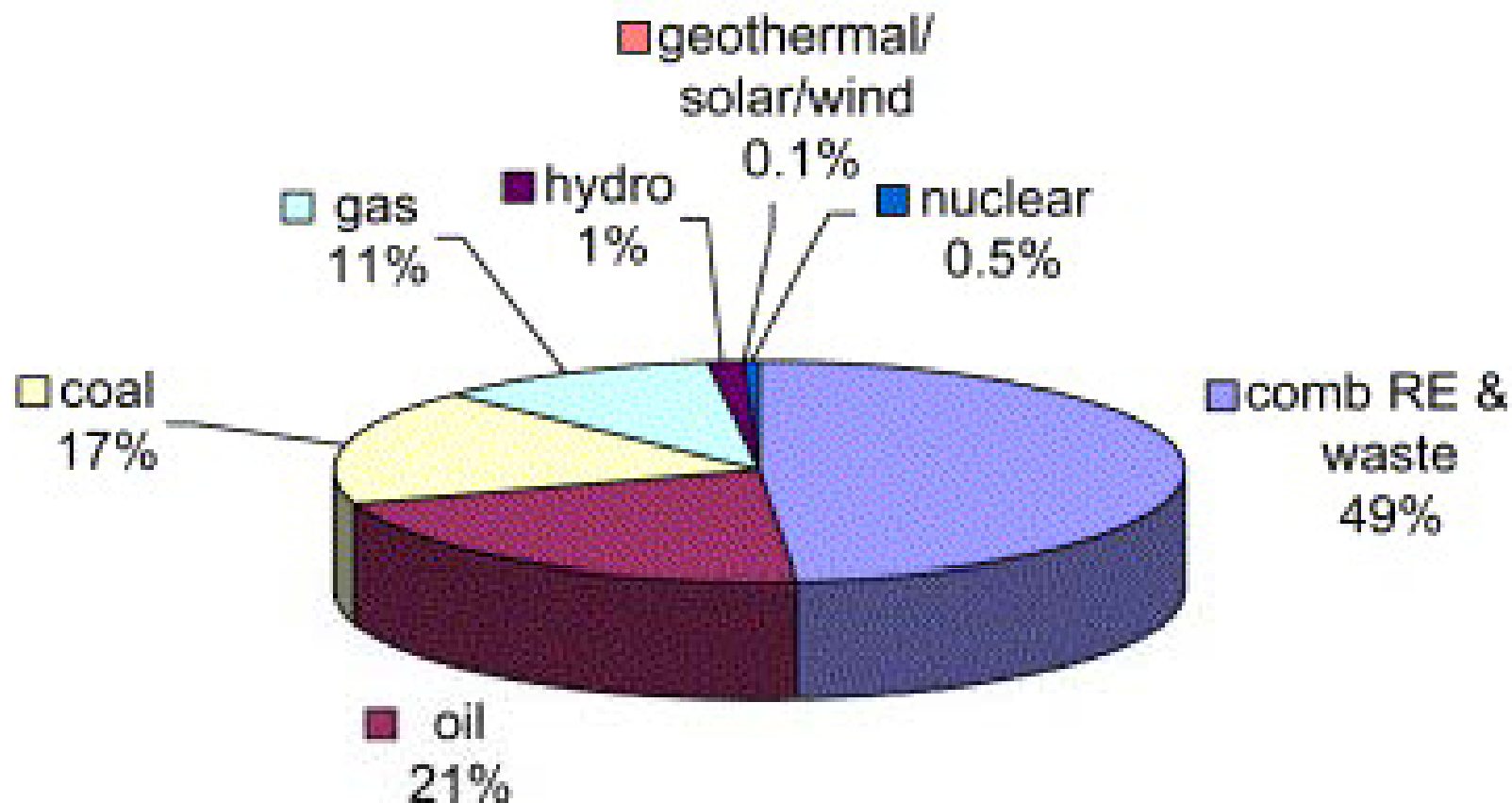
Bioenergy potential in sub-Saharan Africa?

Emile van Zyl

*Department Microbiology
University of Stellenbosch*



Traditional biofuels production in Africa



Share of total primary energy supply in Africa (2001)
[Amigun et. al., 2006. Renew. Sust. Energ. Rev. epub]

Availability of biomass (Malawi as example)



Malawi today



Malawi in the past



Brick-making using woody materials

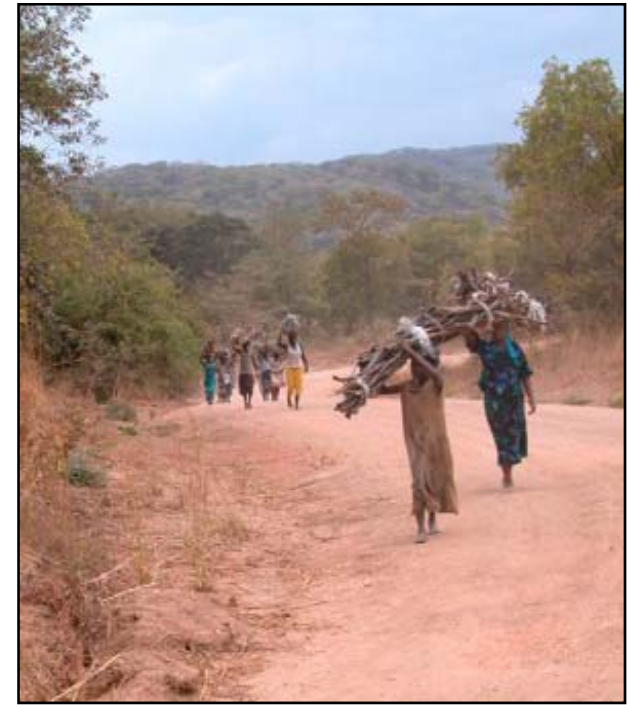


Charcoal

Collecting of biomass (Malawi as example)



Grass collection for roofs and fences



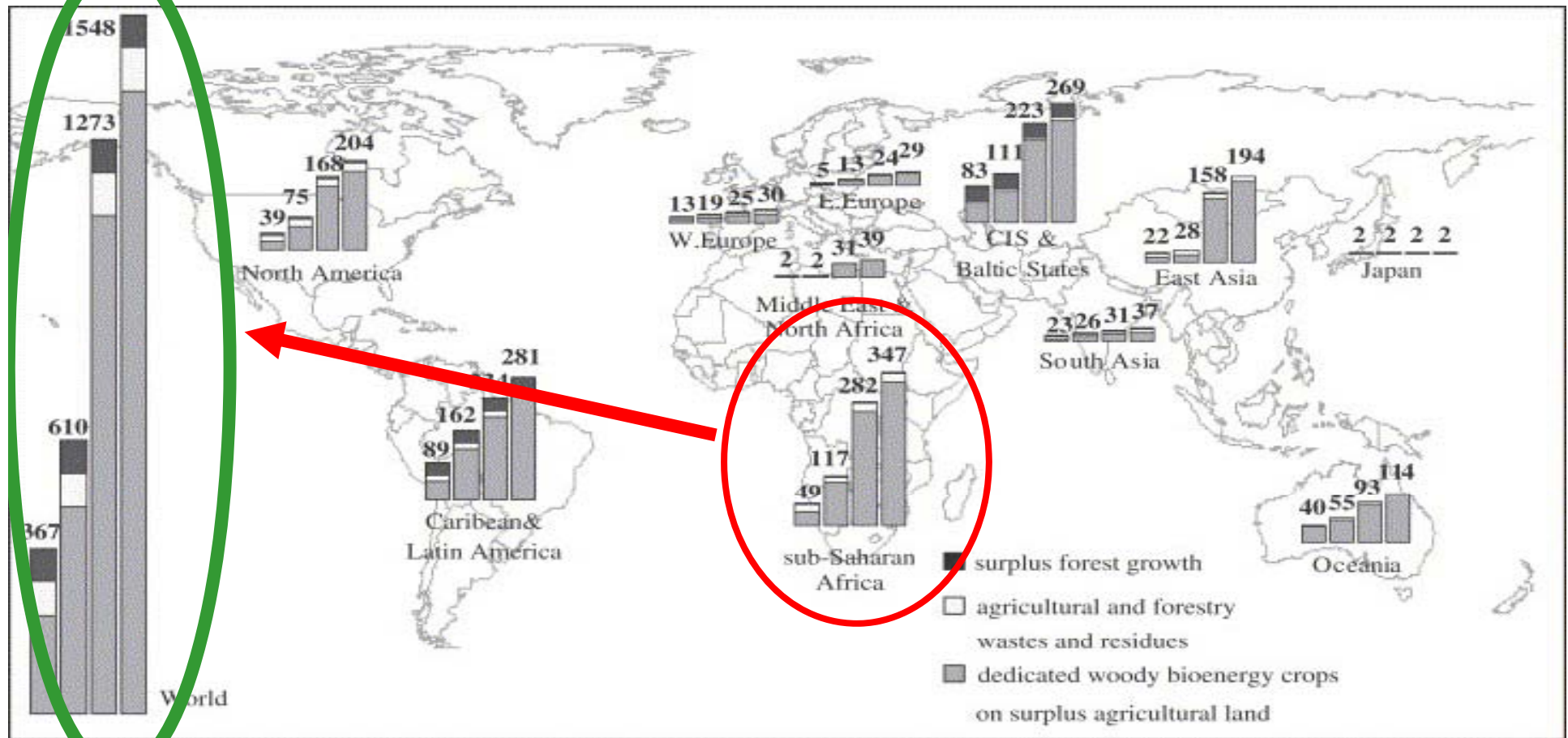
Firewood collection



Future bioenergy potential in Africa

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Bioenergy Production Potential in 2050 (Smeets, Faaij, 2004)

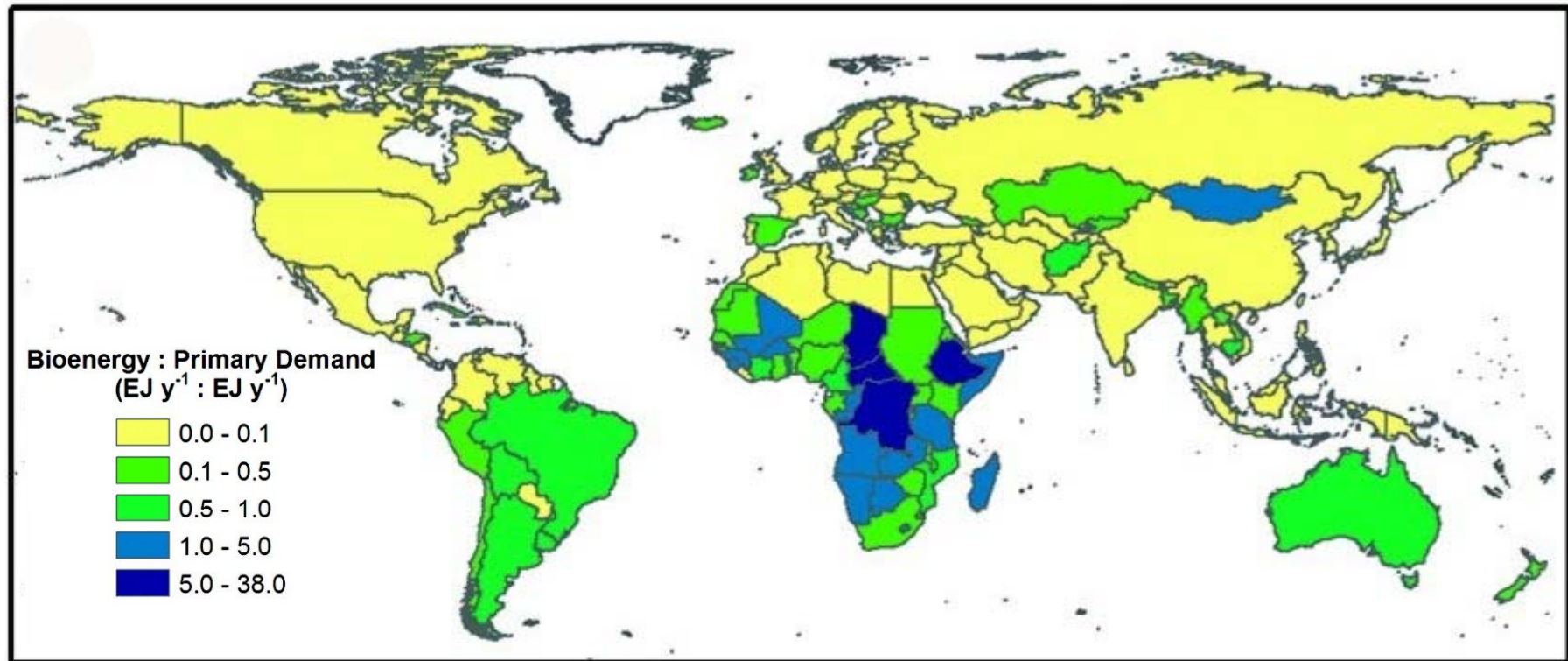


Total bioenergy production potential in 2050 based on different agriculture systems [expressed as EJ (10^{18} J). yr^{-1} ; left to right bars - conventional to highly productive agriculture systems].



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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)

Bioenergy/biofuels value to southern Africa

Benefits of bioenergy production in southern Africa:

1. Source of foreign exchange savings for oil-deprived countries.
2. Boosting of local agriculture production and additional markets and revenue for farmers.
3. Help generate employment and local economic development opportunities in rural areas.
4. Reduction of GHG emissions and preservation of quality of atmosphere.
5. Contribute to political security, make Africa less dependent on oil and create local wealth.

Bioenergy/biofuels value to southern Africa

Important considerations/challenges:

- Choice of crops/ feedstock- species/varieties.
Don't assume what works in rest of world will necessary work in Africa! Jatropha a point and case!
- Production means - technology/expertise.
Don't dump Western thinking and technologies in Africa and assume it will be embraced! Try to understand their culture, their practices and sustainable way of living - acknowledge indigenous knowledge! Try to adapt and promote technology accordingly.

Bioenergy/biofuels value to southern Africa

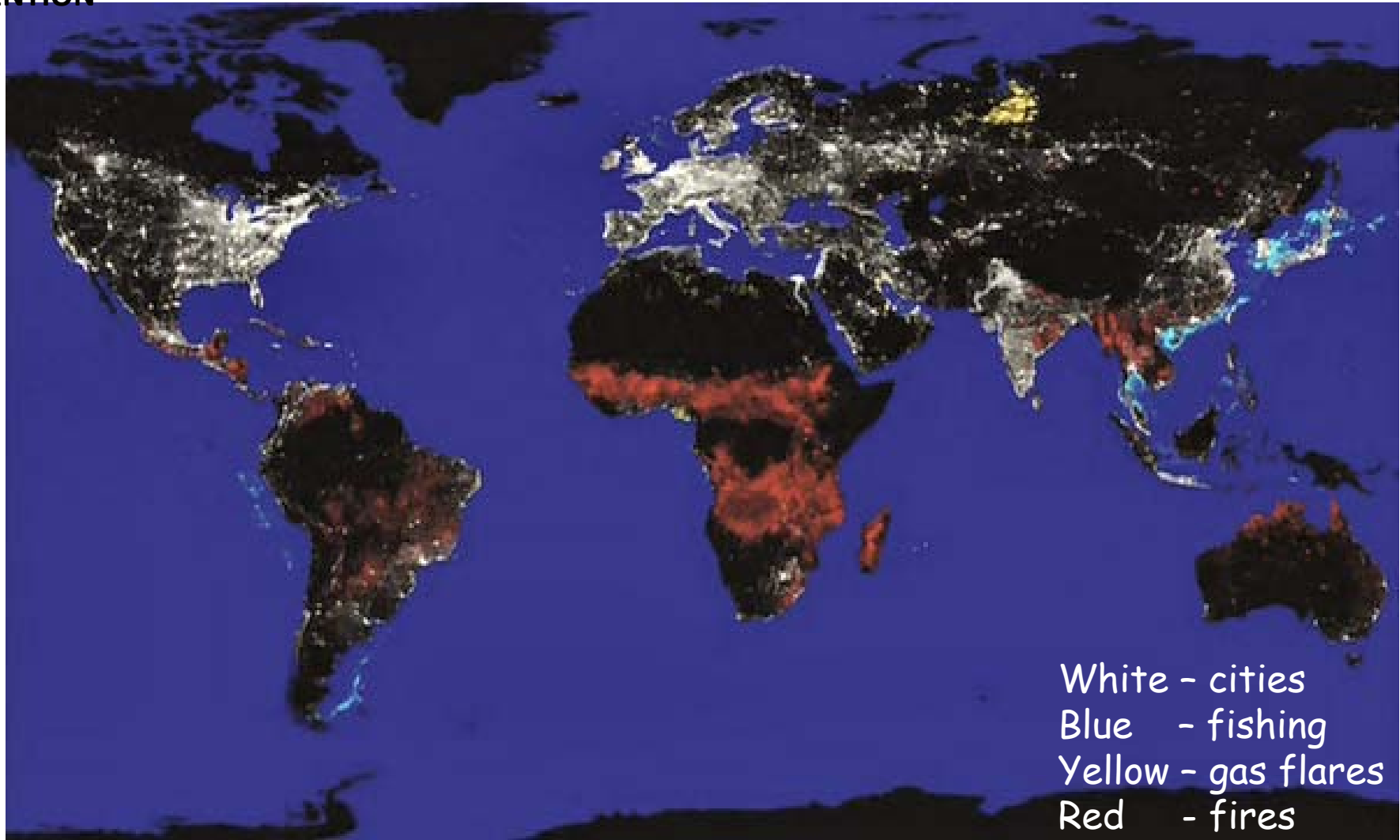
Important considerations/challenges:

- Don't assume infrastructure exists - transport, storage, marketing often have to be created. Acknowledge and respect culture, social and political networks if you want to make any progress!
- Support services are very important, e.g extension services are often non-existing and have to be established from scratch!
- Capital investment will be crucial but first try to ensure an enabling political environment!



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Future bioenergy potential in Africa



From Al Gore: *"The Inconvenient Truth"*

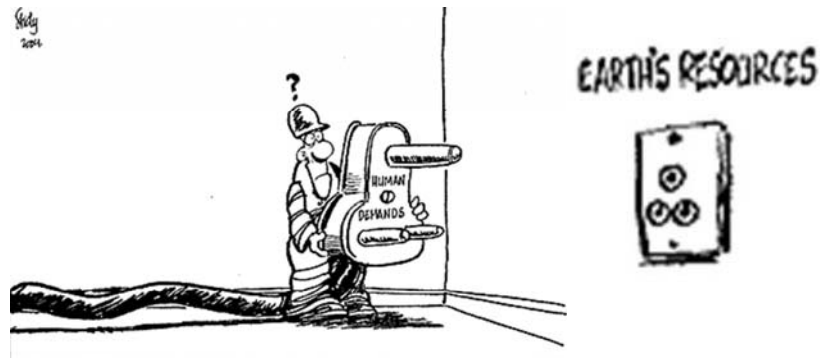
Heading for a non-sustainable future!



Heading for a non-sustainable future!



Heading for a non-sustainable future!





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South Africa's potential: Renewable biomass available

Residues

Agricultural

Maize stover	6.7 Mt/a	(118 PJ/a)
Sugar cane bagasse	3.3 Mt/a	(58 PJ/a)
Wheat straw	1.6 Mt/a	(28 PJ/a)
Sunflower stalks	0.6 Mt/a	(11 PJ/a)
Agricultural subtotal	12.3 Mt/a	(214 PJ/a)

Forest industry

Left in forest	4.0 Mt/a	(69 PJ/a)
Saw mill residue	0.9 Mt/a	(16 PJ/a)
Paper & board mill sludge	0.1 Mt/a	(2 PJ/a)
Forest industry subtotal	5.0 Mt/a	(87 PJ/a)

2. Energy crops

From 10% of available land (Marrison and Larson, 1996)	67 Mt/a	(1 171 PJ/a)
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3. Invasive plant species	8.7 Mt	(151 PJ)
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Total, annual basis	93 Mt/a	(1 622 PJ/a)
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Which bioenergy crops?



Grain sorghum



Sweet sorghum
- two harvests?



Sugar cane
(100+ t/ hect?)



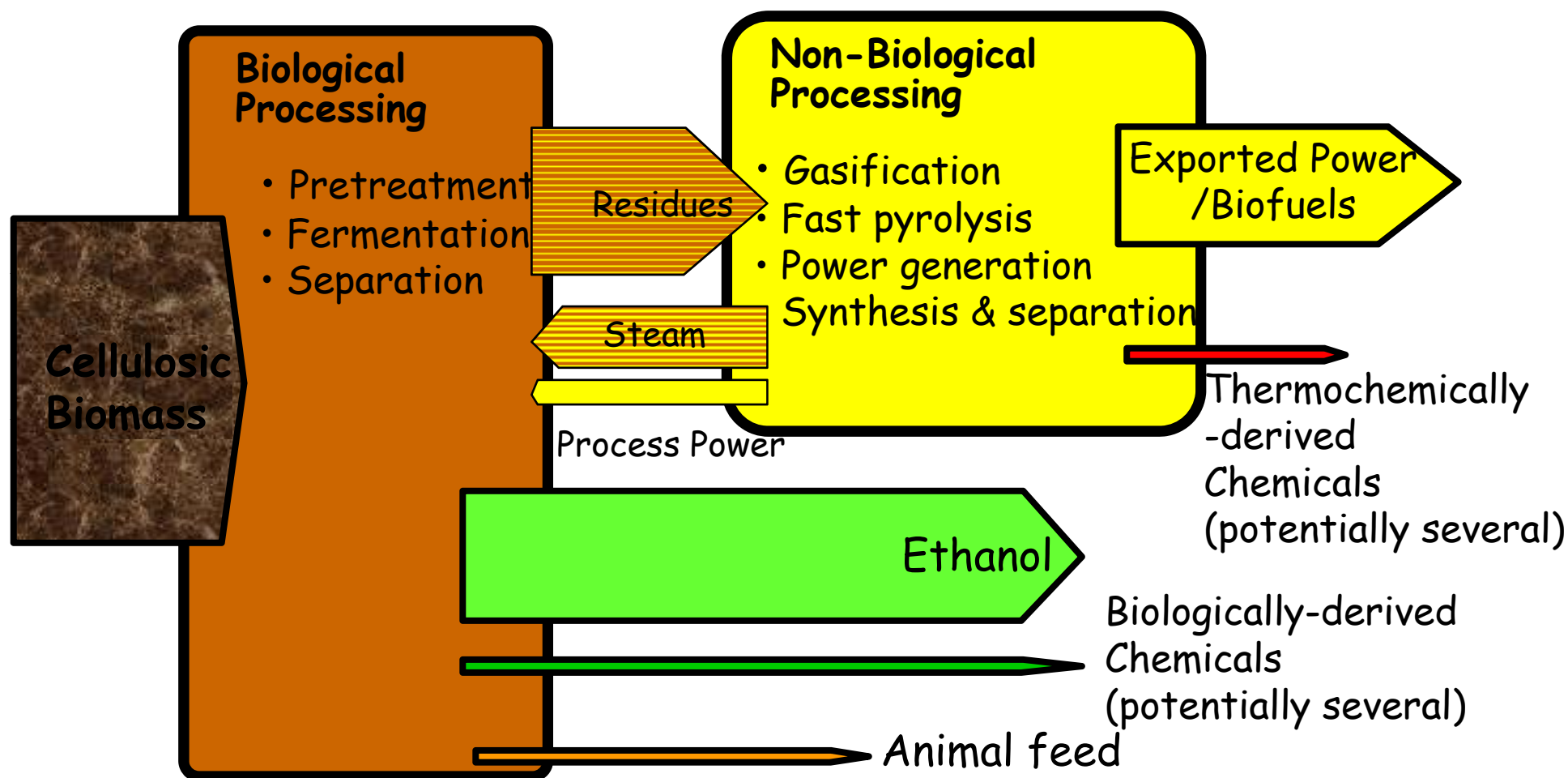
Harvesting red grass



Invasive plants

Technologies for Cellulose Conversion

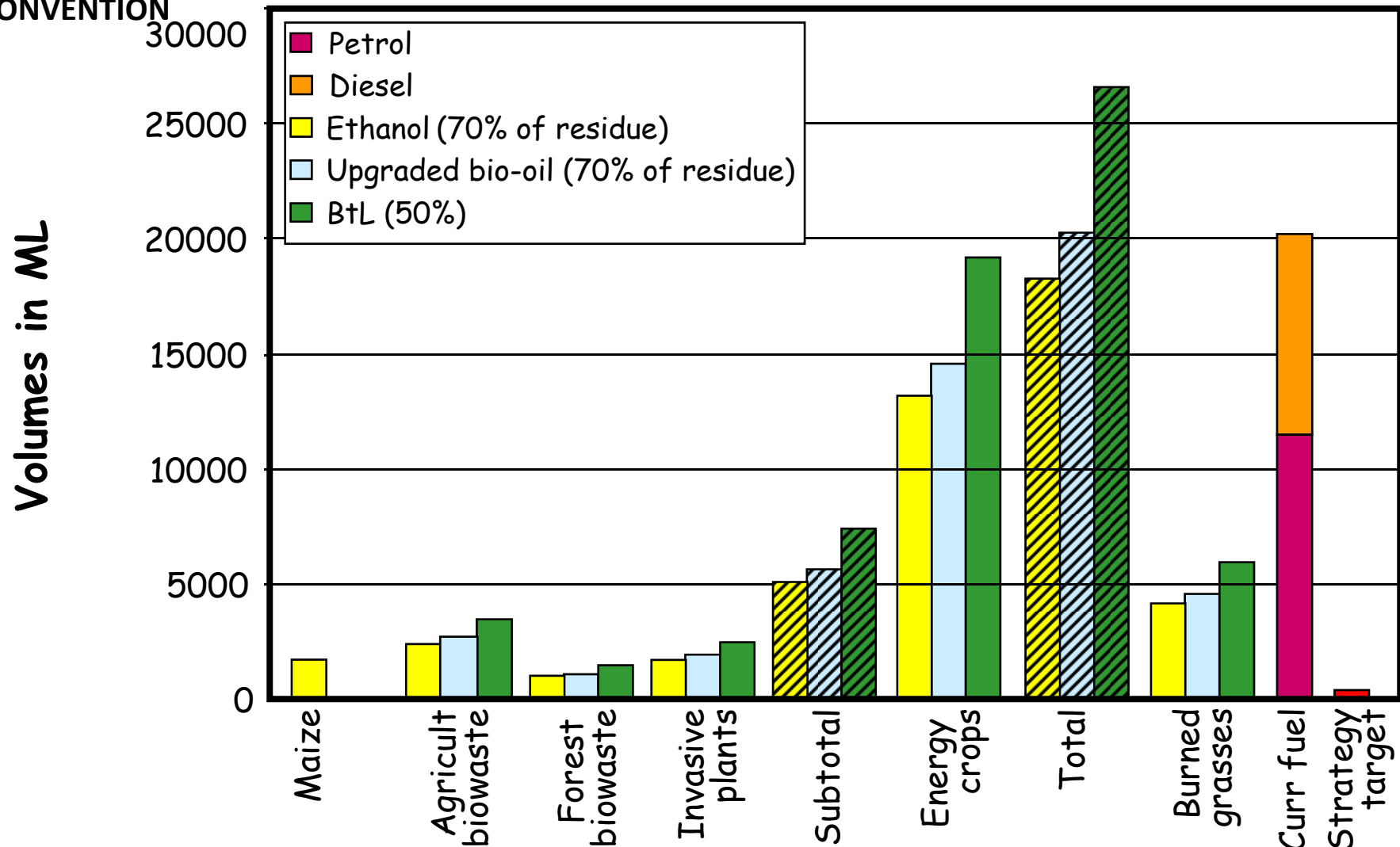
Biomass Biorefinery Concept





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South Africa's potential: Biofuels production



Maize to Ethanol = 430 L/ton

Biomass to upgraded bio-oils = 310 L/ton

Biomass to ethanol = 280 L/ton

Biomass to liquid (BtL) = 570 L/ton



BIOFUELS
research chair

Chair of Energy Research (CoER): Biofuels and other clean alternative fuels

Emile van Zyl

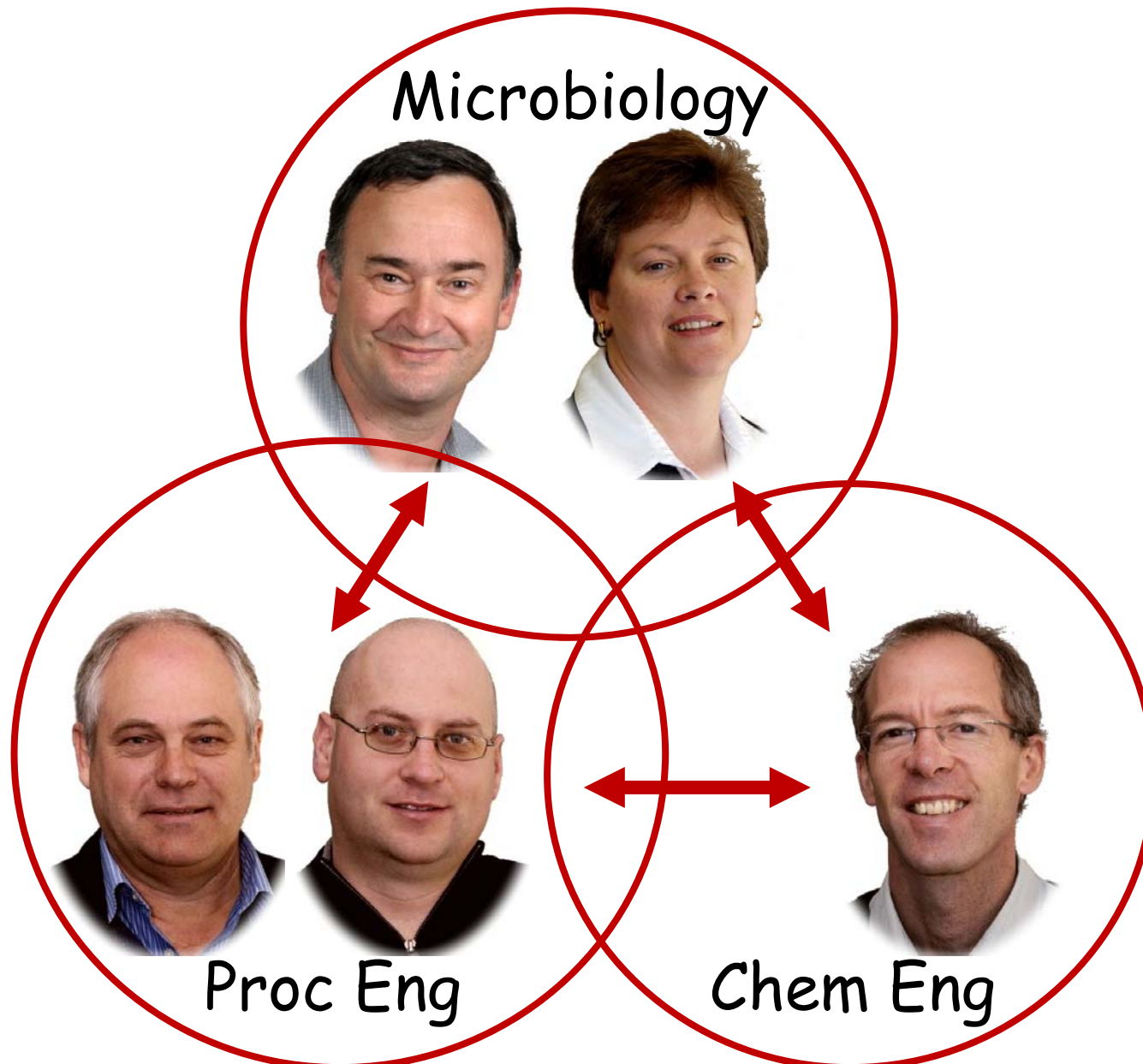
Johann Gorgens, Marinda Bloom & Hansie Knoetze
[Stellenbosch University]

&

Harro von Blottnitz
[University Cape Town]



CoER : Biofuels (members)





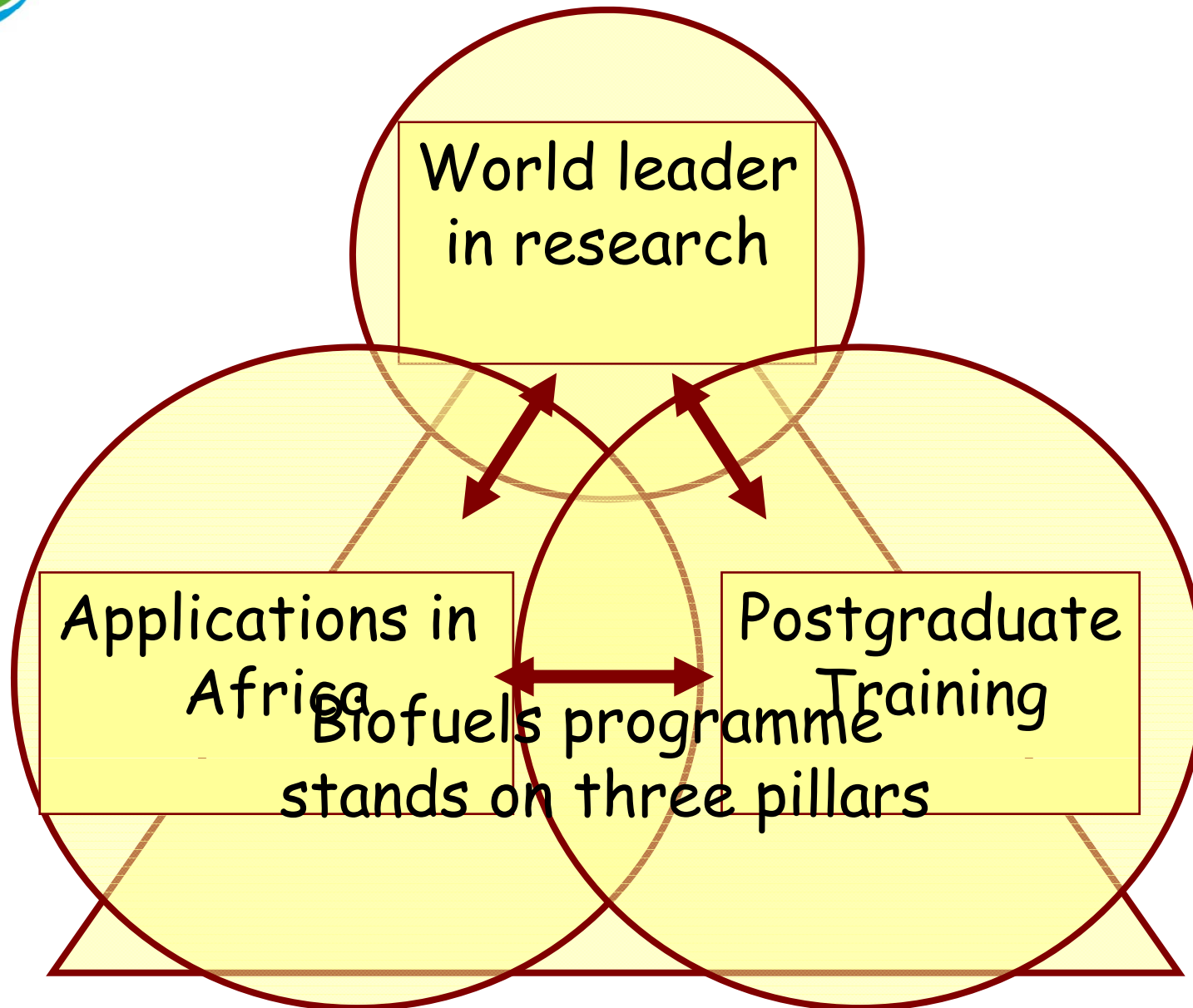
CoER : Biofuels (members)

The objectives of the Chair of Energy Research are:

1. To steer a Biofuels Research Programme (BRP) and other clean alternative fuels at both Stellenbosch University and University of Cape Town, thereby ensuring:
2. Human capital development with a strong scientific and engineering training;
3. Development and establishment of technologies for commercial application;
4. Interaction with South African experts from industry, businesses and NGOs; and
5. Staying abreast with latest technologies and research through extensive international collaboration networks.



CoER : Biofuels (members)



The African Bioenergy Convention

