Lessons learnt from developing and using bioenergy resource maps in Africa
TANZANIA: Identify areas suitable for rain-fed sugarcane.

In 2006 Mlingano Agric. Res. Inst. (MARI) used FAO AEZ methodology

Resolution = 4 km$^2$
MAP threshold= 1,500 mm

Total Area: 5.90% of country or 51,844 km$^2$

Coastal plains= 30,332 km$^2$
Eastern plateau= 1,777 km$^2$
Mountain blocks= 3,357 km$^2$
Fischer et al. (2009) FAO & IIASA commercial, fully mechanized, as bioethanol feedstock.

AEZ methodology but more climatic parameters, longer records, & better resolution terrain data enabled use of water balance & crop models to estimate the actual evapotranspiration, length of growing period, and potential crop & biomass yields for each 10 km² grid cell.
Most African countries do not have long term, data on the wide range of climatic parameters needed to predict yield performance.

Coarse resolution over-emphasizes influence of large areas with good rainfall & misses smaller areas with adequate rainfall.

**Tanzania**

Total area= 0.99% of country or 8,699 km²
Watson (2010) used AEZ methodology to verify rainfall, temperature, terrain, & soils.
Resolution = 1 km²
MAP = 800 mm

Total area = 1.93% of country or 16,940 km²

Many small commercially viable areas are evidently missed when coarser resolution data used
BEFS/FAO (2010)

Resolution = 10 km²

Accounted for annual rainfall distribution, thermal zones & length of growing periods but no crop models

Under conservation agriculture & high input level

Total area = 2.83% of country or 24880 km²
Methodological Framework

First dimension: land suitability assessment

Part I: Land Resource Inventory
- Inventory of the climatic information
- Inventory of the soil information
- Inventory of the landform information

Part II: Land suitability assessment
- Definition of the Land Utilization Type (LUT)
- Formulation of the criteria

Second dimension: availability of land

Land with environmental limitations
- Protected areas
- Forests
- Biodiversity hotspot

Land with conflict in the use
- Agricultural areas
- Population centers
MARI, 2006: 4km² = 5.9% of country
Fischer et al., 2009: 10km² = 0.99%
Watson, 2010: 1km² = 1.93%
BEFS/FAO, 2010: 10km² = 2.83%

FAO AEZ: <16% slopes for sugarcane
Muok et al. (2010): <45% slopes including sugarcane
Brazilian AEZ : <20% slopes for sugarcane

**GBEP Indicator 2: soil quality** > 5% slopes high risk
**Environmental constraints:** slopes < 8%, protected areas, HCV areas, forests, wetlands, wildlife movement corridors (vary), areas with conflict between humans & wildlife (vary). Integrated Biodiversity Assessment Tool (IBAT)
Social constraints: areas currently used for food and/or cash crops, grazing & plantation forests; natural areas NB for NTFPs; routes used by nomadic pastoralists (vary); conflict areas (vary); areas of archaeological, historical and/or cultural NB.
Global Land Cover data obsolete.
* Deforestation
* Rural – Urban migration: peri-urban sprawl
* Humid savannas: bush encroachment
* Dry savannas: rapid change from ‘degraded’ to grass with rain
  inherent, dynamic, temporal & spatial variations in cover
* Clearing land to retain rights to use it

Challenge of GBEP indicators is assessing bioenergy driven land use changes in context of these changes.

What land cover data can be used in the Bioenergy Component of the Global Atlas for Renewable Energy ????
Economic and Development Opportunities:

1. Water bodies & suitable sites for dam construction
2. Infrastructure: roads, railways, electricity grids.
3. Population density, literacy & poverty levels, health status.
4. Existing bioenergy processing & storage facilities, & utilization nodes

Maps are generally available. But, what is the value of superimposing them on maps showing where land is suitable and available for specific or general bioenergy crop production?

Are we assuming the greater the proximity of 1-4 are to such land, the greater the opportunities?