

Agronomic Potential for Biofuel Production in Southern Africa



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Main Objectives

To determine the agronomic potential of biofuel crops in southern Africa

Approach

Suitable areas were identified based on the biophysical requirements of potential biofuel crops. These included rainfall and daily temperatures for the length of the growing season of individual crops, terrain profiles and soil conditions. The EcoCrop Model was used to identify climatically suitable areas. An exclusion approach was used to mask out all areas where soils were not suitable, rainfall was too low for dryland cropping, more than 60% of the grid cell was forest, slope was greater than 16% or the area was zoned for conservation.

Agro-Ecological Zones (HarvestChoice)

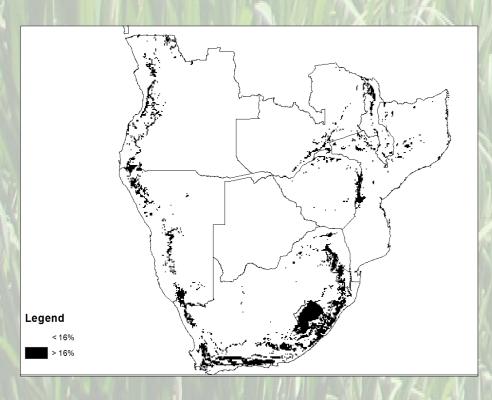
The entire area is tropical to subtropical though the central regions of South Africa are prone to frost in winter

GAEZ: 16 classes Subtropic - warm / arid Subtropic - warm / semiarid Subtropic - warm / subhumid Subtropic - warm / subhumid Subtropic - cool / arid Subtropic - cool / subhumid Tropic - warm / subhumid Tropic - warm / semiarid Subtropic - cool / subhumid Tropic - warm / subhumid Tropic - warm / subhumid Tropic - warm / humid Tropic - cool / semiarid Tropic - cool / semiarid Tropic - cool / semiarid Tropic - cool / subhumid Tropic - cool / semiarid Tropic - cool / subhumid Tropic - cool / subhumid Tropic - cool / subhumid

Slope is a limiting factor for much of the wetter regions in South Africa, most of the rest of the region is relatively flat

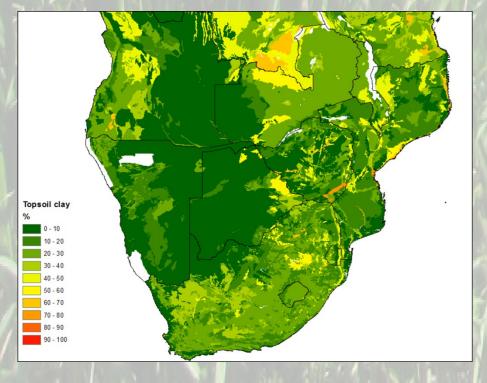
Suitable Slope < 16% (Source: FAO-

GAEZ)



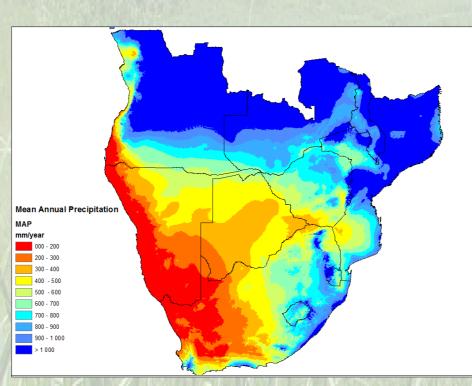
Sandy Soils (Source: AfSiS)

Sandy soils require more Nitrogen application than clayey soils. Vast area of Angola and Mozambique have a very high % sand



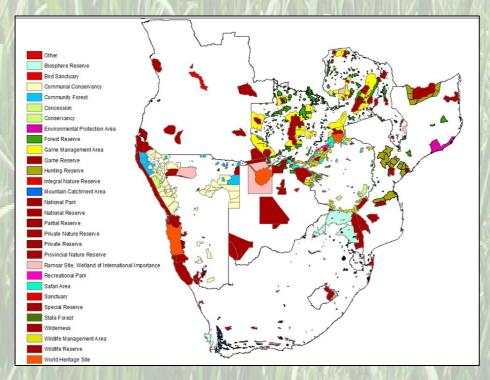
Rainfall (1971-2000) (WorldClim data)

The south-western part of southern Africa is too arid for dryland cropping and too cold for sugar cane under irrigation



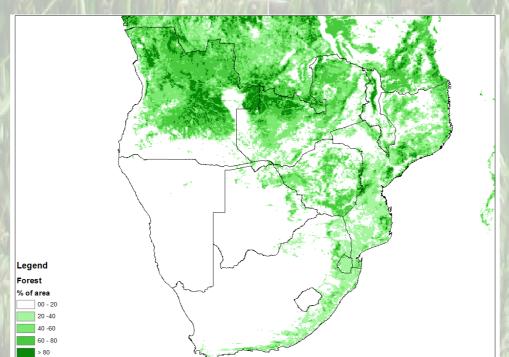
Protected Areas (Source: WPDA, 2016)

Conservation and the associated tourism industry is an important revenue to the region – these areas need to be exclude from potential biofuel production areas



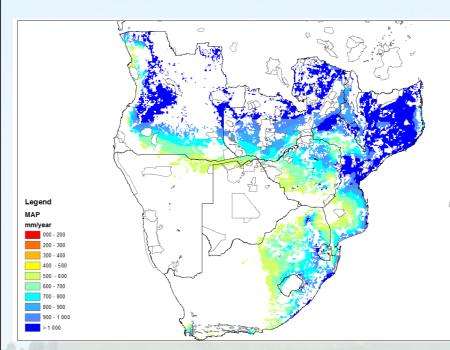
Proportion Forest (Source: FAO)

Areas of mature forest should be excluded from biofuel production for biodiversity and climate change mitigation reasons



Suitable Land Areas for Cultivation Purposes

Angola, Mozambique, Zambia, Zimbabwe appear to have a high biophysical suitability for biofuel crops including sugarcane, cassava and sweet sorghum. For the short-term sugarcane, especially if supplementary irrigation is available, appears to be the most suitable crop as it has high yields in the region and is a well understood crop from an agronomic perspective. Further it is currently grown in all the identified countries

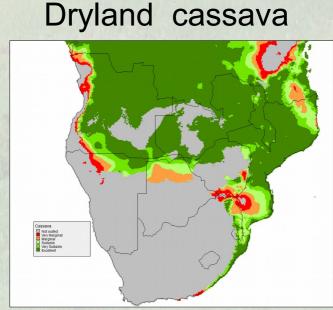


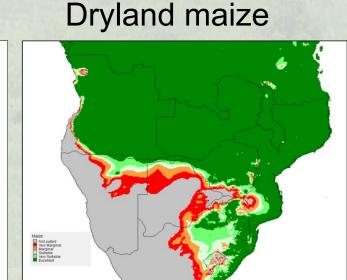
Areas in white are masked out as unsuitable for dryland biofuel.

Note, remaining areas may still have social constraints. Most area in South Africa are already used for commercial food crop production. Most areas in the other countries are used for subsistence farming

Potential Yields Under a High Inputs Management Level

There is a high potential for both dryland maize and dryland cassava over much of the region. Though maize is unlikely to be a biofuel crop due to concerns on food crop production, it provides a good indication of where other similar crops such as sweet sorghum or other energy grass may grow..

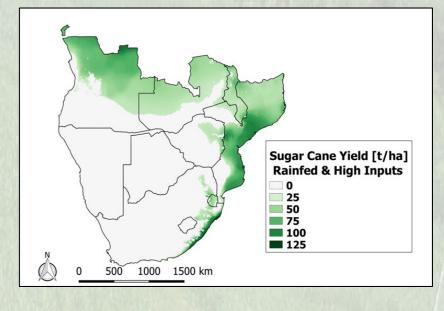




Irrigated sugarcane

Sugar Cane Yield [t/ha] Irrigated & High Inputs 0 38.8 77.5 116 155

Dryland sugarcane



Areas with high dryland sugar production potential are quite restricted, primarily due to the long dry winters. If irrigation water is available then vast areas of the sub region have exceptionally high potential for irrigated sugar

Conclusions

- Large areas of southern Africa have high biofuel production potential BUT these areas are not currently unused.
- South Africa has a low potential to expand into biofuel due to most suitable land already being dedicated to commercial food production.
- Zambia and Mozambique have a high potential, but care will be needed to ensure that subsistence farmers gain true benefit if their land is being converted to biofuel.
- The high yield gap in these areas makes it possible to greatly increase production of existing or new crops.
- Sugarcane (possible with supplementary irrigation) is the most suited crop for the short term, but alternate crops such as cassava and sweet sorghum may have high potential in the future