Bioenergy Production in Zambia: Potential Supply Given Biophysical and Social Constraints

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Presentation Flow

- Motivation
- Research Questions
- Key Findings
- Conclusions

Motivation

Regional bioenergy could increase with South Africa's planned fuel blending.

So will the demand for feedstocks and land for their production.

In pursuing bioenergy investments, tradeoffs are expected in rural areas.

Potential land area needed to meet bioethanol demand

- Limited potential demand in Zambia given the relative size of the fuel market
- Requirement of between c.28,000-58,000 hectares to meet current mandated volumes

Source of demand	2020 onwards
South Africa E2 mandate (litres)	300 million litres
South Africa E10 mandate	1.5 billion litres
South Africa E85 scenario	2 billion (2020) -> c.7 billion (2050)

Area of land (has) needed to meet South Africa's bioethanol demand under different economic scenarios in 2035			
	Low growth	Medium growth	High growth
Low yield (7000 l/ha)			
Zero E85; E10 mandatory blend	193,286	228,571	248,286
High penetration of E85	634,429	742,857	805,571
High yield (10,000 l/ha)			
Zero E85; E10 mandatory blend	135,300	160,000	173,800
High penetration of E85	444,100	520,000	563,900

Motivation

There is a growing literature on large scale land acquisitions (including for bioenergy) and their impacts.

Different models to production have been trialed.

Establishing viable bioenergy projects will require a full understanding of biophysical and social constraints.

Previously social constraints to bioenergy investments received limited attention.

Study objectives

To explore the possible severity of social constraints to producing biofuel feedstocks in different areas of rural Zambia.

To identify areas that are likely least constrained by either physical or social factors

To identify policy constraints to large-scale led feedstock production expansion.

Findings

Biophysical Suitability: areas IIa & III suitable from an agro-ecological perspective (70%)

Water Availability

An estimated 40% of SADC fresh water resources are in Zambia.

Renewable ground water potential estimated at 49.6 Km^3.

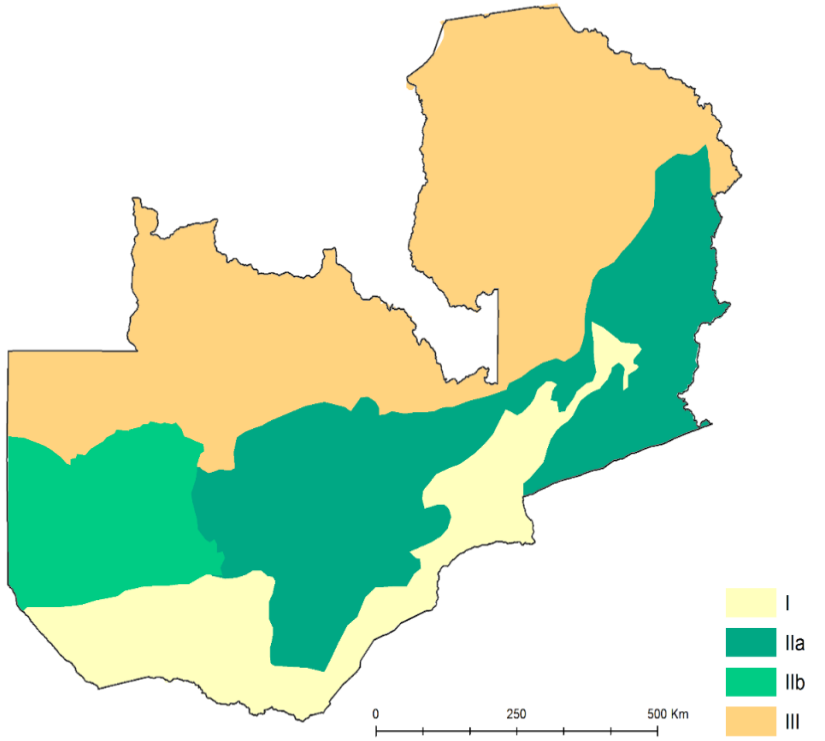
Renewable ground water potential is estimated at 100Km^2.

Irrigation potential is estimated at 2.8 million hectares (only 156,000 ha is under use).

A large share of the country receives rainfall in excess of 800mm (70% of the landmass).

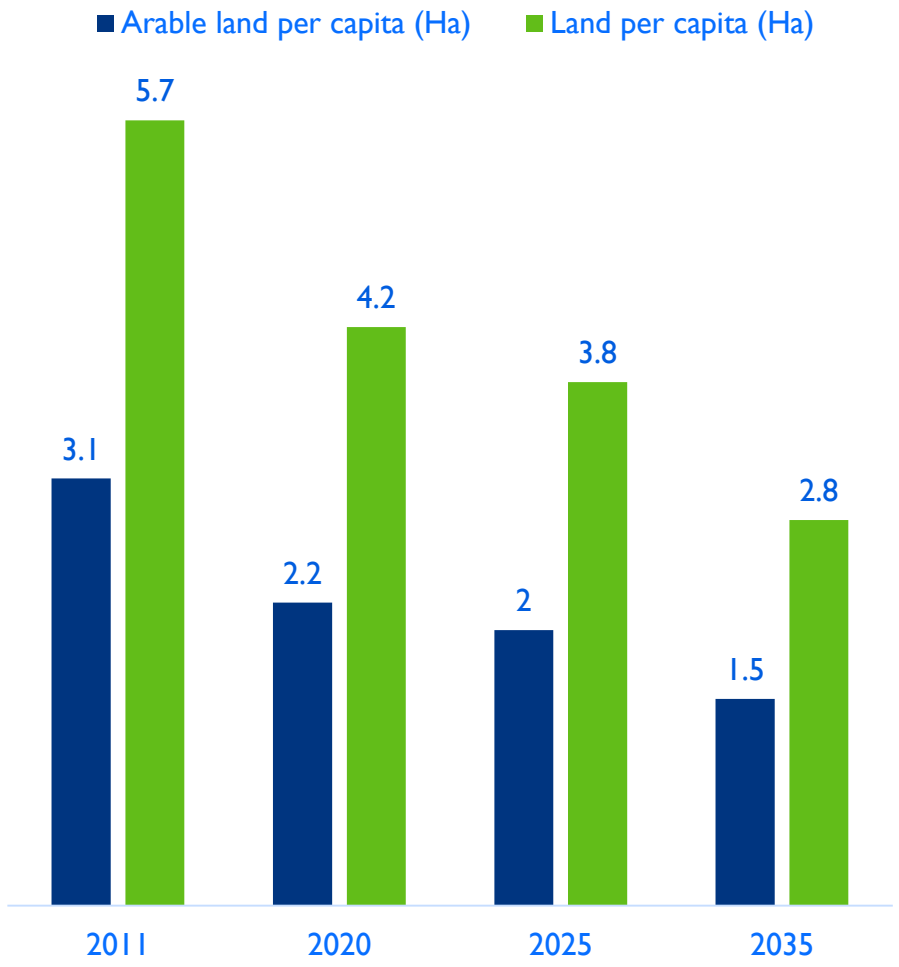
- AEZI (<800mm)
- AEZ II (800-1000mm)
- AEZ III (1000-1500mm)

Zambia's Agro ecological Zones

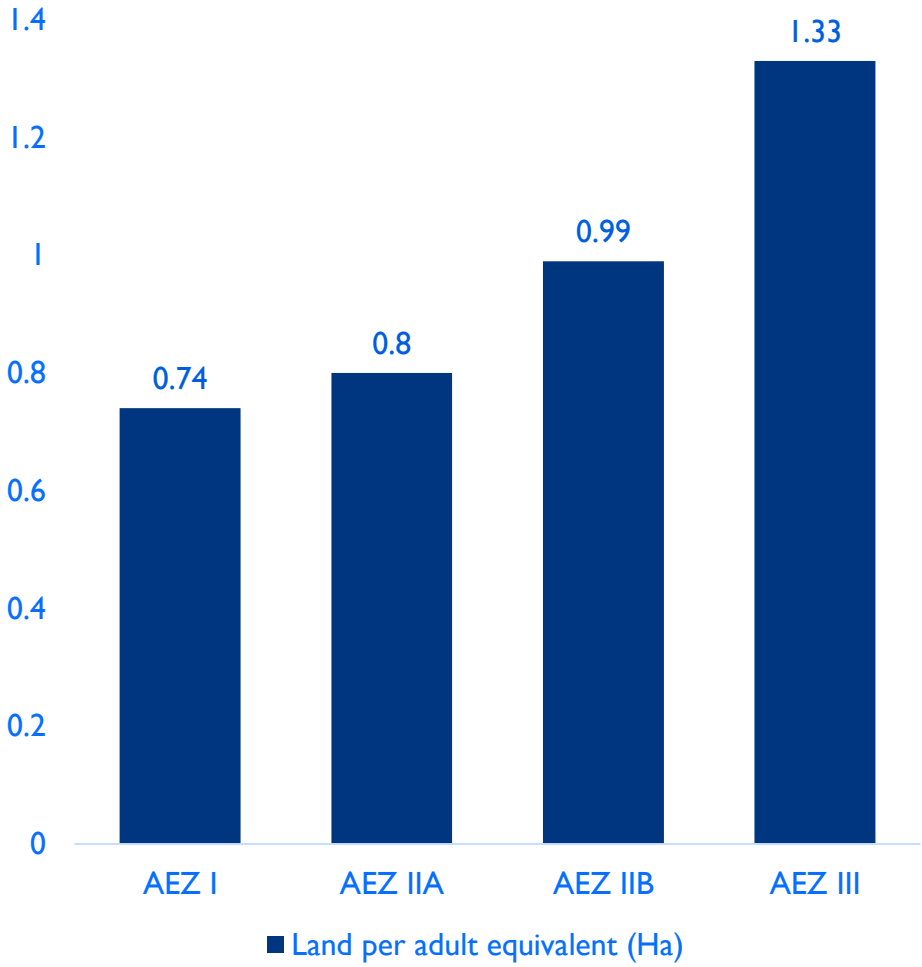


Biophysical Constraints

Land Availability (2011-2035)



Geographical Distribution of Available Land



..Biophysical Constraints

Where agricultural land is suitable and in relative abundance for crop production, there is also sufficient rain-water.

Surface water is also available except for Copperbelt province which has significantly less surface water when compared to Southern, Luapula, and Northern provinces.

The Southern-most parts of the country receive significantly less rain water, little is known about the spatial distribution of groundwater resources.

- Irrigation would play a crucial role in any successful investments.

Social constraints: ex-ante

Social Constraints Considered

Median plot sizes

- Small sizes indicate a general lack of land

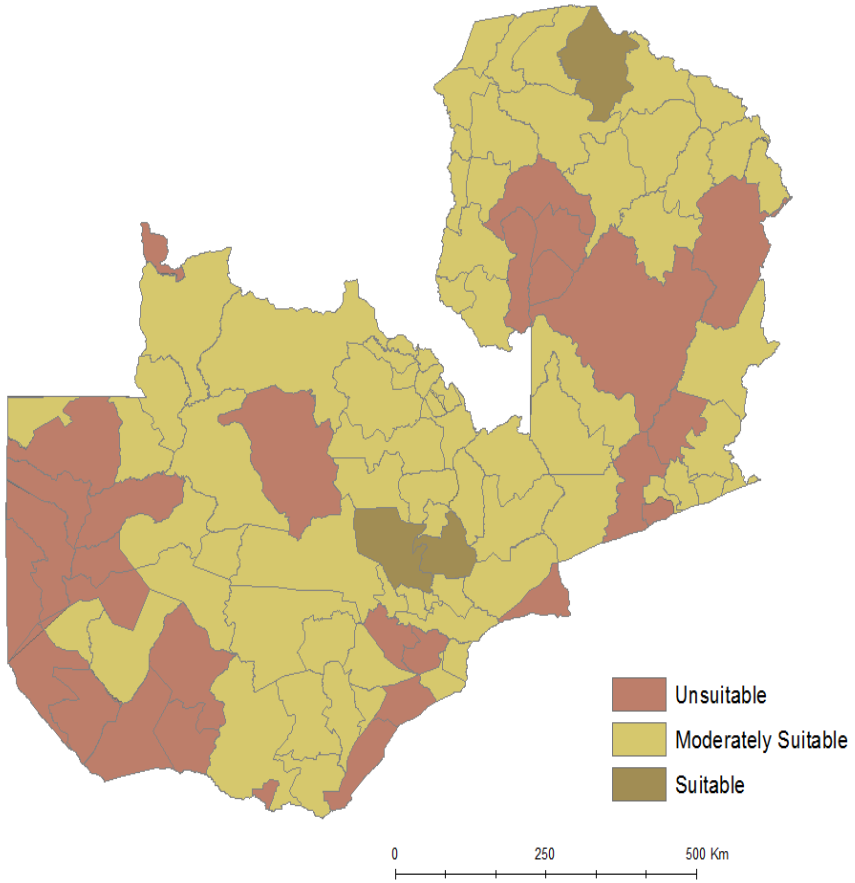
Food insecurity

- In areas with high food insecurity, expanding production may worsen status quo

Share of poor households

- A high share of poor households indicates a general lack of capital or productive assets, and capacity to handle external shocks

Suitability Map Based on Social Constraints



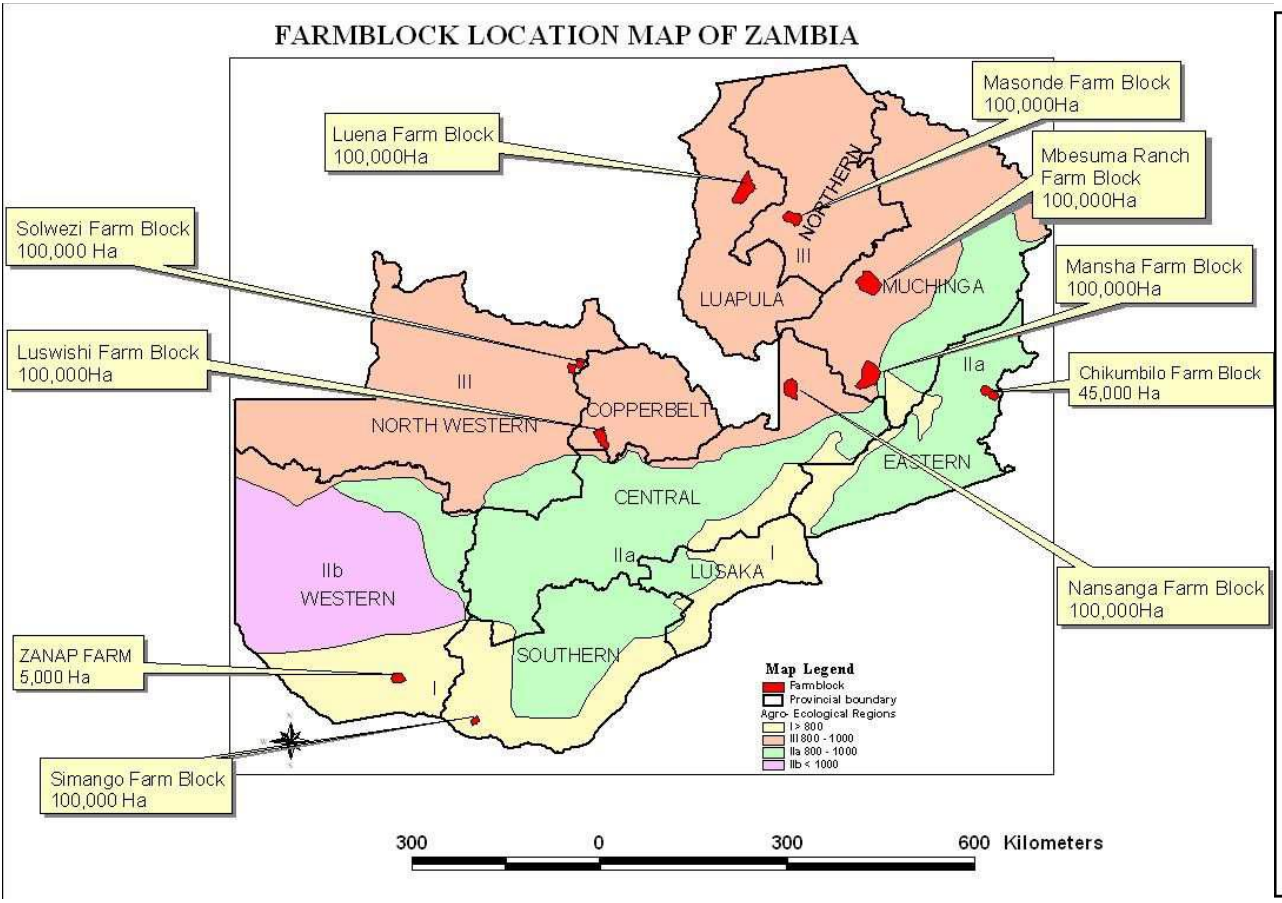
Large farms: social constraints and social costs

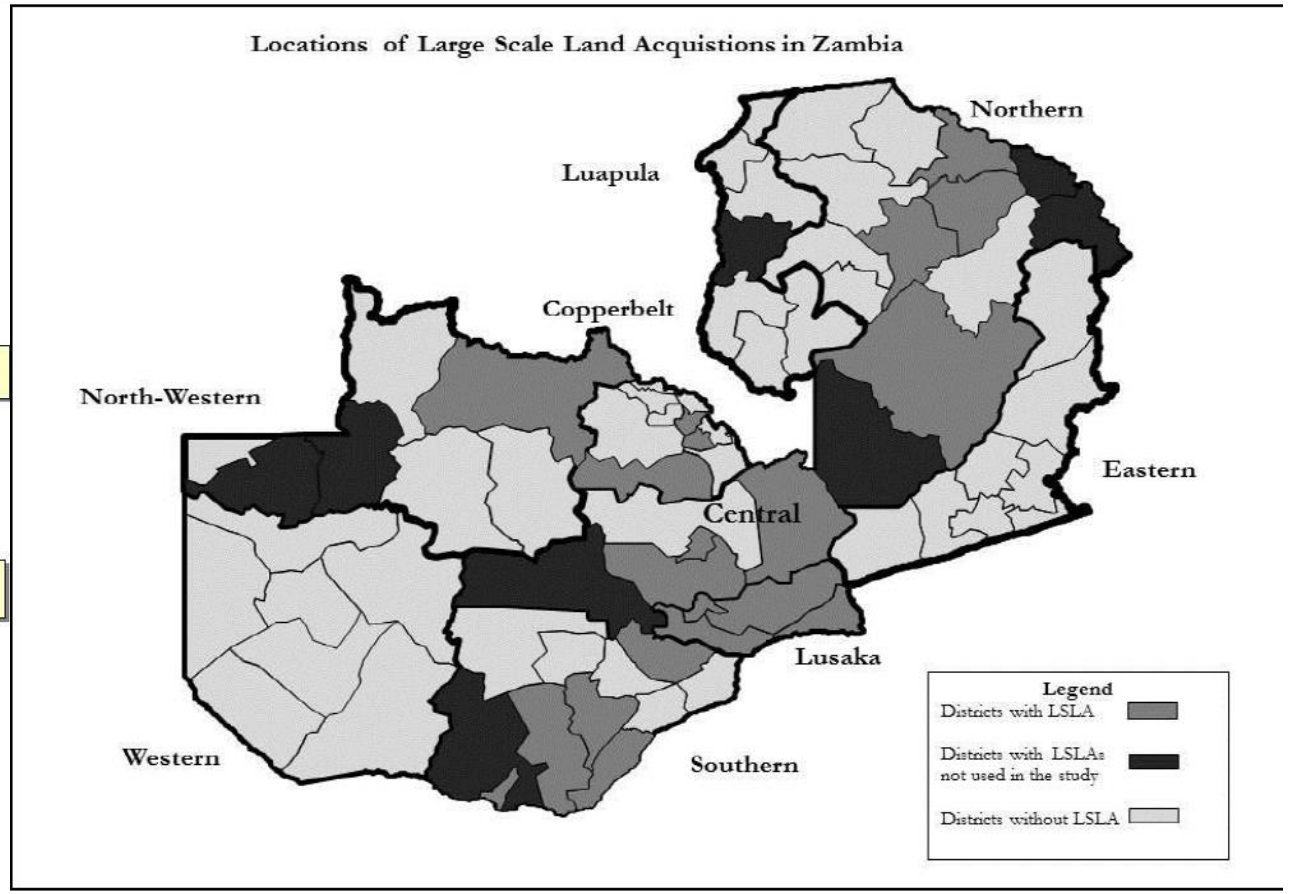
Growing recognition of social and land risks linked to investment failure.

Social costs as constraints: Lack of effective identification and mitigation of social risks constrains access to finance from international donors, and financiers

Post-investment: Factors that may increase the likelihood of projects facing opposition by the locals (e.g. land and water shortage).

Farm blocks vs. location of investments to date





Reviews of application of policies and practice of land acquisition

- Reviews on mining and agricultural sector and processes around consultation, compensation and resettlement.

- Requirements and practice around consultation often weak – rely heavily on consent from traditional authorities with no requirement for further 'downstream' consultation among land users themselves.
- Lack of coordination among institution leads to varying practices.
- Resettlement action plans are not required in all cases
- Capacity for follow up and monitoring is weak.
- Compensation depends on the generosity of investors, the bargaining power of the community, or discretionary interventions by local or national government officials. As a result, it is not uncommon for households to receive no or low compensation for lost land.

Social Constraints

Considerable differences exist between experiences to set up and govern investments: there is a continuous elevated risk of negative social impacts to:

- Community members who previously accessed land and resources
- Resettled community members
- Vulnerable and disadvantaged groups within these.

Social Constraints

Without improvements in the implementation of consultation, resettlement, compensation, much of the investment needed to reach production levels will need to come from funding sources with formal safeguard policies;

- Biofuel projects will need to demonstrate upfront benefits to surrounding communities and those whose livelihoods are negatively impacted.
- Time and cost needed to set up and run projects may be higher than originally anticipated;
- This may affect the economics of biofuel production in favour of other models.

Overall Suitability

We find areas that a biophysically suitable at least also moderately suitable from a social perspective.

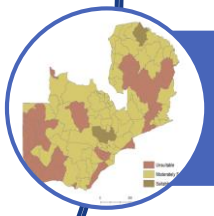
Northern, Central, Luapula, Southern, and Copperbelt provinces are more attractive from a biophysical and social perspective.

Main Implications

Implications

Zambia is well placed to supply the region with bioenergy and energy crops from a biophysical and social perspective. However, within country differences exist in suitability.

Except for Western and the southern-most parts of Southern province, the rest of Zambia is at least moderately suitable for feedstock production expansion from both a physical and social perspective.



The physically suitable areas largely coincide with the socially suitable areas.

However, the choice of where to locate biofuel investments with a regional focus will have to factor in transportation costs if they are to be economically viable.

Caveats

There is need to align local consultation and compensation procedures with acceptable international practice in order to access finance.

Thank you