Economic impacts of developing a biofuel industry in Mozambique

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Background and objective

• Biofuels demand in SADC expected to increase with blending mandates
  • Main market expected to be in SA
• Mozambique potentially key producer: favourable climate / land availability
  • National Biofuel Policy Strategy 2009: 10% in 2015 ➔ 20% in 2021
• Literature suggests many benefits to biofuels production
  • Rural income / employment / BoP / climate change
• Crops identified in Mozambique:
  • Sugar: growing potential but lower global demand ➔ alternative use
  • Sweet Sorghum: drought resistant, new but ignored here
  • Jatrova for biodiesel: implementation issues, previously investigated
• This analysis: impact of increased biofuels production for the SA market.
  • Concern for food security / food prices
• Potential for cogeneration of electricity: successful elsewhere

Potential for biofuel production in Mozambique

• Currently, sugarcane mainly produced by 4 companies
  • Outgrower program for medium large & community farmers (12.5%)
• Land availability: no constraint expected / infrastructure adequate
• Data collected on sugarcane production by CEPPAG (representative)
  • Production costs
    • Includes separate data on supporting outgrowers (community farming)
  • Community farming similar to commercial
    • Commercial operations takes care of most input costs
  • Returns to capital assumed to be same as Zambian field study
• Feedstock costs are estimated to be less than $0.20 per litre
  • Bioethanol processing cost data not available ➔ use international data
• Total costs estimated to be about US$0.32-0.33 per litre

Model

• Standard Neoclassical CGE (Lofgren et al, 2002) using 2012 SAM
  • Recursive dynamic, solve for each year
• Investment current year ➔ new capital stock next year
  • Capital stock updating based on relative activity size & return
• Exogenous population and TFP growth ➔ base line GDP path
  • Adjustment rules: flexible xrate & wage rates

Methodology biofuels modelling:

• Add biofuels activities to SAM with (close to) zero output
• Use cost structure from field data: mapped to model commodities
• Each feedstock is matched to its own ethanol production:
  • Separate value chains for large and small with or without cogen
• Feedstock output is only supplied to matching ethanol
• All ethanol is exported
• Cogeneration: ethanol input structure the same with or without
  • Use conversion factor of 70kWh/tonne @ cost of US$0.08/kWh
• Electricity generation free: value of output ➔ additional to GOS
• Financing for all biofuels activities: foreign capital (no constraint)
  • After tax GOS repatriated

Scenarios: increase supply land exogenously to meet target

1. Expansion with existing shares of large (87.5%) / small (12.5%)
2. Expansion with bias towards small scale: equal shares
3. Cogen: Scenario 1. with electricity cogeneration
4. Displacement. 50% new small farmer feedstock from all other crops

Results: small

• GDP: Agriculture is up but other activities are down
  • Negative impact due to more intense competition for labour
• Cogeneration most positive on GDP, more negative on other agr
• Employment: compositional
• Income Distribution: rural benefit but with cogen this is reversed

Variation: abundant unskilled labour

• From other regions during peak season (currently not the case)
• Impact more positive, most sectors and both rural and urban benefit

Conclusions

• Previous mistake due to lack of guaranteed demand for biofuels must be avoided in order to reap potential benefits. How? SADC or local mandate
• Food security risks are low and manageable due to abundant land but requires coordinated infrastructure program