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Socioeconomic impacts in Mozambique due to
sustainable sugarcane bioethanol production
scenario

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Content of the presentation

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Introduction and objective

- South Africa, Mozambique, Colombia and Guatemala have different opportunities and challenges regarding the possible expansion of sugarcane for energy purposes;
- These differences contemplate the three pillars of sustainability – environmental, social and economic;
- In this context, an important question is: What are the possible ways (probably more than one!) that bioenergy from sugarcane can be a real attractive option for a sustainable development in these countries?



Introduction and objective

- What are the socioeconomic impacts to be evaluated? How to measure them?
- Of course, they will depend on the sugarcane (agricultural and industrial phase) production model, i.e., the scenarios chosen;
- In LACAf I project, the purpose of this study is to contribute to this evaluation.

Socioeconomic impacts and scenarios

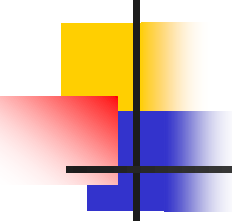


- Considering the economic cross-sector effects (not “only” over sugarcane industry), some of the major socioeconomic impacts are related to:
 - Sectoral production level;
 - GDP (including the possible substitution of gasoline by ethanol);
 - jobs creation;
 - income generation and distribution;
 - tax revenue;
 - increased energy availability.

Socioeconomic impacts and scenarios



- Scenarios need to combine these issues:
 - Large and/or small scale?
 - Vertical integration and/or outgrowers?
 - High amount of output looking for exports and domestic markets and/or bioenergy/biofuel production itself towards smaller-scale markets (e.g., ethanol for cooking fuel)?
 - Necessity of investments? Infrastructure, distribution, transport and storage.



Methodology – What is Input-Output Analysis?

- To evaluate these socioeconomic impacts at the scenarios established, we will use the economic model developed by nobel prize Wassily Leontief in the late 1930's, known as Input-Output Model;
- In 1993, UN standardized IO matrix as a component of the National Accounts for all countries;
- IO analysis is one of the most widely applied approach in economics, such as to evaluate a variety of policies and changes in technologies over many sectors – Agriculture, Energy, Services and others;



Methodology – What is Input-Output Analysis?

- This methodology can be used in a regional, national and international geographic level;
- The fundamental purpose of IO framework is to analyze the interdependence of industries in an economy , taking into account the direct and indirect effects over the production chain;
- This model is constructed from economic observed data for a specific region (usually is a country).

Methodology – What is Input-Output Analysis?

		PRODUCERS AS CONSUMERS							FINAL DEMAND				
		Agric.	Mining	Const.	Manuf.	Trade	Transp.	Services	Other	Personal Consumption Expenditures	Gross Private Domestic Investment	Govt. Purchases of Goods & Services	Net Exports of Goods & Services
PRODUCERS	Agriculture												
	Mining												
	Construction												
	Manufacturing												
	Trade												
	Transportation												
	Services												
	Other Industry												
VALUE ADDED	Employees	Employee compensation							GROSS DOMESTIC PRODUCT				
	Business Owners and Capital	Profit-type income and capital consumption allowances											
	Government	Indirect business taxes											

Source: Miller and Blair (2009)



Possible results

- Impacts due to a distillery in Brazil crushing 2 Mtc per year, producing 170 ML of ethanol and 80 GWh (40 kWh/tc) of surplus electricity:
 - 170 ML: US\$ 100.6 million
 - Total output: US\$ 283.4 million
 - Total GDP: US\$ 124.8 million
 - Jobs: 2.9 thousand
 - Economic surplus of electricity: 71.5 GWh



Possible results

- Ethanol vs gasoline in Brazil – indicators

Item/product	Gasoline	Ethanol	Eth/Gas
Energy balance	0.85	9.26	10.89
GHG (gCO ₂ eq/MJ)	77.52	20.62	0.27
Output (US\$/GJ)	32.55	53.95	1.66
GDP (US\$/GJ)	10.43	26.75	2.56
Jobs (per TJ)	0.26	1.29	4.96
Wages (US\$/month/job)	1,147.85	567.22	0.49



Possible results

- Some output multipliers for Mozambique

Sector	Output multiplier	Indirect effect
Maize	1.32	10.2%
Other export crops	1.26	10.0%
Wood industry	1.82	19.0%
Food processing	2.04	21.2%
Beverages and tobacco	1.95	23.0%
Graphic industry	2.07	25.4%
Chemicals	1.64	18.4%
Industries excluding metal	1.93	23.1%
Other manufacturing	1.74	20.6%
Electricity and water	2.48	29.9%
Construction	1.95	22.0%
Restaurants and hotels	1.95	20.6%
Public administration and defence	1.90	21.6%
Other services	1.83	20.2%



Next steps

- Obtaining (and maybe “correct” it) the most recent IO table for Mozambique;
- Building a flex IO model to combine different scenarios for all technologies routes taking into account sustainable sugarcane ethanol production scenarios in Mozambique at the LACAf project;
- Inclusion of these technologies (i.e., sugarcane and biorefineries) in the model;
- Analysis of the socioeconomic impacts at the whole economy in all sectors: output, GDP, income, jobs, remuneration, Government tax revenue and economic surplus of electricity.



Thank you very much!

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