



Brazilian Bioethanol Science  
and Technology Laboratory



# Alternative Production Models

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LACAf 1.3 Sugarcane Ethanol Production Models and Innovation

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- Past history: goal, interfaces, critical point
- On going activities: new focus on papers
- Sustainability
- Biofuels, food and energy
- Spillover to agricultural practices
- Final considerations



## Goal



Suggest an economically viable production model for sugarcane ethanol that provides environmental protection, economic development and social welfare



## Present Focus

- Work toward preparing the papers defined to cover the relevant aspects to be taken in consideration in defining possible production models for sugarcane ethanol project in the four LACAf countries
- The relevant aspects in question are: economic viability, food security, energy security, jobs, environmental impacts
- The key points in these aspects are: scale, level of mechanization, land tenure, inclusion of smallholders in cane production, landscape services in the affected area

# List of Papers and Authors

Paper Title	Leading Author	Co-Authors
Technical, socioeconomic and environmental assessment of different sugarcane bioenergy production systems	Regis	Horta, Annie Chiphango, Jacobson, Bonomi, Mateus, Otavio, Luiz Gustavo
<b>Sugarcane ethanol</b> and energy poverty	Regis	Tássia Pereira, Chiphango, Suani, M. Ospina, Tom Richards, Michael Jacobson, João Leite
Key Points in the Selection of the Sugarcane Ethanol Production Model: scale of distillery and the mechanization level in cane production*	Otavio	Regis, Mateus Chagas, J. Leite, Bonomi, Chiphango, Johann Gorgens, Horta
With or without biofuels? A key question for smallholder farmers in developing countries	J. Leite	Regis, Chiphango, Suani Coelho, Rui da Maia,
The good and bad of small scale biofuel production	J. Leite	Regis, Bonomi, Mateus, Otavio, Beauclair, Cindy
Assessment of Different Biofuels Production Chain Alternatives	Bonomi	Regis, Otavio, Beauclair, Lee, Johann Goergens, Marcelo Cunha
Economic and technical assessment of new sugar-ethanol mills in Mozambique and South Africa	Marco Ospina	Regis, Jansle Rocha, João Chidamoio, Annie Chiphango, Johann Gorgens
Sustainable Production of Palm Oil in Colombia *	Cortez	Cindy Sarmiento, V. Kafarov, J.Rincón

## Where to Look?

- The reality of the selected countries
- Existing tentative to bring benefits to local communities: Addax, Xinavane, BEFS, etc.
- The local agricultural practices
- Landscape services in the project area

# Reality

- Explore emerging impacts associated with sugarcane mills and local communities

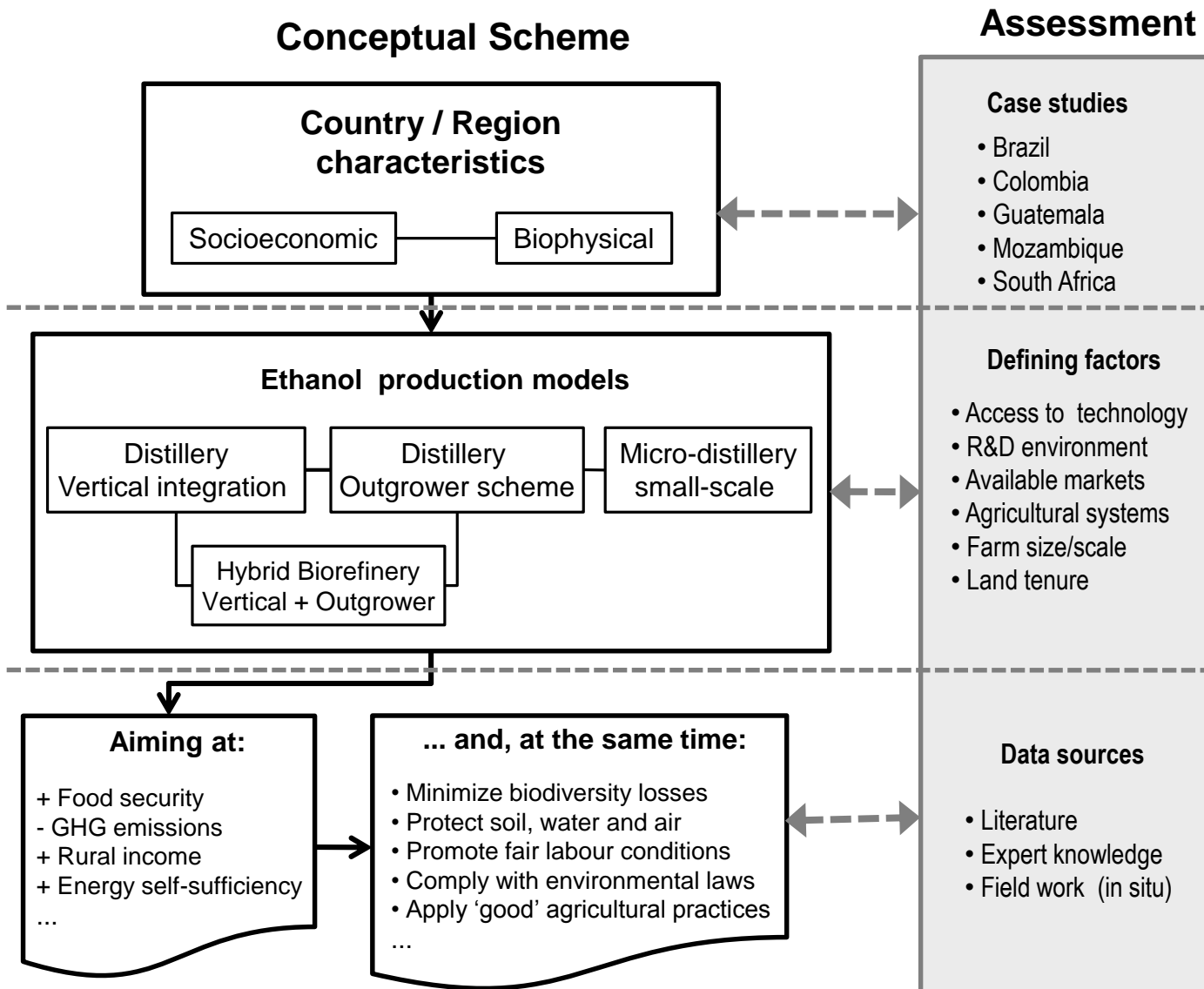


Family farmers (Mozambique, 2010)



Sugarcane mill (Mozambique, 2011)

# Production Model Framework





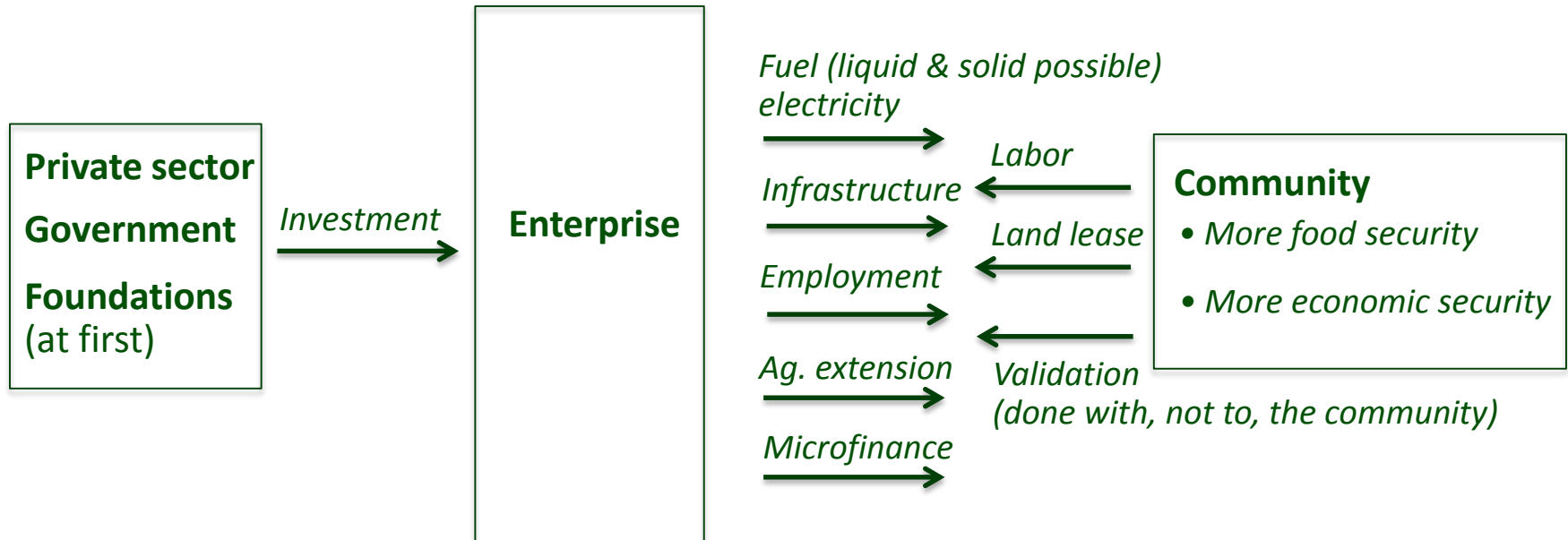
## Basic Model Alternatives

- **High tech model:** largest scale possible, vertical production and processing of sugarcane, maximum energy conversion, lowest cost
- **Medium tech model:** mixed sugarcane production (independent growers and mill production), scale compatible with agricultural production
- **Social model:** small independent sugarcane producers (cooperatives) and outgrowers, integration with food production, energy supply, jobs
- **Optimum model:** will depend on local conditions, and government priorities; may be a combination of the above models; full integration of stakeholders

# Optimum Model

How might an enterprise with the dual goals of producing bioenergy and enhancing local food security be configured?

## Human and institutional perspective



Source: Lynd LR, 2013

## Key Issues

- Driving forces: why? How much? What for?
- Stakeholders involved in decision making
- Investors point of view: profit and risk
- Land tenure model: customary and formal titling, size
- Existing agriculture models: small scale farmers, outgrowers, large properties, cooperatives
- Geographical location of adequate land and water



## Government and Private Sector

- Decision making process to invest in bioenergy
  - Main driving forces, objectives and targets
  - Actions: diagnosis, selection of bioenergy alternative and feedstocks, strategies for deployment, investment required, etc.
  - Legal framework
  - Production model

## What is Desirable?

- **Industry:** state of the art technology, scale, basic energy needs for local community, high level of automation, co-products
- **Agriculture:** best technology adaptable to local culture and skills; fast improvement via TT (extension, new varieties, management, etc.); integration with food production; mechanization (?); irrigation (?)
- **Social:** integration with local community, improvement of local infrastructure beyond enterprise basic needs, take into consideration the land tenure system; food and energy security for the local community.



# Improve Food Security at a Local Level

- Identify shortage in infrastructure, skills, technology, organizational structure, education
- Plan for roads, storage facilities, irrigation, breeding program, agricultural extension, agricultural financing, market organization
- Integrate food, livestock and energy production



# Improve Energy Security

- Alternatives to collected wood and dung as cooking fuel: ethanol stoves, bagasse pellets or briquettes;
- Promote the use of efficient cooking stoves;
- Provide electricity to the local community: substation and distribution grid for the local community, if not available;
- Economics



## Information Required

- Land and water availability
- Productivity maps (high, medium, low, inadequate)
- Sugarcane cultivation technologies, varieties
- Competing cultures
- Possibility of integration with cattle husbandry
- Potential threat to local food production
- Energy situation
- Infrastructure





## Final Considerations

- Integrating local communities and policy makers is key to establish a sustainable foundation for bioenergy initiatives
- In order to meet the different sustainability dimensions, production models will vary following socioeconomic demands (food security, income generation, ...), but constrained by environmental criteria
- Increasing the scope for opportunities and complementarities of sugarcane production models (innovation, employment, rural extension) should be pursued as to the development of the bioenergy sector



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**Comments Please!**