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Incorporating Bioenergy in Sustainable Landscape Designs
Workshop Two: Agricultural Landscapes

Landscape Design in the Sugarcane Based Ethanol Production System in Brazil

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- Implications for bioenergy and sugarcane
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Biomes

Brazilian GHG Emissions By Sector (2005)

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Sector	GWP	
	2005 (Mt CO_2e)	Participation (%)
Energy	328.8	15.0
Industrial processes	77.9	3.6
Agriculture	415.8	18.9
Land use change and forests	1,329.1	60.6
Waste treatment	41.0	1.9
Total	2,194.6	100.0

Source: Ministry of Science, Technology and Innovation (MCTI)

Driving Forces For Government Policies

- Reduce GHG emissions: Commitment in the COP-15 to reduce the country's GHG emissions by 36.1% to 38.7% of the emissions projected to 2020;
- Improve the economics of the agriculture, livestock and forest;
- Orient the agriculture expansion (LUC) to avoid sensitive areas and maintain sustainability.

Main Government Policies

- Five sectoral plans to reduce GHG emissions
  - Reduce deforestation of Amazon by 80% of the 2020 value
  - Reduce deforestation and fires in the Cerrado by 40% of the 2020 value
  - PDE – Ten Year Plan for the Energy Sector
  - GHG emission reduction in steel/iron production
  - Low Carbon Agriculture (ABC Plan)
- Agroecological Zoning (AEZ)
  - Several crops: economic risk (Agroeconomic Zoning)
  - Sugarcane: sustainability
  - Oil palm: sustainability
- Forest Code
  - Legal Reserve Area (ARL): 80% in Amazon, 35% in 3 most sensitive states in Cerrado/Amazon Forest border and 20% elsewhere
  - Permanent Protection Area (APP): riparian vegetation

Deforestation Rates – Past and Future

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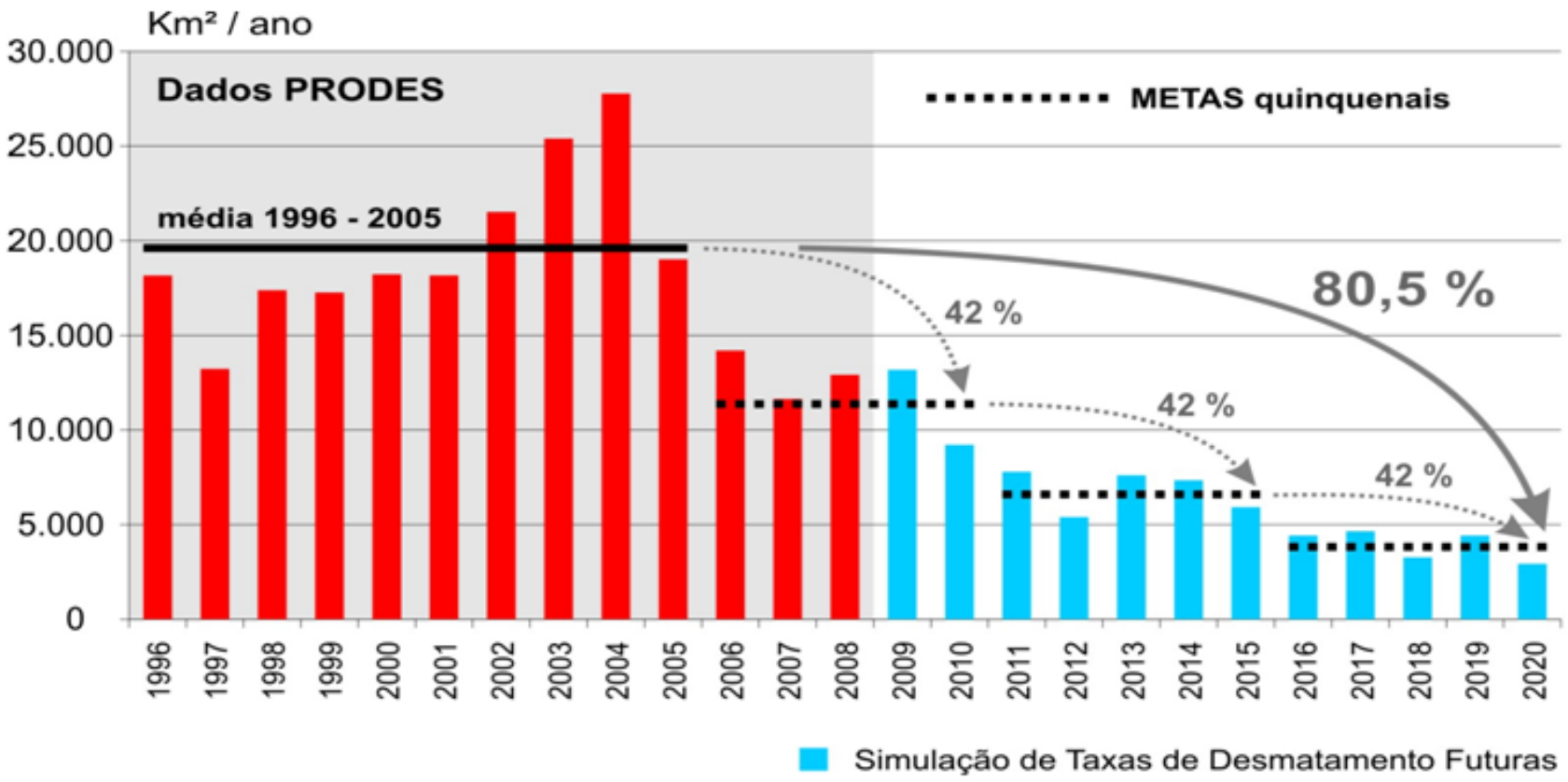


Low Carbon Agriculture (ABC)

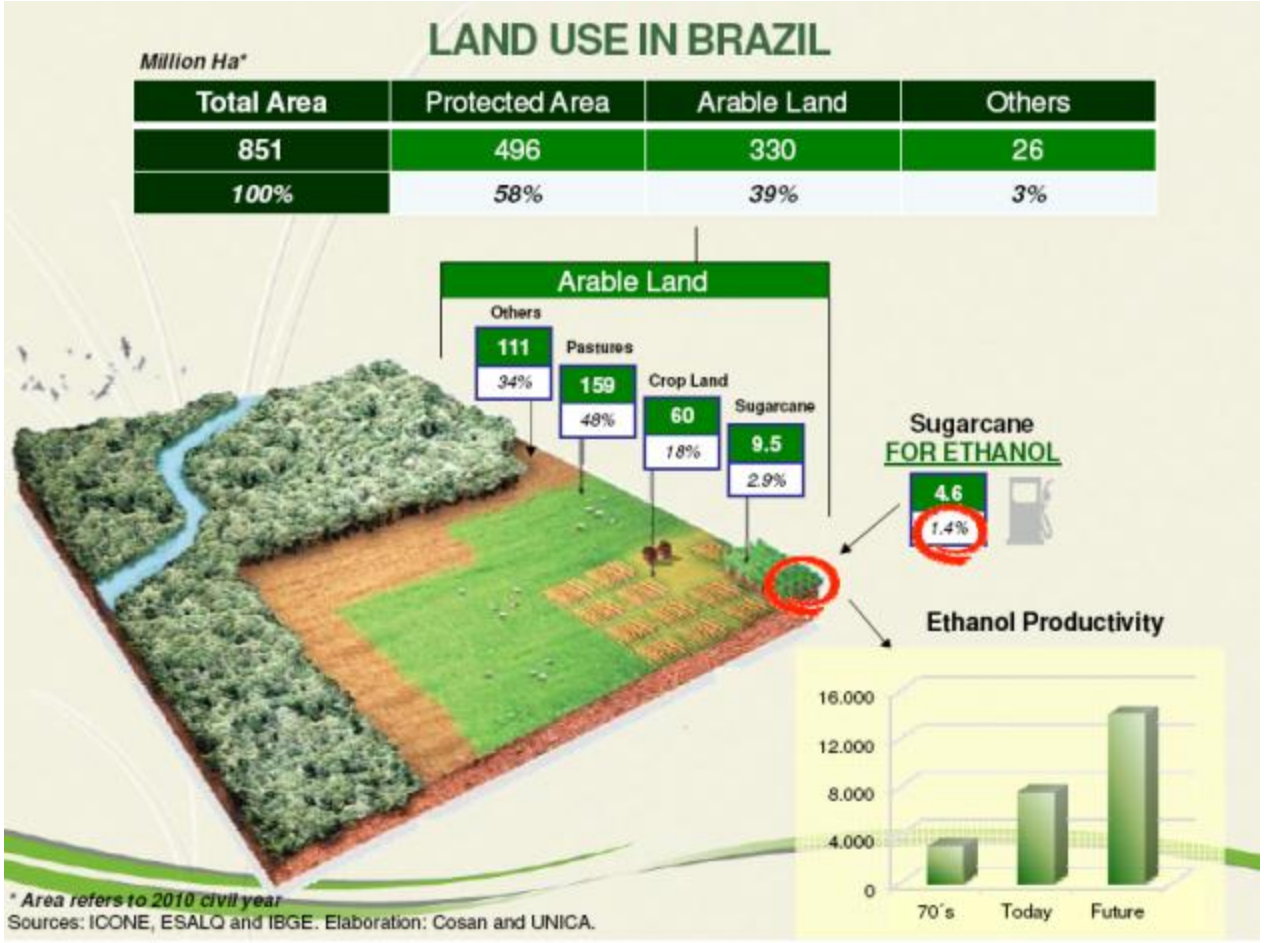
- Objectives: reduce GHG emissions in agriculture, decrease deforestation, adequate rural properties to environmental regulations, stimulate recovery of degraded areas, increase cultivated forest area.
- Actions
  - Recovery of degraded pasture: 15 Mha
  - No-tillage system: 8 Mha
  - Planted forest expansion: 3 Mha
  - Integration of agriculture, livestock and forest: 4 Mha
  - Biological nitrogen fixation: 5.5 Mha
  - Livestock waste treatment: 4.4 Mm^3/y

Detailed GHG Emission Reduction

Item	2020 Expected Reduction (%)
Deforestation (80% in Amazon and 40% in Cerrado)	24.7
Agriculture/Livestock/Forest (ABC)	4.9 – 6.1
Energy (efficiency, biofuels, renewable electricity)	6.1 – 7.7%
Industry/Waste	0.3 -0.4
Total	**36.1 – 38.9**

Source:

Land Use In Brazil



Sugarcane Participation in LU and LUC

- Cropped area: 9.5 Mha
- AEZ: 64.5 Mha for rainfed sugarcane cultivation with low impact on food production and on the ecosystems
- Dynamics of expansion: on pasture, on row crops and very little on native vegetation
- Good potential for landscape integration

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Sugarcane Agroecological Zoning

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The Amazon and Pantanal biomes were maintained out of the AEZ

The impacts on food production and on the biodiversity were minimized

There are 64.5 Mha of land for sugarcane expansion with low impact

The Cerrado

Landscape Types

Degraded pasture

Good pasture

Cattle/Forest integration

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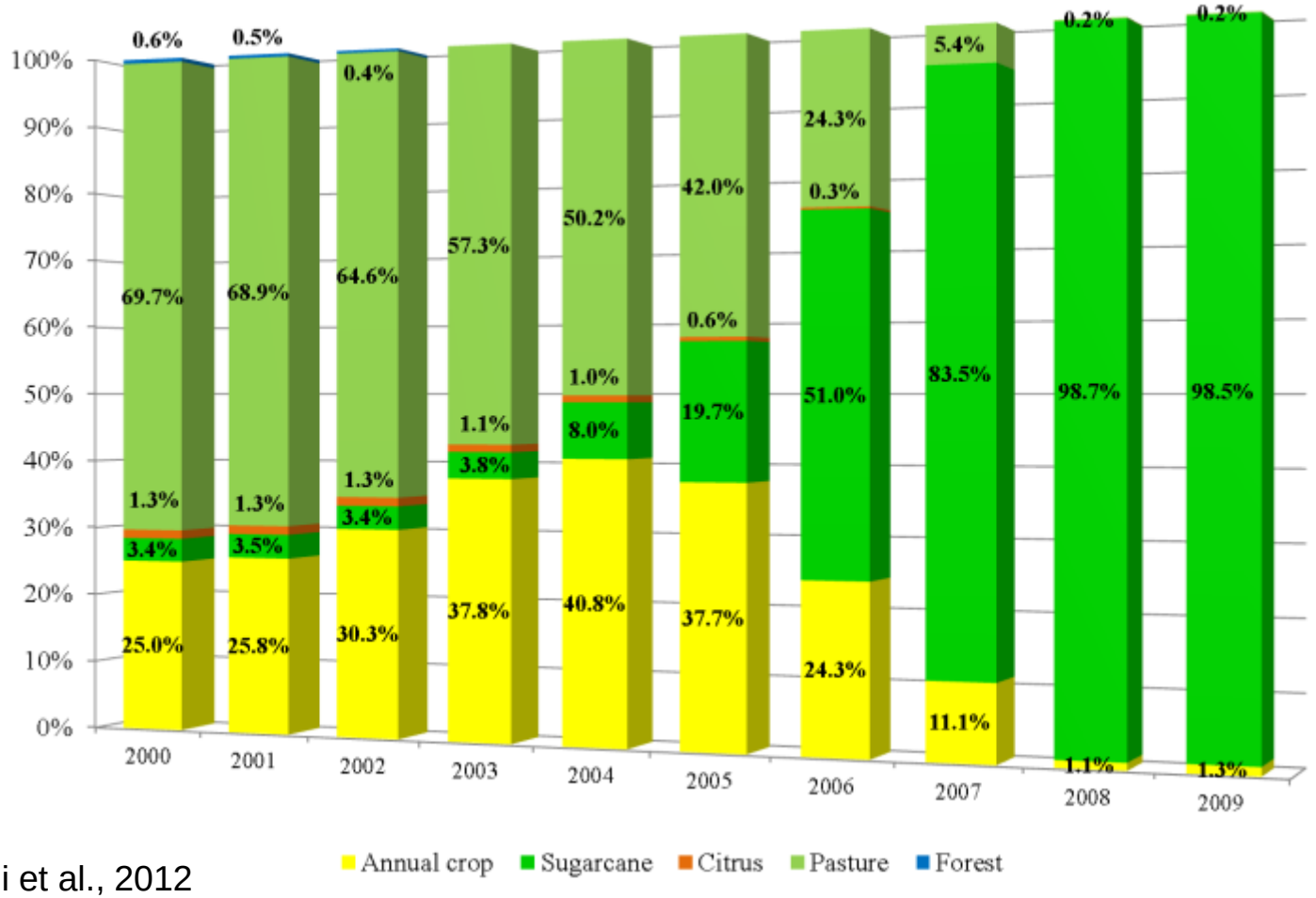
Typical Dynamics of Sugarcane Expansion



Source: Adami et al., 2012

Implications for Bioenergy and Sugarcane Industry

- The new policies and regulations are going to restrict the areas for bioenergy in general and bioethanol in particular, but will induce the production in a sustainable way;
- The restriction in area for sugarcane will not impair the expansion forecasted for many decades to come;
- The integration of sugarcane with other crops, cattle and forests is possible and is being pursued in some cases;
- Recovering degraded pasture for sugarcane production is becoming a common practice with great benefits for the landscape and the sustainability of ethanol;
- Generation of surplus electricity in the mills is an expanding practice making the most of the available residues (bagasse and straw); this will improve sustainability by reducing land demand and GHG emissions , but there are serious barriers to this expansion

Main Barriers Identified to Full Use of Cane Biomass

- **Technological**: lack of a commercial technology widely accepted to recover, transport, process and use the straw; the technology for power generation is available, but need to be tested with high levels of straw;
- **Financial**: the lack of a proven commercial technology decreases the confidence of investors and banks.
- **Information**: there is no reliable and accessible information about the required investments, performance indices, agronomic impacts and impacts on the mill.
- **Regulatory**: the existing regulatory framework does not favor the sale of electricity produced by the mills (the mills have to bear all the costs of the interconnection including the transmission lines, competition from wind power at the same conditions, etc.).

Certification – Access to Markets

- Preferred Certification System: BONSUCRO EU Production Standard
- Nº of certified mills: 38 (36 in Brazil + 2 in Australia)
- Ha certified: 871,229 (3.66% of global sugarcane surface)
- Tonnes of certified sugarcane: 55 million (3.32 %)
- Tonnes of certified sugar: 3.8 million
- Billion liters of certified ethanol: 2.6

Final Comments

- Brazil has a very typical and reasonably defined context for landscape design for bioenergy;
- The biofuels are receiving most of the attention (AEZ and other policies);
- The use of BONSUCRO to define the key sustainability indicators may facilitate the use of landscape design system for the sugarcane sector;
- Agriculture/cattle integration has an enormous potential to optimize land use in Brazil.

Thank you for your attention!

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