Centro de Ciência e Tecnologia do Bioetanol

Workshop on Environmental, Social and Economic Impacts of Biofuels

Environmental Impacts of Biorenewables and Biofuels

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Ministério da Ciência e Tecnologia

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Environmental Impacts of Biorenewables and Biofuels

The point of view of the Sustainability Research Program of CTBE – Brazilian Bioethanol Science and Technology Laboratory

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Research Program on Sustainability of Bioethanol

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Outline of this presentation

- CTBE and its Sustainability Research Program.
- Some comments regarding social and economic dimensions.
- The environmental dimension and its priorities.
- The existing know-how in Brazil, and potential interactions with The Netherlands.
- Concluding remarks.

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CTBE and its Sustainability Research Program

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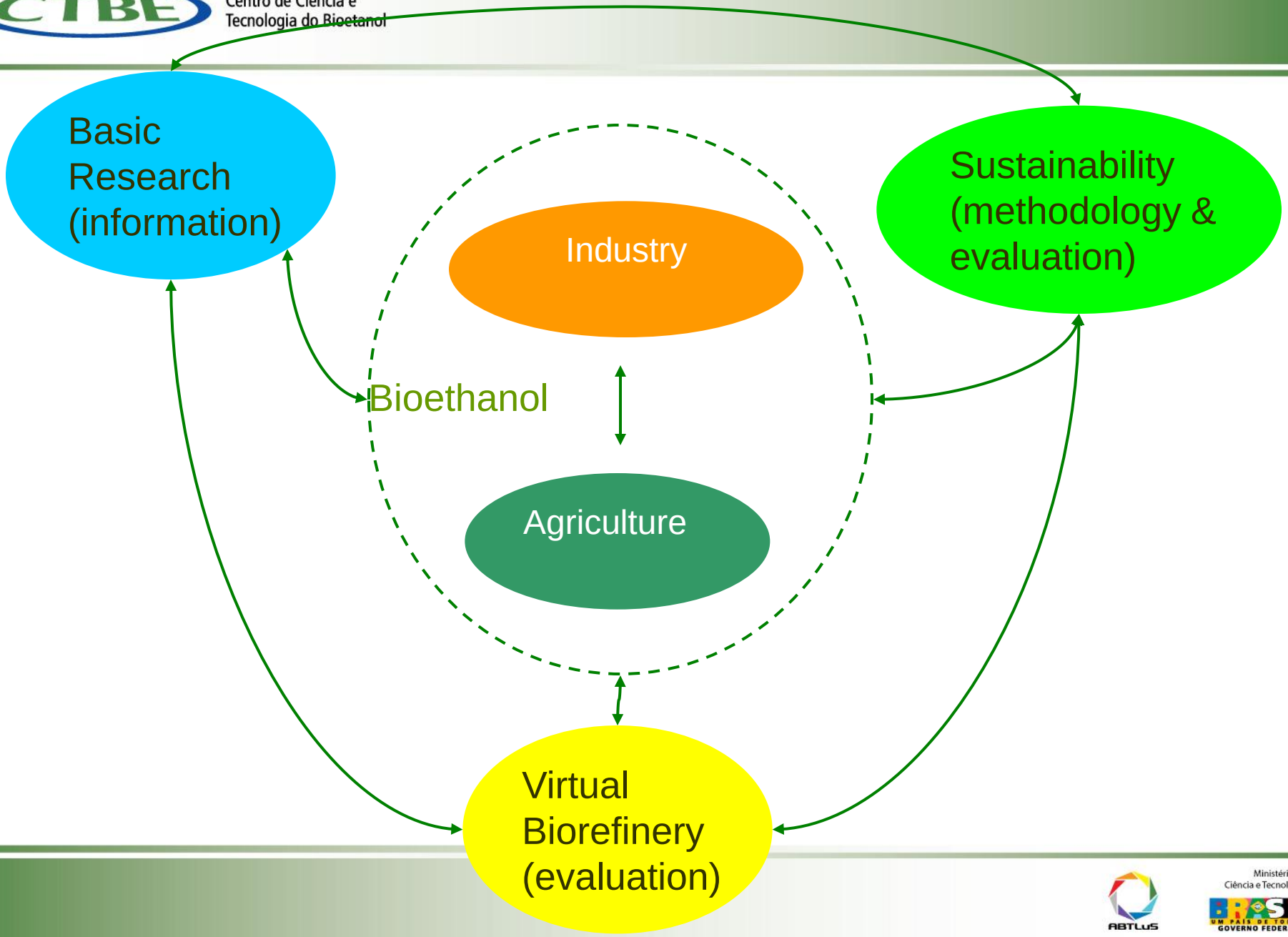
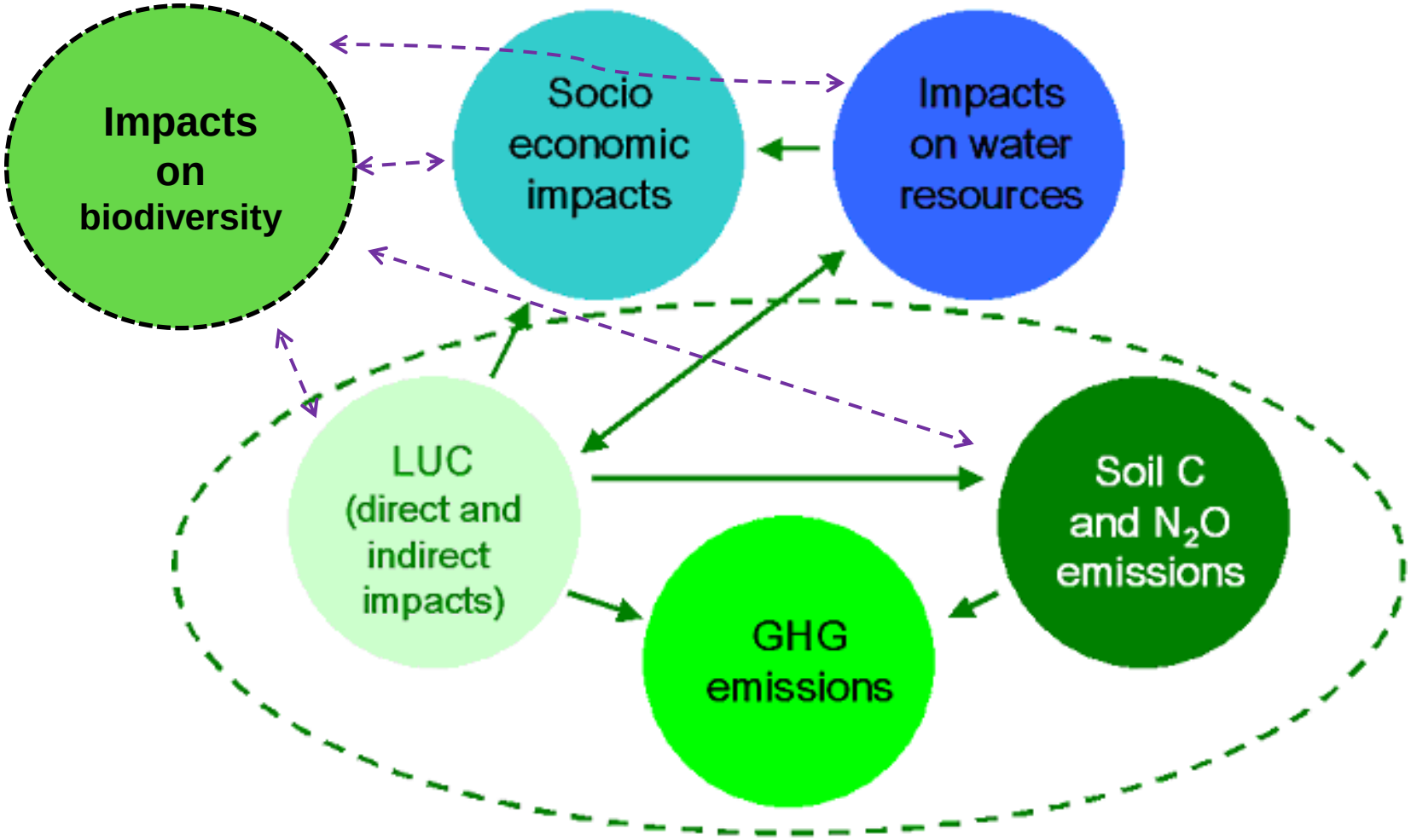
BRASIL UM PAÍS DE TODOS GOVERNO FEDERAL

CTBE

- The Brazilian Bioethanol Science and Technology Laboratory (CTBE) is a national laboratory with focus on innovative and sustainable production of ethanol from sugarcane.
- CTBE's main goal is on studying the ethanol production cycle, focused on industrial technologies for cellulosic ethanol. Moreover, CTBE intends to help the implementation of no-till farming of sugarcane and create sustainability models for the sector.


Basic Research (information)
Sustainability (methodology & evaluation)
Industry
Bioethanol
Agriculture
Virtual Biorefinery (evaluation)

Sustainability Program



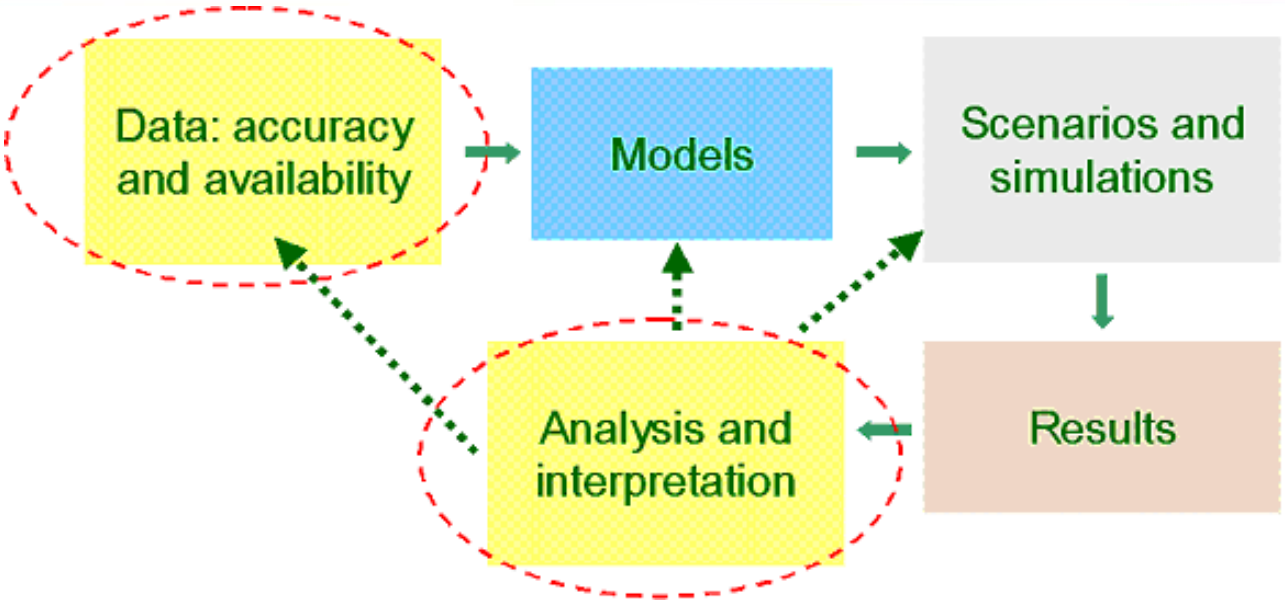
Sustainability RP: its goals

- On short-term, **the aim is evaluating the sustainability of bioethanol production from sugarcane, considering current technology and all changes that can be implemented in the years to come**.
- The mid-term aim is on **evaluating the bioethanol production from a sustainability point of view, taking into account all science and technology innovations that shall be incorporated to the production chain**, and that will be developed by the CTBE in its Research Programs (e.g., low impact mechanization in the agricultural side, ethanol production through hydrolysis of the bagasse, diversification of products, etc.).

Sustainability RP: its priorities

- Three priority aspects were defined by CTBE taking into account both the national and the international agenda.
- They are: energy balance and balance on greenhouse gas emissions; socio-economic impacts; and impacts on the availability and on the quality of water resources.
- Strategy was defined: (1) based on priorities, (2) on capacity skills, (3) on the necessity to reach solid results in short-term.
- The strategy is based on working with partners, in Brazil and abroad, in other to (1) reach better results in short to mid-term, (2) lower costs, and (3) also for recognizing the existing expertise.

Priority actions



- In short term the development of models will not be a priority.
- Data should reflect as much as possible Brazilian conditions of sugarcane and ethanol production, and, in this sense, considerable efforts would be put on data gathering (e.g., regarding soil carbon stocks, N_2O emissions, socio-economic aspects, etc.).
- Another priority should be on better understanding the results of modeling process.

Some comments regarding social and economic dimensions

Social aspects

- In Brazil (and many other countries), so far, there are few research activities founded on well established methodologies and supported on solid statistics analysis. It is not possible to generalize results (good or bad) of case studies.
- CTBE's priority has been on evaluating the impacts at the level the production activity takes place.
- Research activities focused on developing indicators and on applying models (e.g., input-output matrix) at the lowest aggregated level (e.g., municipalities).
- The necessity of understanding the synergies between water use and social aspects, (and also LUC, due to biodiversity change, etc.).

Economic aspects

- The current feasibility of ethanol production from sugarcane, in Brazil, has implied lower focus on economic aspects.
- The issue should be addressed properly, in the context of production diversification (e.g., production of second generation ethanol, new products, use of residues, competition of materials for different uses).
- Proper data basis is required. Methodologies should be developed/adapted. Capacity skills should be enhanced.

The environmental dimension and its priorities

Environmental aspects

- The main issues have been brought by the international agenda: GHG emissions, LUC and ILUC, impacts on water resources, impacts on biodiversity, ….
- In most cases (or even in all above mentioned cases?), the main constrain is not on personal skills, but on the lack of accurate information, related with the reality in Brazil.
- Let’s see some examples …

GHG emissions

- Methodologies/models are well known.
- The lack of proper information about:

1. Carbon stocks on soil, considering different soils, different agricultural practices, different land use changes, …;
2. Emissions along the life cycle of fossil fuels produced in Brazil;
3. The production and use of fertilizers (and their substitutes);
4. The impact of new agricultural practices, including mechanical harvesting and trash disposal in the soil.

LUC and ILUC impacts

- Modeling is a new issue in Brazil (and also worldwide) and models should be developed/adapted/improved.
- The lack of proper data/information regarding:

1. Dynamics of land use change;
2. Imprecision on evaluations (e.g., elasticities);
3. The necessity of taking advantage of satellite images;
4. The impacts of increasing yields;
5. The necessity of understanding (and also proper evaluating) the impacts of new technologies and new agricultural practices.

Water resources

- It seems that there is lack of specific knowledge concerned to the impacts of sugarcane cropping on water resources.
- It is (still) unknown:

1. The real impact of sugarcane cropping (in traditional areas) on water resources, considering availability and quality;
2. There is even less knowledge on the impacts of sugarcane cropping over water resources in new producing areas;
3. The impacts of new agricultural practices on water resources is unknown;
4. Is there potential advantage of irrigation in some specific cases?
5. How water resources could be managed in the context of sugarcane expansion?
6. What are the impacts of new industrial technologies on water demand?

Biodiversity

- The issue in (relatively) new regarding sugarcane production. What is known regarding biodiversity in traditional sugarcane areas and what is necessary to know in order to avoid problems in new producing areas?
- What are the actual impacts of extensive monoculture of sugarcane?
- What are the synergies between biodiversity and social aspects?
- What are the synergies between biodiversity and water use in large-scale?
- What are the impacts of new agricultural practices?

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The existing know-how in Brazil, and potential interactions with The Netherlands

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State-of-art (a diagnostic)

- Some good research groups in Brazil, acting in different areas of knowledge.
- Lack of proper information, in some cases because the issue is new, and also because only recently priority has been given to them.
- In some cases the main drawback has been on dissemination of the information available, as (at least in some areas) publications in peer-reviewed journals have not been the tradition.
- The lack of financial resources cannot be presented as the main drawback (everybody agrees?). But it is obvious that continuous financial support is fundamental.

Partnerships BR-NL

- There are successful partnerships: Wageningen-ESALQ, Utrecht-Unicamp, Delft-different Brazilian Universities and research institutes, ...
- It seems clear that there are win-win opportunities concerned to bioenergy and biorenewables.
- The potential of biomass production, the knowledge regarding agriculture, technological know-how, the ability on innovating, existing capacity skills, the priority that should be put on sustainability, …

Concluding remarks

Concluding remarks – 1

- Biomass is not a panacea, but can contribute a lot on enhancing sustainability (in different aspects, including reducing GHG emissions).
- There are drawbacks on large-scale production of biofuels (and biorenewables) but the main constrains can be well-addressed.
- Science and technology development are crucial, as the biomass industry should be much different than the one we currently know.

Concluding remarks – 2

- Brazil can enhance its position as biomass and bio-product producer improving the sustainability of its production.
- Human skills are not exactly a drawback, but it is clear that more well-trained and young researchers are necessary. Besides the required specific knowledge in some areas, a multidisciplinary approach and an international vision are crucial.
- A drawback in Brazil is the lack of accurate information, and of proper information regarding the local reality.
- An event like this one is an excellent opportunity for moving forward.

- Thanks for the opportunity, and thanks for your attention!
- Questions?
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