BIOEN

FAPESP

SP BIOEN

RESEARCH CENTER

USP - UNICAMP - UNESP

BIOEN DIVISIONS

BIOMASS
Contribute with knowledge and technologies for sugarcane improvement
Enable a systems biology approach for biofuel crops

BIOFUEL TECHNOLOGIES
Increasing productivity, energy saving, water saving and minimizing environmental impacts

ENGINES
Flex-fuel engines with increased performance, durability and decreased consumption, pollutant emissions, aviation applications

BIOREFINERIES
Complete substitution of fossil fuel derived compounds
Sugarchemistry for intermediate chemical production and alcoholchemistry as a petrochemistry substitute

SUSTAINABILITY AND IMPACTS
Studies to consolidate sugarcane ethanol as the leading technology path to ethanol and derivatives production
Horizontal themes: social and economic Impacts, environmental studies and land use

BIOEN FACTS AND FIGURES

US$ 167 million	**research expenditures by FAPESP and partners**
13	**co-funding partners**
7	**private companies co-funding projects**
467	**scholarships** – 89 ongoing and 378 completed
206	**research projects** – 66 ongoing and 140 completed
300+	**researchers involved**
21	**fields of knowledge**
920+	**scientific publications**
17	**patents filed**

FAPESP Bioenergy Research Program BIOEN

Knowledge built upon a solid core of fundamental research...

212
Research projects

493
Scholarships (Brazil and abroad)

930+
Scientific publications

300+
Researchers involved

58
Collective h-index

FAPESP Bioenergy Research Program BIOEN

…and application-driven focus, in cooperation with private partners, are paramount for the development of new technologies.

24
Fields of knowledge

7
Private companies co-funding projects

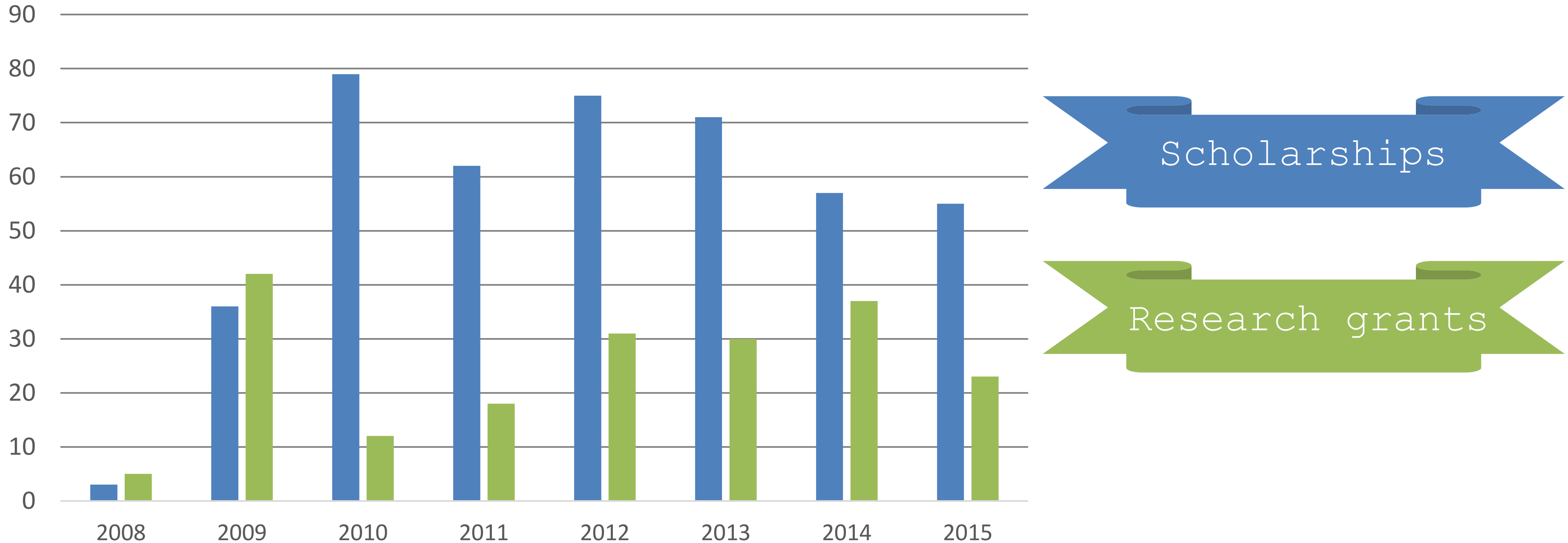
17+
Patents filed

$ 239mi
Public investment (BRL)

FAPESP Bioenergy Research Program BIOEN

Human resources training is also an important aspect of the BIOEN Program.

Number of Research grants and Scholarships started per year



BIOEN network

RESEARCHERID THOMSON REUTERS

You are viewing the ResearcherID Labs page for **FAPESP, BIOEN (H-6149-2012)**

Publications network: 30% of the articles derive from international cooperation

Publication type	Number
Articles	930
Book Chapters	81
Books	7
Doctoral theses	56
Master's dissertations	117
Abstracts	371
Awards	5
Patents	19
Software	1

Collaboration Network

The map graph below displays (up to) the top **500 geographic locations** for this researcher's co-authors. Scroll over the map and place your cursor on a pin to view city, state, and country information. Clicking on the pin will display bibliographic data for the paper that has cited the researcher's publication(s).

Top: Authors | Research Areas | Countries/Territories | Institutions | Map |

Quais os limites da produtividade da cana:
84 → 148 → 212 → 381 ton/Ha?

Plant Biotechnology Journal

Plant Biotechnology Journal (2010) **8**, pp. 263–276 doi: 10.1111/j.1467-7652.2009.00491.x

Review article

Sugarcane for bioenergy production: an assessment of yield and regulation of sucrose content

Alessandro J. Waclawovsky[1,†,‡], Paloma M. Sato[1,‡], Carolina G. Lembke[1], Paul H. Moore[2] and Glaucia M. Souza[1,*]

[1]*Departamento de Bioquímica, Instituto de Química, Av. Prof. Lineu Prestes, São Paulo, Brazil*
[2]*Hawaii Agriculture Research Center, Kunia, HI, USA*

Table 1 Average, maximum and theoretical sugarcane yields (Australia, Colombia, and South Africa) and total dry matter production

Type of yield	Cane yield t/(ha yr)	Biomass* t/(ha yr)	Biomass* $g/(m^2\ d)$
Commercial Average	84	39	10.7
Commercial maximum	148	69	18.8
Experimental maximum	212	98	27.0
Theoretical maximum	381	177	48.5

Translational genomics

Journal of Experimental Botany Advance Access published June 19, 2015

Journal of Experimental Botany
doi:10.1093/jxb/erv283
This paper is available online free of all access charges (see http://jxb.oxfordjournals.org/open_access.html for further details)

RESEARCH PAPER

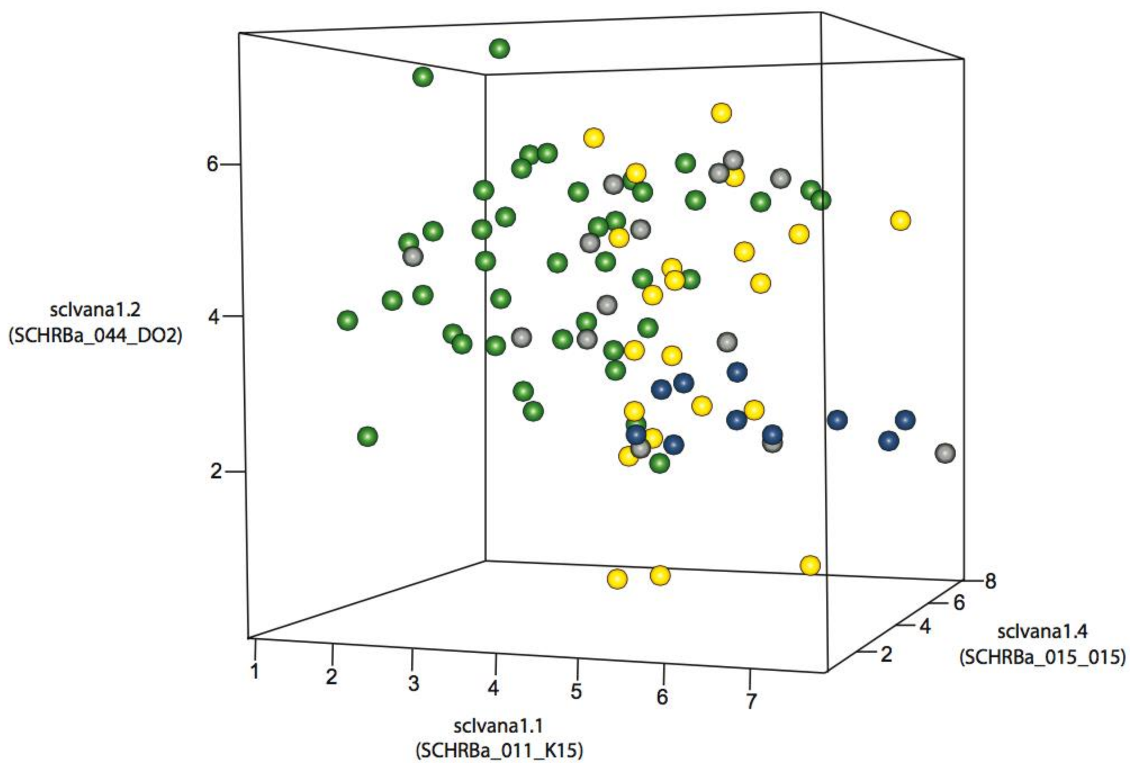
Using quantitative PCR with retrotransposon-based insertion polymorphisms as markers in sugarcane

Cushla J. Metcalfe[1], Sarah G. Oliveira[1], Jonas W. Gaiarsa[1], Karen S. Aitken[2], Monalisa S. Carneiro[3], Fernanda Zatti[3] and Marie-Anne Van Sluys[1,*]

[1] GaTE-Lab, Departamento de Botânica, IBUSP, Universidade de São Paulo, rua do Matao 277, 05508-090, SP, Brazil
[2] CSIRO Agriculture Flagship, Queensland Bioscience Precinct, 306 Carmody Road, St Lucia, QLD 4072, Australia
[3] Centro de Ciências Agrárias, Universidade Federal de São Carlos, Araras, 13600-970, SP, Brazil

* To whom correspondence should be addr

Received 15 April 2015; Revised 15 April 201

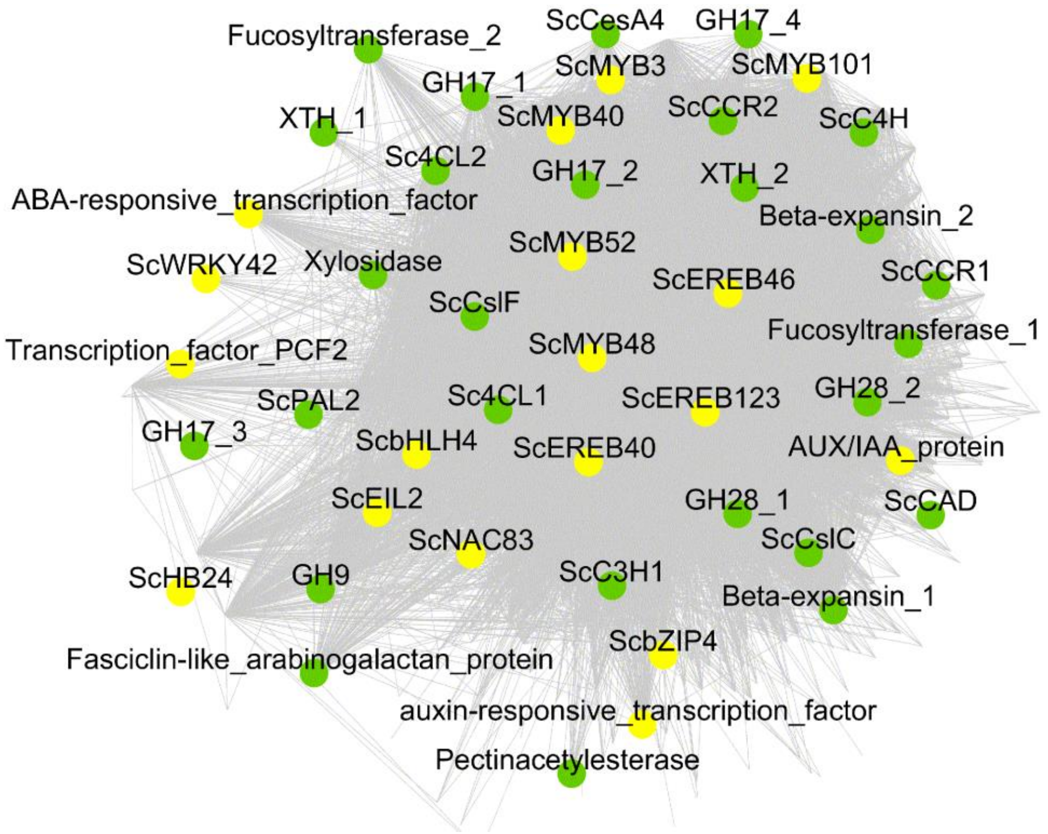


FUNCTIONAL GENOMICS

Plant Mol Biol
DOI 10.1007/s11103-016-0434-2

Co-expression network analysis reveals transcription factors associated to cell wall biosynthesis in sugarcane

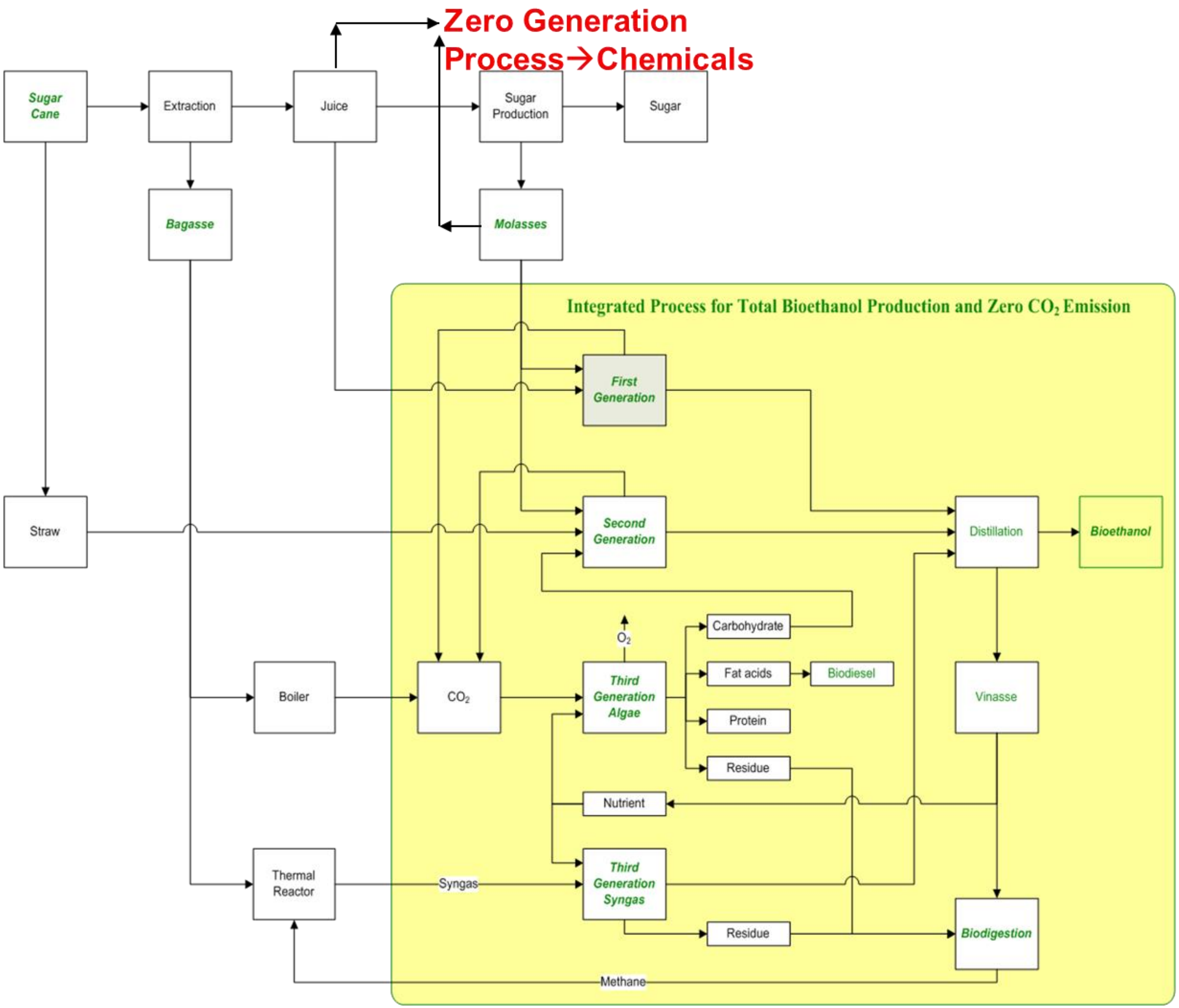
Savio Siqueira Ferreira[1] · Carlos Takeshi Hotta[1] · Viviane Guzzo de Carli Poelking[2,6] · Debora Chaves Coelho Leite[3] · Marcos Silveira Buckeridge[3] · Marcelo Ehlers Loureiro[2] · Marcio Henrique Pereira Barbosa[4] · Monalisa Sampaio Carneiro[5] · Glaucia Mendes Souza[1]



PITEs using a biorefinery approach

Process number	Researcher	Research area	Institutions
08/03606-9	Mattoso, L.H.C.	nanofibers from renewable sources	Embrapa, Braskem
08/03694-5	Maciel Filho, R.	acrylic and propionic acid production	UNICAMP, Braskem
08/03620-1	Menck, C.F.M.	glycerol transformation	USP, Braskem
10/52416-8	Contiero, J.	lactic acid production	unesp, Braskem
08/03487-0	Lombardi, A.T.	microalgae; CO_2 mitigation	ufscar, Braskem
07/51754-4	Zanchet, D.	glycerol hydrogenolysis	UNICAMP, OXITENO
07/51656-2	Maiorano, A.E.	enzymatic hydrolysis of sugarcane bagasse	ipt Instituto de Pesquisas Tecnológicas, OXITENO
07/51755-0	Curvelo, A.A.S.	organosolv delignification	USP, OXITENO
10/51298-1	Petraconi, G.	plasma treatment; syngas	ITA, VALE

Biofuel Technologies: Integrating 1st with 2nd Generation



Source: Thematic Project Fapesp 2008/57873-8– Coordinator Maciel Filho

Biorefineries: CO_2 as a solvent

Industrial Crops and Products 57 (2014) 141–149

ELSEVIER

Contents lists available at ScienceDirect

Industrial Crops and Products

journal homepage: www.elsevier.com/locate/indcrop

Enhancing liquid hot water (LHW) pretreatment of sugarcane bagasse by high pressure carbon dioxide (HP-CO_2)

Leandro Vinícius Alves Gurgel[a,c], Maria Teresa Borges Pimenta[b], Antonio Aprigio da Silva Curvelo[b,c,*]

OXITENO

[a] Grupo de Físico-Química Orgânica, Departamento de Química, Instituto de Ciências Exatas e Biológicas (ICEB), Universidade Federal de Ouro Preto (UFOP), 35400-000 Ouro Preto, Minas Gerais, Brazil

[b] Laboratório Nacional de Ciência eTecnologia do Bioetanol (CTBE), Centro de Pesquisa em Energia e Materiais (CNPEM), Caixa Postal 6179, 13083-970 Campinas, São Paulo, Brazil

[c] Grupo de Físico-Química Orgânica, Departamento de Físico-Química, Instituto de Química de São Carlos (IQSC), Universidade de São Paulo (USP), Av. Trabalhador São Carlense, 400, Caixa Postal 780, 13560-970 São Carlos, São Paulo, Brazil

Table 5
Effect of LHW-HP-CO_2 pretreatment on the enzymatic digestibility of pretreated bagasse.

Sample	*T* (°C)	*t* (min)	*Glu* (g/L)	*CC* (%)[a]
Depithed bagasse	–	–	4.61	9.54
5	93.8 (−1.414)	60 (0)	11.16	20.2
6	136.2 (+1.414)	60 (0)	32.54	42.8
7	115 (0)	17.6 (-1.414)	22.25	32.1
8	115 (0)	102.4 (+1.414)	29.81	41.7
9	115 (0)	60 (0)	30.43	41.2

[a] *CC* is the cellulose conversion. CC was calculated according to Eq. (3).

sugarcane bagasse

combined liquid hot water – high pressure carbon dioxide **(LHW-HP-CO_2) pretreatment**

+

enzymatic hydrolysis

cellulose conversion to glucose = 41.2%

The proposed pretreatment method may improve the overall economic feasibility of the process in a lignocellulosic biorefinery once CO_2 is considered a green solvent, is non-corrosive and can be easily recovered and recycled

Biorefineries: acrylic acid from molasses

427

CHEMICAL ENGINEERING TRANSACTIONS
VOL. 37, 2014

A publication of AIDIC
The Italian Association of Chemical Engineering
www.aidic.it/cet

Guest Editors: Eliseo Ranzi, Katharina Kohse- Höinghaus

ISBN 978-88-95608-28-0; **ISSN** 2283-9216

DOI: 10.3303/CET1437072

Hybrid Route to Produce Acrylic Acid from Sugarcane Molasses

John H. Bermudez Jaimes[a], Bruna T. Da Silva[a], Jaiver E. Jaimes Figueroa[a], Betânia H. Lunelli[a], Rubens Maciel Filho[a], Maria R. Wolf Maciel[a], Augusto T. Morita[b], Paulo. L. A. Coutinho[b]

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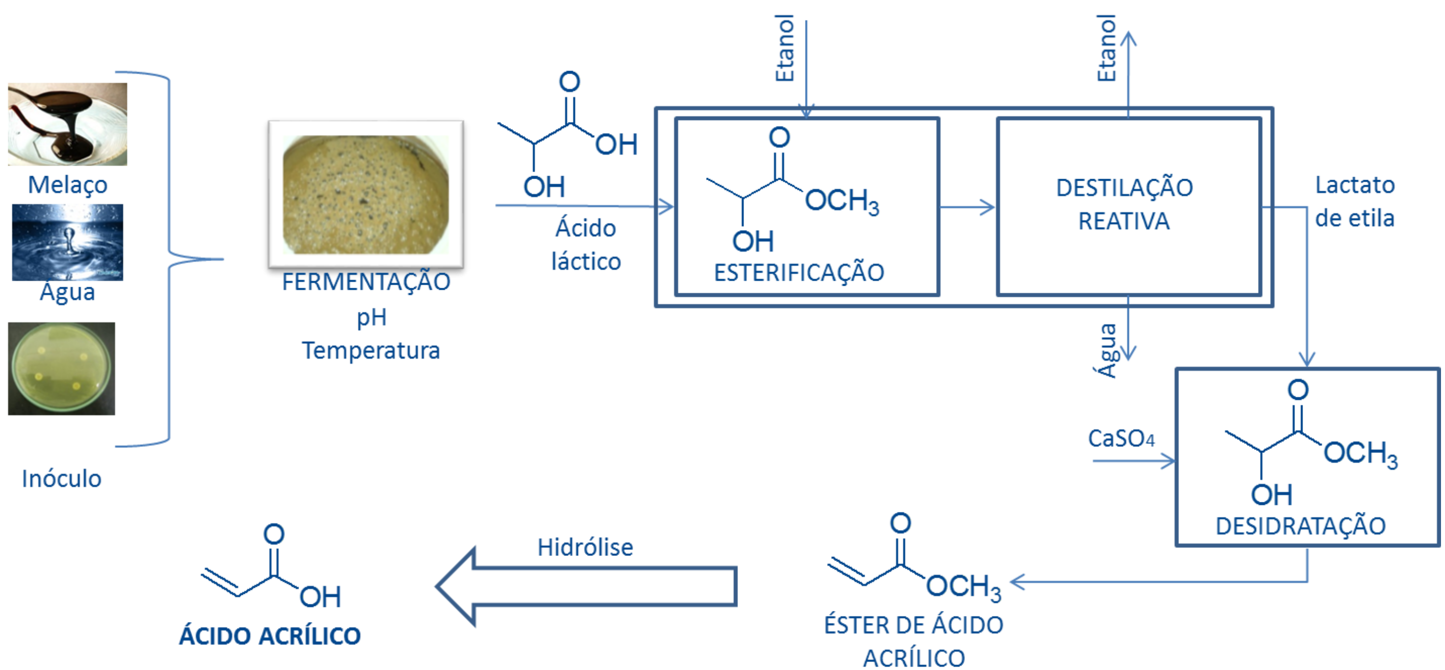
[b]BRASKEM, Av. das Nações Unidas 4777, 11th floor, CEP 05477-000 São Paulo, Brazil.
johnhervinbermudez@gmail.com

Braskem

- **sugarcane molasses** as raw material to produce molecules with **high added value** as **acrylic acid**, which is commonly obtained from fossil fuels sources
- the use of **renewable feedstock** contributes to many issues regarding environmental concerns



Patent filed

Biorefineries: 2nd generation PHA from xylose

International Journal of Biological Macromolecules 71 (2014) 2–7

Contents lists available at ScienceDirect

International Journal of Biological Macromolecules

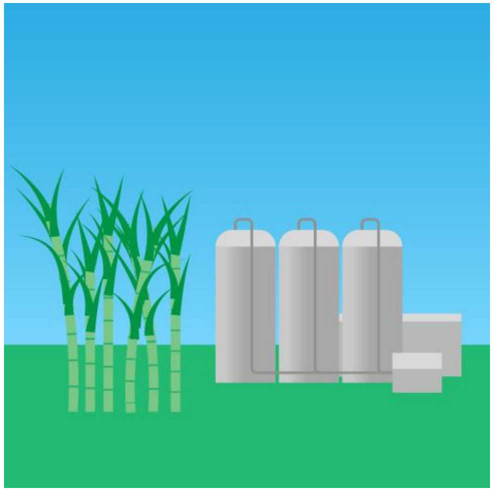
journal homepage: www.elsevier.com/locate/ijbiomac

ELSEVIER

Perspectives on the production of polyhydroxyalkanoates in biorefineries associated with the production of sugar and ethanol

Luiziana Ferreira Silva[a,*], Marilda Keico Taciro[a], Gil Raicher[a], Rosane Aparecida Moniz Piccoli[b], Thatiane Teixeira Mendonça[a], Mateus Schreiner Garcez Lopes[a,1], José Gregório Cabrera Gomez[a]

[a] *Department of Microbiology, Institute of Biomedical Sciences, University of São Paulo, Av. Prof. Lineu Prestes, 1374, 05508-000 São Paulo, SP, Brazil*
[b] *Instituto de Pesquisas Tecnológicas do Estado de São Paulo S.A., IPT, Av. Prof. Almeida Prado, 532, 05508-901 Brazil*



- **Polyhydroxyalkanoates (PHA)** are **biodegradable** and biocompatible bacterial thermoplastic **polymers** that can be obtained from **renewable resources** (sugarcane agricultural residues)

- Although PHA production from sucrose integrated to a 1G ethanol and sugar mill has been proposed in the past, the integration of the process of **2G ethanol** in the context of a **biorefinery** will provide enormous amounts of xylose, which could be applied to produce PHA, establishing a **second-generation PHA production process**

Hydrogen from ethanol

ARTICLE IN PRESS

INTERNATIONAL JOURNAL OF HYDROGEN ENERGY XXX (2015) 1–7

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/he

Potential applications of the hydrogen and the high energy biofuel blend produced by ethanol dehydrogenation on a Cu/ZrO_2 catalyst

André G. Sato [a], Ana L.G. Biancolli [b], Valdecir A. Paganin [b], Gabriel C. da Silva [b], Glauber Cruz [c], Antonio M. dos Santos [c], Edson A. Ticianelli [b,]*

[a] Department of Chemistry, Universidade Federal de Viçosa, CEP 36570-000, Viçosa, MG, Brazil
[b] Department of Physical Chemistry, IQSC Universidade de São Paulo, C.P. 780, CEP 13560-970, Brazil
[c] Department of Mechanical Engineering, EESC, Universidade de São Paulo, C.P. 780, CEP 13560-970, Brazil

CONCLUSIONS

- **liquid fuel blend** obtained from ethanol dehydrogenation has a **heat of combustion higher than that of ethanol**, and it is essentially formed by **un-reacted ethanol, acetaldehyde and ethyl acetate**

- results demonstrate the advantages of combining the **renewable ethanol as hydrogen carrier for highly efficient PEMFC technology avoiding on board hydrogen storage**

- the co-production of the **fuel blend** with higher specific enthalpy which could disseminate the **use of these biofuels in regions with harsh winter conditions**

GOALS

To analyze the potential application of:

- the liquid effluent coming from a catalytic ethanol dehydrogenation reactor as a fuel blend or additive for internal combustion engines, and

- the hydrogen produced, as fuel for a polymer electrolyte fuel cell (PEMFC)

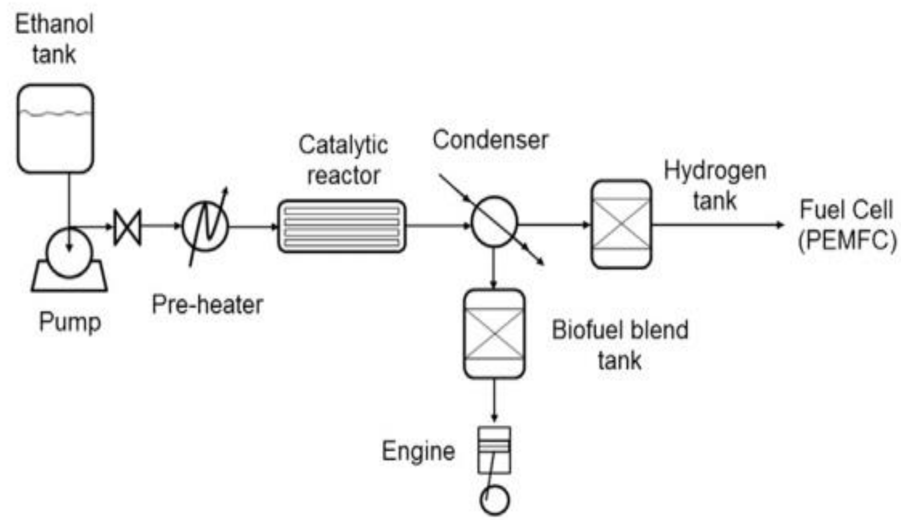


Fig. 1 – Schematic illustration of a catalytic system employed for biofuel blend and hydrogen production from ethanol.

FAPESP+Peugeot-Citroen: biofuel engines

Advanced Research Centers: 10-year contracts, researchers from universities and from company

British Gas, BG: natural gas from renewable sources

FAPESP inaugura Centro de Pesquisa em parceria com a PSA Peugeot Citroën

Iniciativa apoiará o desenvolvimento de motores movidos a biocombustíveis com participação de pesquisadores da USP, Unicamp, ITA e Instituto Mauá de Tecnologia

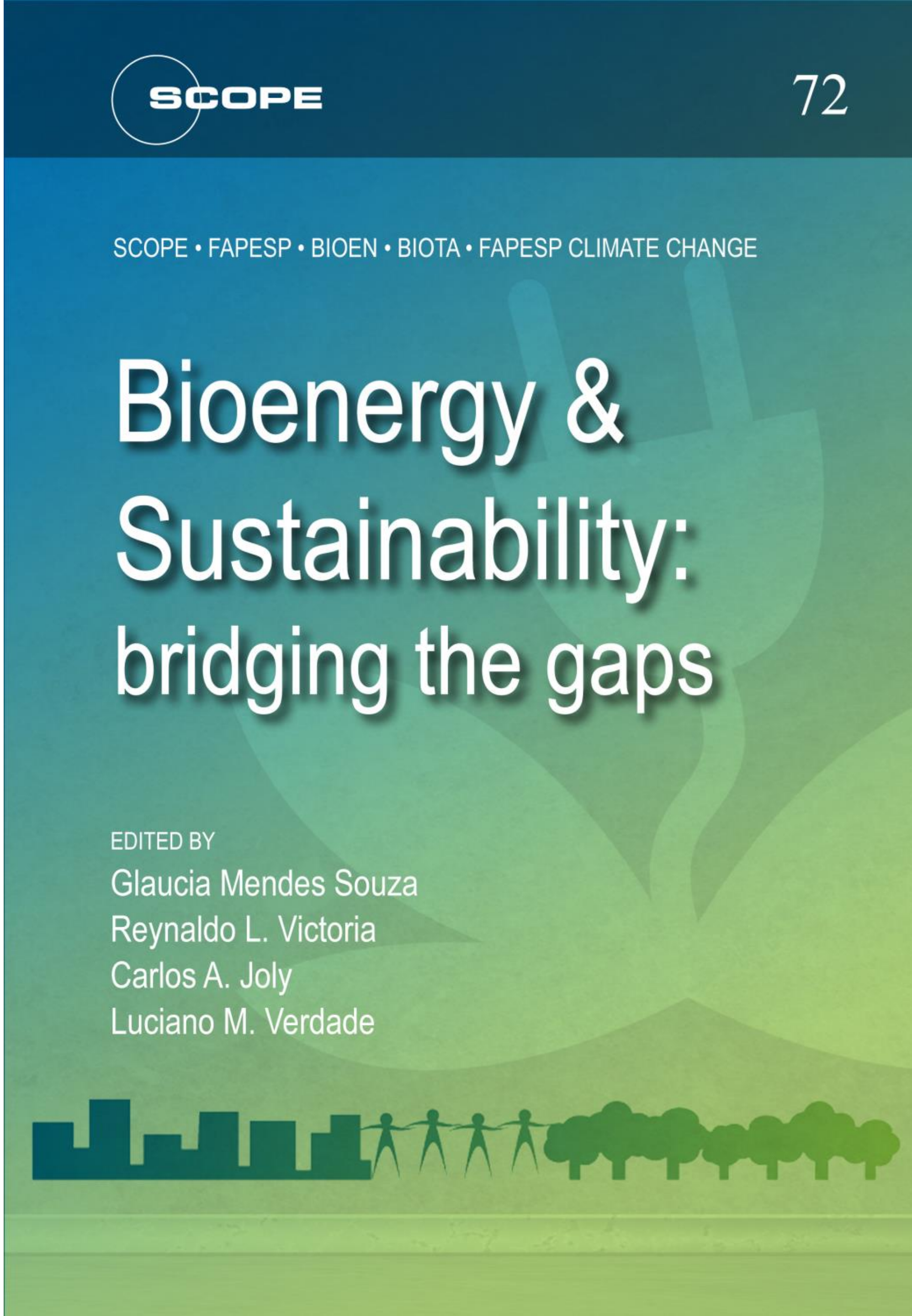
A Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) e a PSA Peugeot Citroën do Brasil anunciaram ontem, dia 04 de novembro de 2014, na sede da FAPESP, o lançamento do Centro de Pesquisa em Engenharia “Professor Urbano Ernesto Stumpf”, para desenvolvimento de motores de combustão interna, adaptados ou desenvolvidos especificamente para biocombustíveis e de estudos sobre a sustentabilidade dos biocombustíveis.

SCOPE-FAPESP
Reporting a global assessment of
Bioenergy & Sustainability
137 experts from 24 countries

Bioenergy now
Bioenergy expansion
Energy security
Food security
Environmental and climate security
Sustainable development and Innovation
The much needed science

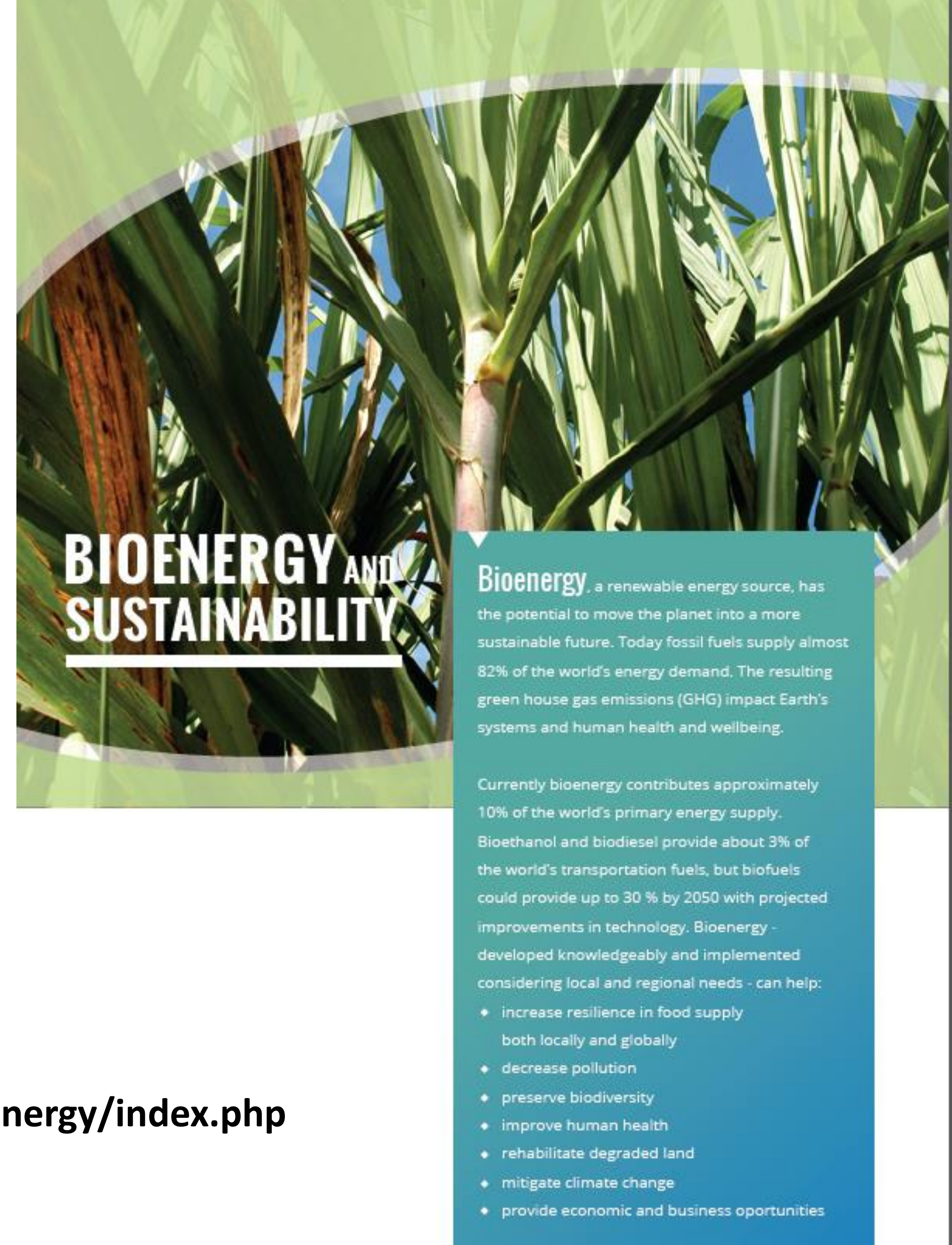
Developed and developing regions
Numbers, cases, issues, solutions

779-page Ebook
Download at http://bioenfapesp.org



SCOPE-FAPESP Bioenergy & Sustainability Policy Brief

São Paulo - FAPESP
São Paulo - FIESP
Brussels - EU Sustainable Energy Week
Washington DC – World Bank
Academia Brasileira de Ciências
Brussels – Bioenergy & Biomass V
Berlin – Global Bioeconomy Summitt
Rotterdam – EcoBio
São Paulo – FAPESP, ICRAF and SEI



http://bioenfapesp.org/scopebioenergy/index.php

Science & Environment

Bioenergy can deliver cleaner future, says global report

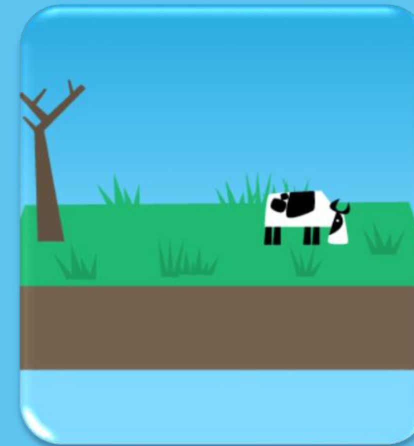
By Mark Kinver
Environment reporter, BBC News

17 June 2015 | Science & Environment

Bioenergy crops, like willow, could play a key role in delivering a low carbon future, the report says

A global bioenergy assessment has said biofuels could meet up to a third of the world's transportation fuel needs by the middle of the century.

Low carbon agriculture



Energy Security

Sugarcane bioethanol contributes to 20% of the Brazilian liquid fuels matrix

Biomass cogeneration can contribute with up to 18% of Brazil's electricity demand

Only 1% of brazilian land used to produce sugarcane contributes to 19% of the country's primary energy

Sustainable Development

The sugarcane industry contributes to agriculture modernization, rural development, improved education and the creation of jobs

Opportunities for innovation

Environmental Security

The use of Sugarcane bioethanol can reduce CO_2 emissions by 76% when compared to gasoline

Multi-functional landscapes, biofuel certification , agroecological zoning to maximize benefits

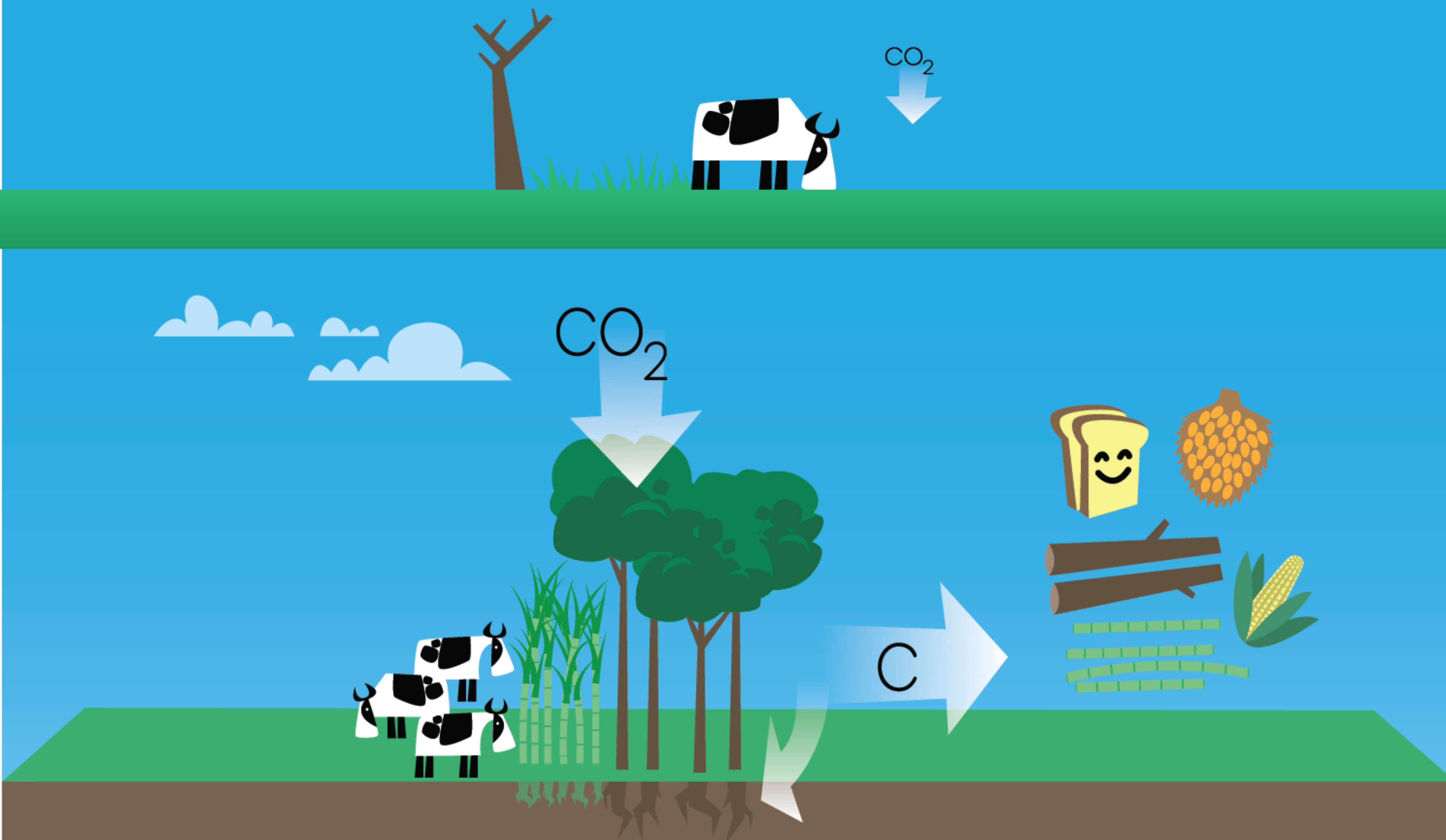
Food Security

Sugarcane production for energy did no decrease food production

Expansion is occurring mainly in pasture land

Integrated food-energy systems are needed and to improve use of agricultural residues

Existing pastureland could support almost four times the numbers of animals. Bringing the poorest-performing pastures up to 50% of their maximum attainable density would more than double the global stock of grazing animals.



Actions to improve pasture conditions, along with livestock production intensification, can effectively make large amounts of land available for alternative uses.

World Road Transport Liquid Biofuels Demand

2010 | **2050**

3% ········ Biofuels ········ 27%

800 million cars | 2.1 billion cars

50 countries, including many developing countries, now have biofuels mandates with blends of 5-27%, many driven by climate change

Advanced automotive technology has expanded the use of ethanol
Biofuels could contribute to up to ~30%
Electricity, hydrogen, CNG/LPG to ~20%

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André Damasio (IPBEN)

UNICAMP USP unesp

State of São Paulo Bioenergy Research Center

UNICAMP

SP BIOEN RESEARCH CENTER USP - UNICAMP - UNESP

Prédio existente (2.990 m^2), antes ocupado pelo Centro de Tecnologia (CT), que está sendo reformado.
Previsão de conclusão: dezembro de 2016

Novo prédio (1.115 m^2), em construção com recursos do GESP, ao lado do prédio existente.
Previsão de conclusão: dezembro de 2017

State of São Paulo Bioenergy Research Center

Laboratório Central – Rio Claro

- Área Reformada: 1284 m^2
- Inauguração: Dezembro de 2014

State of São Paulo Bioenergy Research Center

USP

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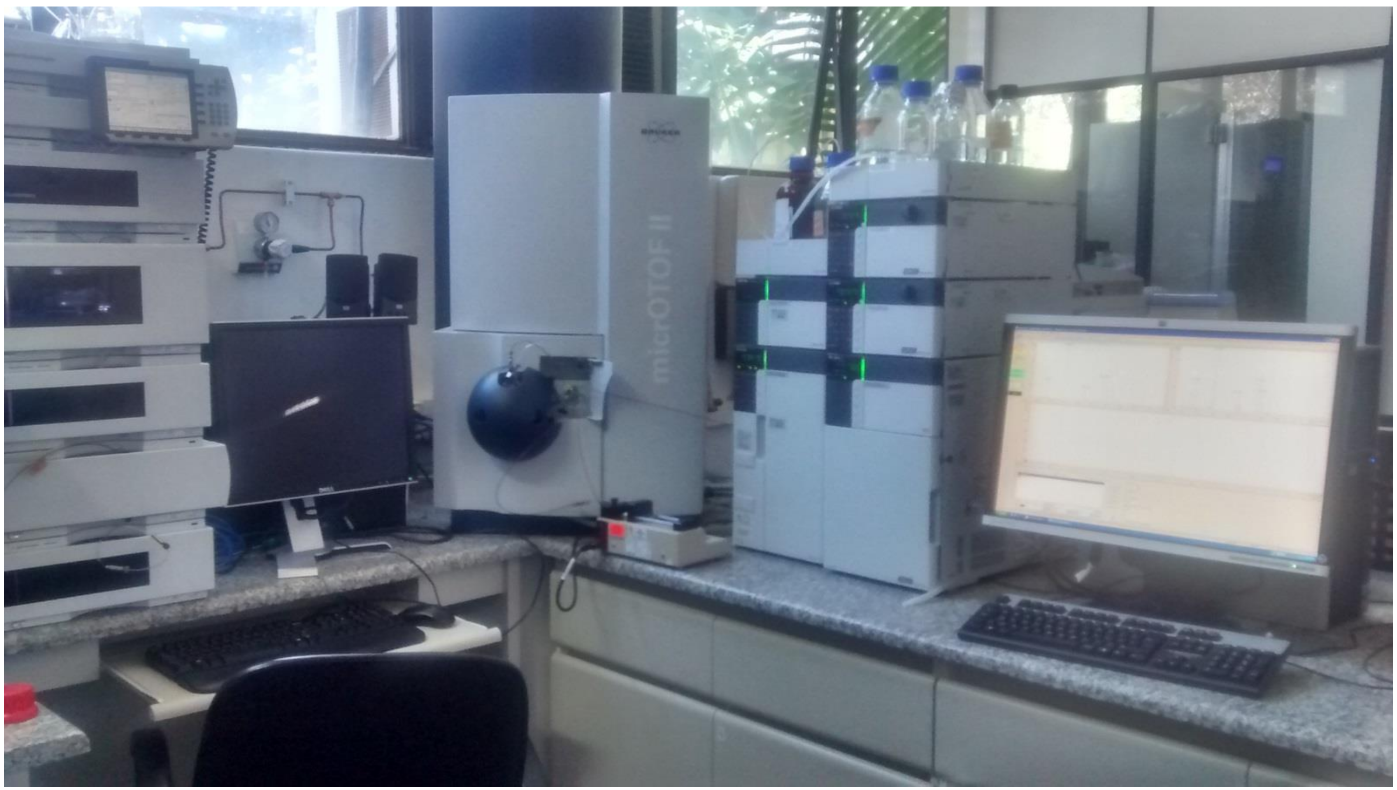
Laboratório de Metabolômica (Instituto de Química – USP)

microTOF II - Bruker



Equipamento adquirido com recursos NAP-USP

Laboratório de Metabolômica (Instituto de Química – USP)

2 cromatógrafos a gás

Biomass

Systems and Synthetic Biology

Center

BBEST 2017

Brazilian BioEnergy Science and Technology Conference

DESIGNING A SUSTAINABLE BIOECONOMY

Campos do Jordão, 17 a 19 de Outubro de 2017

SAVE THE DATE

Advances in International and Brazilian Bioenergy Research

A Science and Policy Conference

Designing a Sustainable Bioeconomy

BIOMASS
Focus on sugarcane and other energy crops, including genomics, biochemistry, cell biology, physiology, plant breeding and farming technologies

BIOEFUEL TECHNOLOGIES
Focus on Processing and Engineering

BIOREFINERIES
Integrated focus on sugarchemistry, alcoholchemistry and bio-based chemicals

ENGINES
Focus on biofuel applications for motor vehicles including aviation

SUSTAINABILITY AND IMPACTS
Focus on social, economic and environmental studies, policy

http://bbest.org.br
Information: bbest@bbest.org.br