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# INTRODUCTION

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The book *Ethanol: Research and Development* is the result of a project carried out between August 2006 and March 2009 entitled "Guidelines for Public Policy for Scientific and Technological Research on Bioenergy in the State of São Paulo" (http://www.apta.sp.gov.br/cana/) also known as PPP Ethanol Project. It was funded by the São Paulo State Research Foundation – Fapesp.

The Fapesp PPP Ethanol Project also worked closely with the São Paulo Technology Agribusiness Agency – APTA, which includes institutions such as IAC, IEA and Ital). In addition, the following institutions were also involved in the project:

- Centro de Ciência e Tecnologia do Bioetanol – CTBE
- Centro de Referência de Biomassa – Cenbio
- Centro de Tecnologia Canavieira – CTC
- Dedini S/A Indústrias de Base
- Embrapa Brasileira Agropecuária – Embrapa
- Instituto de Pesquisas Tecnológicas – IPT
- Universidade Estadual Paulista – Unesp
- Universidade Estadual de Campinas – Unicamp
- Universidade Federal de São Carlos – UFSCar
- Universidade de São Paulo – USP

Contributors to this book include researchers and experts from a variety of areas ranging from policy, sustainability, or specific technological developments in the sugar-ethanol sector in Brazil.

There were 18 technology workshops covering a wide range of institutions and topics, as illustrated in Table 1. The objectives were to assess and develop scenarios for the development of proposals for RD&D and to propose strategies and policies for the sugar-ethanol sector.

The technology workshops covered the entire production chain from sugarcane to the end use of ethanol. The meetings were aimed at developing guidelines, by identifying the bottlenecks in the industry, spread across areas and expertise, integrating all the participating team. This included the encouragement of other experts not directly participating in the project and representatives of the production chain, in order to assess the potential for sustainability and growth of the industry and how to meet the demands of society.

These workshops allowed the authors of this book to develop indicators and measure the performance, make assessments, analyze the results and identify bottlenecks of the whole supply chain of the sugarcane ethanol sector. The book is, therefore, a collection of documents obtained through the workshops and papers of experts who took part in the project.

It is the hope that will help the policy-makers to define guidelines and strategies for the development of public policies for the sugarcane and ethanol industry. The research undertaken by this project should allow the development of research policies to improve the current production chain to the desired sustainable development path. To that extent, the Bioen Fapesp Program is a good example to stimulate research efforts and training of human resources in bioenergy. The Bioen-Fapesp Program, in addition of constituting a strong core of basic research, has also

**TABLE 1** Technological Workshops conducted by the Fapesp PPP Ethanol project.

| Topic | Responsible Institution | Date |
|---|---|---|
| Ethanol Production | EEL/USP | 10 Nov. 2006 |
| Cane Harvest, Transport, and Trash Recovery | Feagri/Unicamp | 29 Nov. 2006 |
| Hydrolysis | IPT | 11 Dec. 2006 |
| Sustainability | IEA/APTA | 14 June 2007 |
| Genetic Improvement and Biotechnology | IAC/APTA | 28 June 2007 |
| Biomass Production and Agricultural Modeling | Esalq/USP | 17 July 2007 |
| Sugarcane Pests | Esalq/USP | 14 Aug. 2007 |
| Energy Cane | FEQ/Unicamp | 05 Oct. 2007 |
| Vinasse | FCA/Unesp | 10 Oct. 2007 |
| Cogeneration | FEM/Unicamp | 23 Jan. 2008 |
| BTL (Biomass To Liquids) | IPT | 26 Fev. 2008 |
| Environmental Aspects | Cenbio/Cetesb | 16 Apr. 2008 |
| Sector Evolution Impacts | APTA/CATI | 16 May 2008 |
| Production of Ethanol: Quality of the Raw Material | EEL/USP | 30 May 2008 |
| Sugar-Ethanol Sector Agricultural Management | CTC | 02 Oct. 2008 |
| Use of Water in the Production of Sugarcane Ethanol | FEM/Unicamp | 24 Nov. 2008 |
| Instrumentation and Automation in the Sugarcane Ethanol Agriculture and Industry | Embrapa Instrumentações | 28 Nov. 2008 |
| Photosynthesis | Fapesp | 18 Fev. 2009 |

industrial partnerships such as Dedini, Braskem and Oxiteno.

The involvement of the staff of APTA, universities and private sector, will enable the adoption of policies aimed at maintaining and improving the competitiveness of the sugar and ethanol industry in Brazil.

This book is divided into 5 parts, each one under the responsibility of a respective organizer:

- Public Policy Strategies for Ethanol in Brazil (Luís Augusto Barbosa Cortez).
- Sustainability of Biofuels Production and Consumption (Arnaldo Walter).
- A New Model for Sugarcane Mechanization System (Paulo Sérgio Graziano Magalhães and Oscar A. Braunbeck).
- A New Model for Industrial Production and Final Uses of Ethanol (Antonio Bonomi).
- Technological Roadmapping for Sugarcane Ethanol (André Tosi Furtado and Rodrigo Lima Verde Leal).

At the end of the project, a workshop was organised to assess the main findings and how to develop a Public Policy Guidelines for Ethanol production (should also say sugarcane).