

POSTFACE

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This book is a compilation of texts written from Fapesp's Ethanol Public Policies Project – PPP workshops, or by authors invited for the relevance of their work in the sugarcane ethanol subject. This provides closure to the Ethanol PPP Project, or at least to its first phase.

However, some important themes failed to be covered. Such is the case of automotive engines and their development, ethanol fuel cells, and ethanol hybrid cars, to mention the automotive use of ethanol, currently its leading application. All the issue related to the mid and long-range term of the automotive industry and its energy, were not covered here. The outlook of ethanol as a fuel was not discussed either; its future, if it remains in the Brazilian and global energy matrix for a long time, or if it is replaced by some other higher energy density fuel e.g. buthanol.

As it is widely known, Brazil became the leader in producing ethanol from sugarcane, gradually improving its agro-industrial productivity indexes (1975-2010). This took place due to several factors, including successful long-term policies that resulted in incremental gains. However, the present situation is quite different, requiring technology leaps increasingly based on science. For instance, sugarcane agriculture must be rethought, making it a modern, waste-free agriculture, with a better understanding of photosynthesis and genomics, using rationally all natural resources. This will imply redeveloping a new agriculture, not for sugarcane alone, but a new model of land usage in Brazil, considering the proper use of space, protecting biodiversity, and ensuring the integration

of food and energy production. This process has already begun with agricultural zoning; however, but planning and implementation is a long-term assignment.

For this reason it is a must that from now on, we conceive a new model for whole sugarcane exploitation, promoting an actually sustainable production system, placing the human being and its welfare in the center of all discussions. Regarding conversion technologies for wholly exploiting sugarcane, present discussions cover a whole family known as "second generation" that spans from hydrolysis and its variants to thermal conversion (pyrolysis, gasification etc.). Each of these technological variants may bring some special benefit to Brazil. It is necessary to analyze them, understand their hurdles and opportunities.

In this sense, given the complexity of the subjects covered and their evaluation, we consider it important to include in this book a first attempt to build a roadmap for each major agricultural and industrial component. We consider that the chapters for the roadmaps, in spite of having been thoroughly discussed by many specialists, cannot be deemed final; on the contrary, they are a first step in the difficult journey of building a modern biomass civilization. The final part of this book comprises a summary of the main conclusions in a chapter entitled "Public Policy Guidelines". In each area, bottlenecks were pointed out, and investments and other policies were recommended.

We hope that the text presented herein will, in some way, help young researchers in this important moment the world is going through, while consider-

ing sugarcane as a possible source for liquid fuels, bioproducts (plastics, among others), and bioelectricity. Different centers are actively involved in bioenergy in Brazil (Centro Paulista de Bioenergia, Laboratório Nacional de Ciência e Tecnologia do Bioetanol – CTBE, Embrapa Agroenergia) and abroad (National Corn to Ethanol Research Center – NCERC, DOE Bioenergy Research Centers in the USA), among others. These initiatives associated to Fapesp's Bioen Program, new Fapesp partnerships with corporations (Dedini, Oxiteno, Braskem, and Vale), in addition to federal government actions to foster research may – if well coordinated – be successful on the long run.

It is expected that, in the next few decades, the bioenergy area as a whole will undergo an important leap. It should be noted here that in many countries neither energy assurance nor biofuels production and use to mitigate GHG emissions are important issues, but they are seen as means to generate wealth from innovation.

It is very important to remember that sugarcane, though being a large culture in the São Paulo state, where it occupies 5 million ha (20-25% of the state area), is not very representative throughout Brazil, where it takes 8 million ha (1% of the total land), and less than 20 million ha worldwide. Each of other cultures such as wheat, corn, rice, and soy

individually surpasses 100 million ha, therefore attracting more investments in science and technology. Thus, sugarcane is increasingly a Brazilian agenda, and Brazil should stay alert for the science and technology development in this area, as most of innovation should take place right here, since we intend to remain leaders in sugarcane ethanol.

Another point to be remembered is the rapid corporate transformation taking over the sugar-alcohol industry, with mergers and acquisitions, and the implications this will have in science, technology, and innovation. It is expected that the new groups will be growingly sensitive to innovation in the energy and green chemistry areas, increasing the industry income.

In this sense, upon closing this book, it is important to leave here a final message that innovation, as well as socio-economic development, so much longed for by Brazil and developing nations alike, will only happen with a new generation of high level human resources. People are an unrelinquishable demand for innovation, hence, at this time, if there is an area where it is worthwhile to invest heavily, it is in the development of human resources at all levels, above all investing in people who are willing to work hard, to grow, to associate their future to the future of sugarcane ethanol, and to the future of the country.