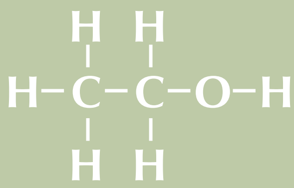

Preface

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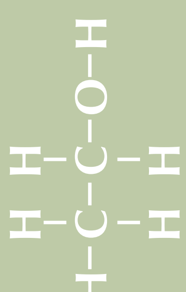

C_2H_5OH

Biofuel production started to attract growing attention in the early 2000s because of mounting interest in the development of cleaner and renewable energy sources: biofuels were seen as part of the drive to move beyond the prevalent fossil-fuel paradigm. Brazil stands out in this context, with a sugarcane bioethanol programme that has delivered remarkable results along the entire production chain, from the improvement and development of higher-yielding sugarcane varieties to the manufacture of engines that run on any gasoline and bioethanol blend.

President Luiz Inácio Lula da Silva requested the National Bank of Economic and Social Development (BNDES) and the Center for Strategic Studies and Management (CGEE) to produce this book, principally in order to share the Brazilian experience with other nations, especially with developing countries located in tropical and subtropical areas. This motivation also underlay the contributions made by the Economic Commission for Latin America and the Caribbean (ECLAC) and the Regional Office for Latin America and the Caribbean of the Food and Agriculture Organization of the United Nations (FAO).

Biofuels have been in the spotlight recently owing to the surges in food and agricultural commodity prices for which biofuel production has often been held largely responsible. This book stresses the need to distinguish between different types of biofuel production systems before making assertions regarding their impact, not only on food prices, but also on food security and energy and environmental balances. Biofuels are not all the same in terms of impacts and benefits or even in terms of the origin of their raw inputs. The book makes the point that bioethanol made from sugarcane, for example, has little to do with bioethanol made from wheat or maize. Sugarcane bioethanol is advocated as preferable to other biofuels both because of its food security impacts and because of environmental and energy aspects.

The book aims to offer a comprehensive review of biofuel issues. BNDES and CGEE coordinated the preparation of the book with the support of ECLAC and FAO. The preparation of chapters 1 to 7 and chapter 9 was coordinated by BNDES and CGEE; ECLAC and FAO coordinated the production of chapter 8 and provided insight and valuable assistance for developing the other chapters.

Chapter 1 discusses bioenergy-related concepts and describes the development of bioenergy sources, stressing their importance in today's energy context. Chapter 2 deals with ethanol as a motor-vehicle fuel, discussing its properties and performance as a fuel, as well as economic and logistical aspects of its use. Chapter 3 describes the processes used to produce bioethanol from different sugary and starchy crops, focusing on sugarcane and maize conversion routes and the energy and greenhouse gas (GHG) balances in each case. Chapters 4 and 5 look at technical aspects of the co-products and by-products obtained in sugarcane bioethanol production. Chapter 4 discusses sugar and bioelectricity, the two main co-products under current technologies, and chapter 5 analyses innovative conversion routes, such as hydrolysis and gasification, that could be used in the future to obtain biofuels from sugarcane by-products and residues. The first five chapters take a technical approach; despite occasional references to Brazil's experience, the concepts discussed are applicable in other contexts. Chapter 6 then moves on to the Brazilian experience, presenting the country's bioethanol programme — which was established in 1975 — and discussing its evolution, indicators and current perspectives. Chapter 7 addresses sustainability issues that represent major sources of concern regarding biofuels production in Brazil. Sustainability is discussed in environmental, economic and social terms, including some remarks on biofuel certification. Chapter 8 assesses the global potential for biofuel production, discusses policies adopted to foster it and evaluates the possibilities of setting up a global bioethanol market and how this would affect food security. Chapter 9 summarizes the main points made in the book and offers some recommendations.

The book aims to provide grounds for a meaningful and objective discussion on the potential and constraints of producing bioethanol from sugarcane, especially in those countries where sugarcane is already being cultivated. Policies and incentives to create a competitive market for sugarcane bioethanol are important, but the promotion of biofuels must not compromise food security, internationally agreed commitments on poverty and hunger reduction or the promotion of sustainable natural resources management.

The book also emphasizes that many developing countries — chiefly those located in tropical and subtropical zones, which includes most of the countries of Latin America and the Caribbean — have adequate natural conditions, as far as soil, water, solar radiation requirements and land availability are concerned, to expand energy-oriented sugarcane production. Recent studies stress that these comparative advantages can be exploited under *sustainable conditions by implementing strategies that balance the costs and benefits in economic, social, environmental and strategic terms. These strategies must be subject to the close analysis and monitoring of land-use changes, investment standards, GHG emissions, trade flows and food security, as highlighted in recent international forums. Many countries currently interested in biofuels may benefit from the experience accumulated by Brazil during more than three decades in the agricultural, industrial, technological and logistical aspects of the production and use of sugarcane bioethanol. This stock of know-how could constitute an important asset for other countries whose biofuel potential could be boosted through horizontal technical cooperation mechanisms.*

Tapping the potential advantages of producing bioethanol from sugarcane will require greater integration and coherence between national and international policies — especially in the areas of energy, environment, agriculture and food security — as well as between public and private action. Every effort must be made to prevent the implementation of mechanisms that could undermine the legitimate comparative advantages that many countries have in sugarcane-based bioethanol production.

As the book discusses, in designing biofuel policies, it is especially important to: (a) develop common methodologies for analysing the GHG lifecycle, given the importance of the direct and indirect emissions generated by biofuel-related changes in land use; (b) adopt internationally agreed, non-distorting standards to address the possible environmental impacts of bioenergy production; (c) set out guidelines for developing and developed countries to estimate and report GHG emissions and compliance with World Trade Organization (WTO) rules on barriers to trade; and (d) strengthen the linkages among agricultural, food and energy policies so that biofuel production does not threaten food security and farmers are not deprived of the opportunity to profit from biofuel production.

The bioethanol agenda is growing by the day. Some of the topics still open for discussion are beyond the scope of this book and will no doubt be the subject of research in the near future. One of these is the globalization of bioethanol. As in the case of petroleum, the creation of a worldwide bioethanol market will mean developing a number of complementary measures to ensure continuity and safety in production and supply. Such a process will require the formation of new alliances (public-private, private-private, multilateral) and the creation of consumer markets with clearly defined rules regarding price formation and reference product specifications.

Other significant strategic issues include the need to ensure that biotechnology developments and sugarcane variety enhancements are protected by intellectual property rights and that measures are taken to maintain the competitive advantage that developing countries currently enjoy in biofuel production.

Biofuel policies today need to be based on four pillars:

(a) a market-oriented approach *to both reduce agricultural and biofuel market distortions and avoid the creation of new restrictions;*

(b) an environmentally sustainable approach *to the development of biofuel production that results in positive net balances in terms of energy ratios (i.e., energy use versus energy production), the reduction of GHG emissions and the sustainable use of natural resources;*

(c) a development approach *that pays due attention to research, development and innovation policies that help improve the economic and physical efficiency of feedstocks and of the processes to convert them into biofuel; and*

(d) a socio-economic approach that focuses on the protection of lower-income populations and the improvement of food security *by addressing the problems created by food deficits and the dependence on fossil fuel imports, especially in poorer countries.*

The institutions involved in the production of this book maintain that, if properly designed and implemented (i.e. on the basis of the four pillars outlined above), programmes to develop the production and use of sugarcane bioethanol can foster cooperation among countries and promote sustainable development.

Luciano Coutinho
President, BNDES

Alicia Bárcena
Executive Secretary, ECLAC

Lúcia Melo
President, CGEE

José Graziano da Silva
FAO Regional Representative for Latin America and the Caribbean