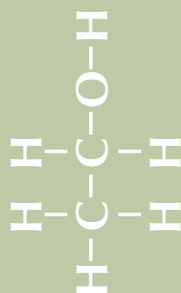


Foreword



Oil, natural gas and their derived-products account for 55% of the world's energy consumption. The fast and efficient transport facilities of our times, as well as most industrial activities are possible thanks to these fuels. Unfortunately, they will last as much as a few decades: as fossil fuels, their reserves are finite, supply safety is troublesome for many importing countries and their use is the main source of climate-changing and global warming gases.

These fuels, thus, must be substituted. The most rational way of producing the substitutes is using renewable organic matter (biomass), out of which, long ago, fossil fuels were produced by nature. One of the options is the ethanol, an excellent substitute for gasoline, the main car fuel used around the globe.

In Brazil, the sugarcane-based ethanol substitutes half of the gasoline that would be used if it did not exist and its cost is competitive without the subsidies that helped launching the program at first. That has been accomplished in 30 years since the Brazilian Ethanol Program was launched in the 1970s to reduce the dependence on oil imports. Economic considerations of the sugar industry also had a bearing on the program when it was launched; however, environmental and social concerns did not play a significant role at that time.

In the United States, the largest world producer of corn-based ethanol, an ethanol programme has been recently launched and its justifications are eliminating additives on gasoline and cutting down on global-warming gases. In Western Europe, wheat and beet-based ethanol are also used. In these countries, the cost of ethanol is four times greater than in Brazil and internal subsidies and customs barriers protect local industries, preventing ethanol imports from Brazil.

This has caused some groups to feel quite uneasy, as they associate ethanol (and biodiesel, produced at smaller amounts) to a false dilemma: producing food versus fuels. This argument does not find grounds as we realize that ethanol production in the world, around 50 billion liters per year, takes 15 million hectares, that is, 1% of the area currently used for agriculture purposes in the world (ie, 1.5 billion hectares).

These groups also argue that, in fact, ethanol does not cut down on greenhouse gases; however, in the case of sugarcane-based ethanol that is a misconception. Actually, sugarcane-based ethanol is almost entirely renewable, since sugarcane bagasse supplies the entire energy required in the industrial phase of ethanol production. The United States is in a less comfortable position because ethanol production requires the use of energy fully derived from external fossil-fuel sources. We can say that corn-based ethanol is, in fact, fossil-fuels converted into ethanol, whereas in Brazil, it is almost fully derived from solar energy.

Sugarcane and corn production expansion involve changes in land-use, which may cause emission of greenhouse gases if expansion triggers deforestation, which is not the case of Brazil, where sugarcane expansion is taking place mostly in areas previously occupied by pasture lands. Indeed, this is a an issue related to the expansion of agriculture more than a problem associated with the expansion of ethanol (or biodiesel) production. The dilemma here, if any, could be on food production versus climate change.

What we may call “a Brazilian fix for fossil fuel problems” - the use of sugarcane-based ethanol to substitute gasoline – is not only a Brazilian phenomenon, as it is being adopted in other sugarcane producing countries (almost one hundred), such as Colombia, Venezuela, Mozambique and Mauritius Islands.

These and other issues are analyzed in depth in this book, which describes the biological characteristics of sugarcane as a plant, alcohol and other co-products and by-products production techniques, such as bioelectricity, presenting the state-of-the-art in terms of “advanced technologies”.

The use of “second generation technologies” to produce ethanol based on cellulose of any other types of agricultural products (including sugarcane) is also discussed, as well as biomass gasification technologies. Social and environmental sustainability issues for ethanol production are also analyzed.

This book will certainly clear some myths around the Brazilian ethanol program and its potential expansion in the world.

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