Chapter 10
Sweet Sorghum Supply Chain for Bio-Ethanol Production

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ABSTRACT

20% ethanol blending is targeted for petroleum fuel (EBP-20) by countries. However, traditional feedstocks like sugarcane, rice, and maize are facing constraints due to climate change and food security concerns. To bridge this gap, this research explores that Sweet Sorghum as an alternative potential feedstock for bio-ethanol production. While having lower conversion efficiency and ethanol price compared to traditional crops, Sweet Sorghum offers advantages such as multiple cropping cycles per year, high temperature tolerance, and low water requirements. This makes it a sustainable choice for bio-ethanol production and augmenting the ethanol supply.

INTRODUCTION

Global Sweet Sorghum Production

Sweet Sorghum production is high in the United States, Nigeria, India, Mexico, and Brazil. The top-producing countries are shown in table 1.

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Table 1. Top Producing Countries for Sweet Sorghum

Country	% of Global Production	Total Production (2023/2024, Metric Tons)
United States	14%	8.07 Million
Nigeria	11%	6.4 Million
India	8%	4.74 Million
Mexico	8%	4.49 Million
Brazil	8%	4.43 Million
Ethiopia	7%	4.01 Million
Sudan	5%	3.06 Million
China	5%	3 Million
Argentina	4%	2.5 Million
Australia	4%	2.2 Million

Source: USDA, Foreign Agricultural Service, U.S. Department of Agriculture, https://fas.usda.gov/data/production/commodity/0459200

Ethanol Production

India is the third largest energy-consuming country in the world (Dhinakaran & Kesavan, 2020). India also imports crude oil to meet the requirements. India's share in global energy consumption is going to double by 2050 (Anandarajah & Gambhir, 2014). Increasing trends of energy consumption and import may lead to issues like security and health welfare. Over dependence on oil imports can be avoided by mixing domestic produced ethanol with conventional fossil fuels. India launched the Ethanol Blending Programme (EBP) in 2003 with the idea of saving the overuse of fossil fuels. The ethanol blending program was developed for the sugarcane by product like molasses. This has set an example of circular economy for producing from byproducts. The sugar industry has been able to generate revenue from its byproducts. By 2015, 5% blending with ethanol was achieved. In 2018, the National Biofuel Policy was revised, introducing feedstocks other than C molasses for ethanol production. By 2019, 10% blending was achieved, and the target to achieve 20% blending has been set for 2025. By March 2024, India achieved an 11.6% ethanol blending with petrol in the first four months of the 2023-24 period (Mukherjee, 2024). The commercial sources of Bio-Ethanol production are sugarcane syrup, broken rice, maize, and molasses.

When the government of India announced the Biofuel policy, the availability of sugarcane and rice was surplus, but due to erratic changes in the climate and the El Nino effect in 2022-23, the production of Sugarcane and rice has drastically reduced. Therefore, the availability of these sugarcane and rice for the conversion of

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