

FEASIBILITY STUDY FOR DISTILLERY EXPANSIONS AT EXISTING SUGAR MILLS IN EL SALVADOR



Study Objective

Determine the feasibility of modifying and expanding the El Angel and La Magdalena Sugar Factories to produce fuel grade ethanol for domestic consumption utilizing raw sugar currently being produced for sale to the world market.

Two Alternatives:

- Modifications to produce ethanol instead of, or in addition to, sugar at each mill.
- Establish a centralized ethanol distillery based on transporting cane syrup or molasses from one or both mills to a central point and possibly adding inputs from the other mills.

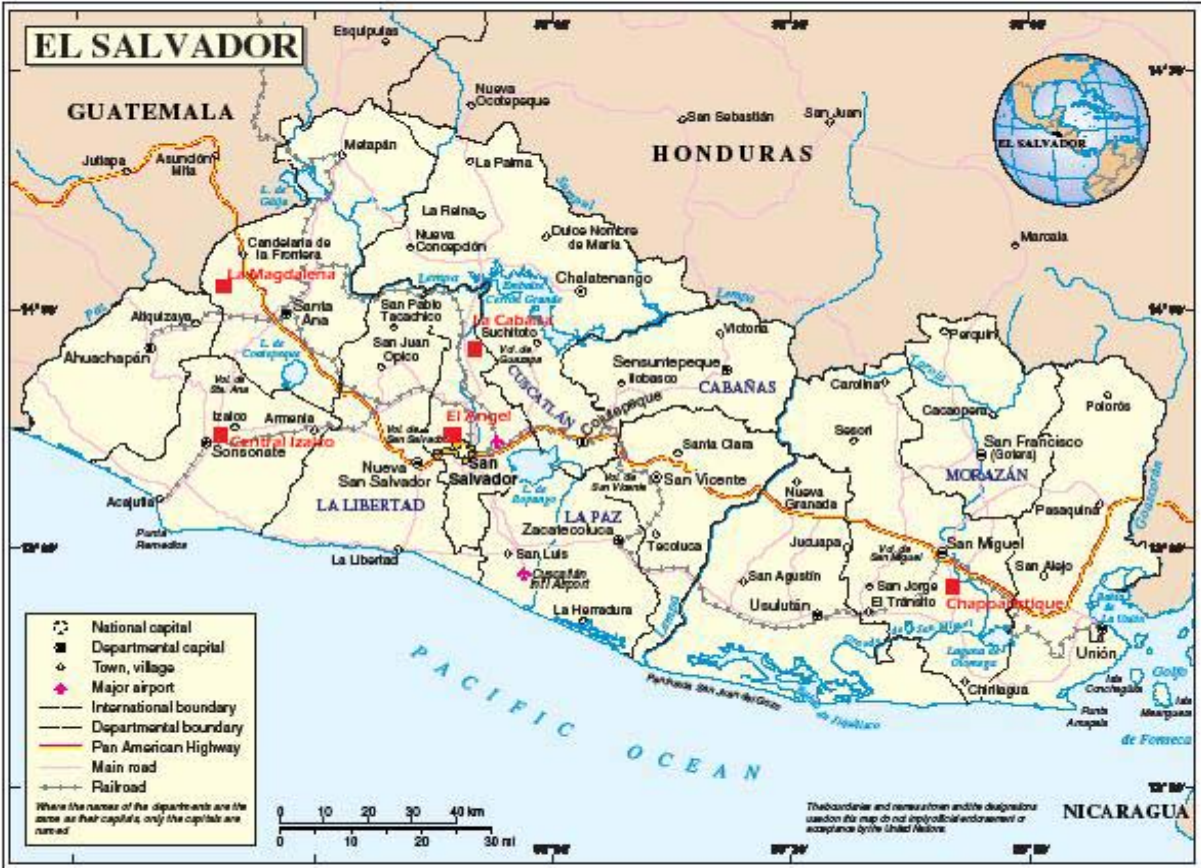
Sugar Production in El Salvador

- Sugar is sold locally, to preferential markets, and to the world market.
- Between 4.6 and 5 million MT of sugarcane are harvested every year as whole stalk cane.
- Sugarcane is burned prior to harvest and about 80% is hand cut.
- The industry has approximately 7,000 cane growers on about 90,000 hectares (222,394).
- Average yield is 100 mt/ha. (40tc/ac), which makes El Salvador one of the region's leaders in terms of cane yields.
- Cane is harvested each year 24/7 over a 4-5 month period from end November to approximately end April.
- According to sources in the industry there is land available to expand sugarcane production.

Sugar Sold on World Market – 2007-08

➤ Central Izalco	87,800 MT
➤ Ingenio El Angel	53,200 MT
➤ Ingenio La Cabaña	37,000 MT
➤ Ingenio Chaparrastique	39,100 MT
➤ Ingenio La Magdalena	<u>14,500 MT</u>
➤ Total	231,900 MT

Sugar Factory Locations



Potential for Ethanol Production

- Converting 100% of the sugarcane crop to ethanol
 - 100 million gallons
- Sugar currently sold on the world market
 - 232,000 tons raw sugar
- 232,000 tons sugar equivalent ethanol
 - 34 million gallons or almost 25% blend
- Goal of blending 10% gasoline supply to ethanol
 - 15 million gallons

Advantages of a Centralized Facility

- Most of the necessary infra-structure already in place.
- Fuel source for the boiler comes in with the cane (bagasse).
- Electricity, process water, water treatment and steam
- Trained staff, including maintenance technicians
- Environmental permits
- Roads
- Offices and an operating laboratory

Stand Alone Centralized Facility

- Alternative fuel (oil) for power production and steam and electricity is not attractive economically.
- The ability to utilize existing staff, both management and operators.
- The capital cost is higher compared to an existing operating sugar factory.
- More storage will be needed at a centralized location not attached to sugar factory.
- Transport of distillery feedstock is required.

Cases

- Case 1** – Install an ethanol facility at both the La Magdalena and El Angel with each factory processing its own cane to sugar or ethanol .
- Case 2** – Install one central ethanol facility at either La Magdalena or El Angel to process a portion of the cane and molasses from each plant in the ethanol plant.
- Case 3** – Install one central ethanol facility at either La Magdalena or El Angel to utilize cane syrup from one of the factories plus molasses from the other factory in the ethanol plant.
- Case 4** – Convert La Magdalena to 100% ethanol production with some syrup and some molasses from El Angel.
- Case 5** – Install one central ethanol plant at La Magdalena to utilize only molasses from both factories.

Issues Evaluated

- Utilize cane juice or concentrate the juice to syrup
- Batch vs. continuous fermentation
- Cogeneration and Bagasse
- Transportation Cost
- Vinasse Usage
- Availability of Land and Ability to Expand

Summary

- Sugarcane to ethanol in El Salvador has great potential.
- Feedstock is available to meet and exceed the domestic goal for 10% ethanol blend.
- A centralized distillery at an existing sugar factory is most cost effective.
- Next step is to select the case most advantageous to Angel and Magdalena and proceed with the technical and economical evaluation.



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