Recent Developments in Sugar Production – Impact on Molasses Quality and Supply Alternatives

The Alcohol School Concise

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Ethanol Technology Institute

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Facts on 2024 – Future

A. The Backbone of Rum: Sugar Cane Plant.

- For over a century, the Caribbean's rum industry has thrived on backstrap molasses, a byproduct of sugar production. Historically, molasses was both plentiful and inexpensive, largely because many sugar mills operated with less efficiency. However, the landscape is shifting. As outdated mills close down; modern, efficient sugar mills have become the new standard, significantly reducing the availability of low-cost molasses.

- Today's sugar mills are designed for maximum sugar extraction and optimized molasses production, leading to fewer gallons of molasses per ton of cane and a reduction in molasses' total sugar content. The result? A pressing challenge for rum distilleries, which traditionally rely on standalone operations, with only a handful integrated directly with sugar mills (e.g., Flor de Cana, Barcelo)."

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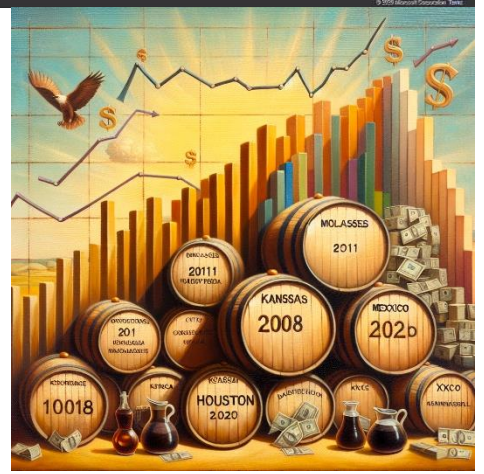
B. “Navigating Supply and Quality Challenges”

The Caribbean rum industry has long utilized blackstrap molasses, a byproduct of sugar refining, as a primary ingredient. This reliance brings with it several challenges:



- **Quality and Supply Control:** Distilleries face issues with inconsistent quality and supply of molasses, lacking control over factors such as Brix (sugar content), fermentable sugars, and ash content.
- **Price Volatility:** The cost of molasses is susceptible to fluctuations, influenced by alternative market demands.
- **Geographical Constraints:** Major suppliers of high-quality molasses are located far from the Caribbean (e.g., Far East, Africa, India, Australia, Fiji), with only a limited volume available closer to home from Central America and the Dominican Republic. This distance complicates logistics and increases reliance on large molasses traders and brokers.

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BRASIL
Ingenio Vale do Paraná

"Impact of Shifting Sugar Consumption on Molasses Demand"

While sugar consumption is on a downward trend in the Americas, the demand for molasses is experiencing a contrasting demand increase , growing annually by 3-5%. This presents both challenges and opportunities for the rum industry:

- **Exporting Countries:** The only molasses exporters in the hemisphere are Central America (Guatemala, Nicaragua, El Salvador, Belize) and the Dominican Republic.
- **Quality Concerns:** Molasses from Mexico and the USA are deemed of 'Very Low Quality,' suitable primarily for cattle feed, and not for rum production.
- **Brazil's Shift:** Despite being the largest sugar producer, Brazil has not exported molasses since 2008.
- **If:** Oil Prices trend continuous above to be US$70.00/Barrel:
  - **Result:** More "Fuel Ethanol" and SAF to be produced from Sugarcane feedstock **(Diversion: No sugar production = No Molasses supply)**
  - Example: Brasil / Colombia/ Ecuador/ Peru

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C. **"A Glimpse into the Future: Decline of the Caribbean Sugar Cane Industry**

The sugar cane industry in the Caribbean Area is “dying” or in process to be “history”: (except Dominican Republic and Belize)

Some examples:

1. **End of an Era:** Countries like Puerto Rico and Trinidad and Tobago have already seen the closure of their sugar cane industries, while others like Barbados and Guyana are nearly there or undergoing major reductions.
2. **Substantial Declines**: Jamaica and Cuba, once giants in sugar production, are experiencing drastic decreases, with Cuba’s industry shrinking by over 60% in the past six years alone.
3. **The Exception:** Among these falling giants, the Dominican Republic and Belize stands out as an exception.

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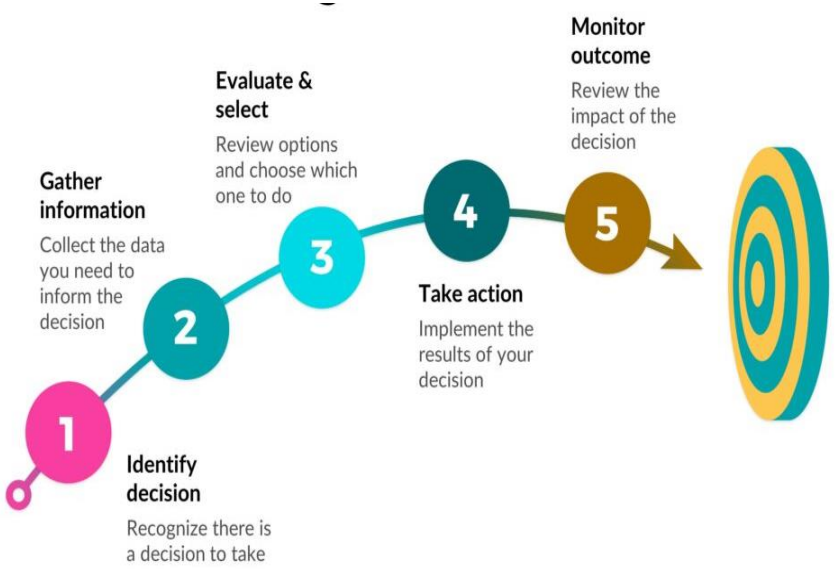
Question or Dilemma:

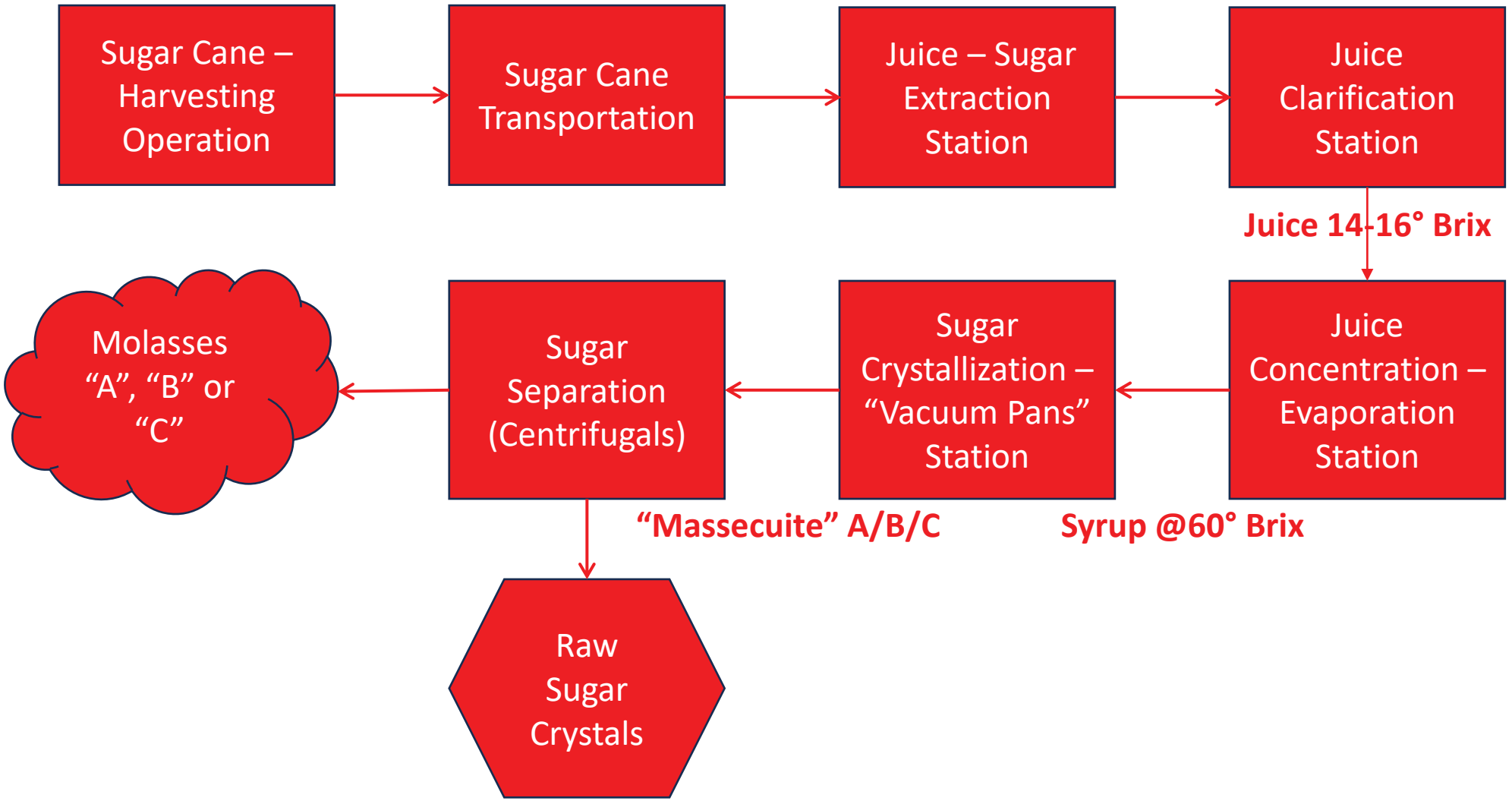
- Based on these actual and forecasted facts:

“How Rum Distillers could guarantee the supply/availability of Raw Materials?



- Option 1: Study, learn and understand the peculiarities of the Sugar Industry
- Option 2: Join and be part of the Sugar Industry. **Be Pro-Active on the Sugar Industry Sustainability Pathway!!**

Raw Sugar and Molasses Production Scheme ("Standard" Sugar Mill Production)



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Sugar Mill Operations – Solutions with Critical Effects on Molasses and Rum Distillers Feedstocks

A. Sugar Cane Harvesting Operations
   1. "Old days" System (until 1970's) – Manual cut and handling
   2. "Modern" System: Combine Harvesters // Mechanical type – automatic

- **Traditional vs. Modern Harvesting:** Previously, sugar cane was harvested manually, a labor-intensive process that, however, had less impact on the quality of molasses produced. The shift to mechanical harvesting, while increasing efficiency and productivity, has led to molasses with higher ash content.
- **Impact on Molasses Quality:** Data from various countries indicate that molasses produced through mechanical harvesting has seen an 80-100% increase in ash content compared to manual methods. This results in molasses that can be less desirable for rum production due to the higher impurities.

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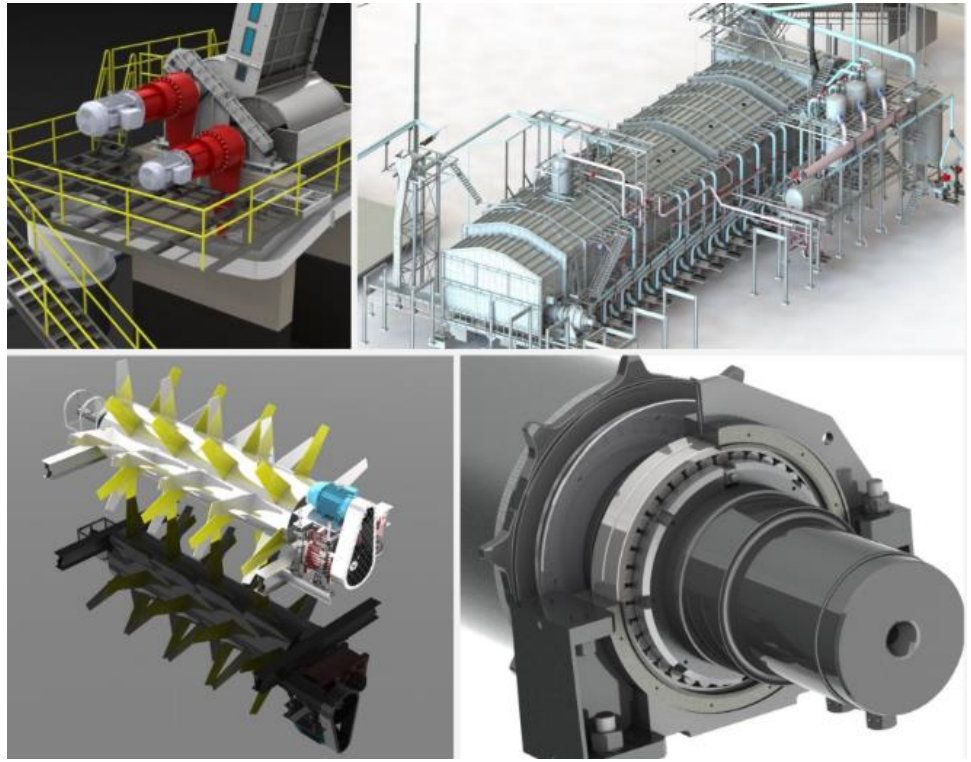
Sugar Mill Operations – Solutions with Critical Effects on Molasses and Rum Distillers Feedstocks

B. Juice – Sugar Extraction

- There are two (2) very proven technologies:
  - Alternative I: Milling Rolls
    - "New" Mill Sugar Recovery: 94-95%
    - Requires "high" Energy (H.P.)
    - "Old" Mills sugar recovery: 85%
  - Alternative II: Cane Diffusers
    - Latest Technology
    - "High" Sugar Recovery: 98%(+)
    - Requires "Low" Energy (H.P.)
    - "High" Water Evaporation
- Effect on Molasses
  1. Less production per ton of cane
  2. Produce Molasses with "high" viscosity compared with Milling Rolls due to "high" levels of "waxes" and polysaccharides
  3. "Old" Sugar Mills usually produce Molasses with 55% (+) Total Sugars. "New" Sugar Mills produce molasses with 45% or less total sugars.



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Sugar Mill Operations – Solutions with Critical Effects on Molasses and Rum Distillers Feedstocks

C. Sugar Crystallization (Vacuum Pans)

1. "Old" Mills standard was "Batch" type vacuum pans with Batch crystallizers.
2. "New" Mills design and operations with
3. "Continuous" Vacuum Pans and "Continuous" vertical crystallizer // Highly Efficient – Fully Automatic.

- Effect on Molasses:
  1. Low purity Molasses (less than 45% T.S.)
  2. Less production of Molasses per ton of cane
     - "Old" Sugar mills: 40Kgs of Molasses "C"/ton cane
     - "New" // Modernized Sugar Mills: 25Kgs Molasses "C"/ton cane

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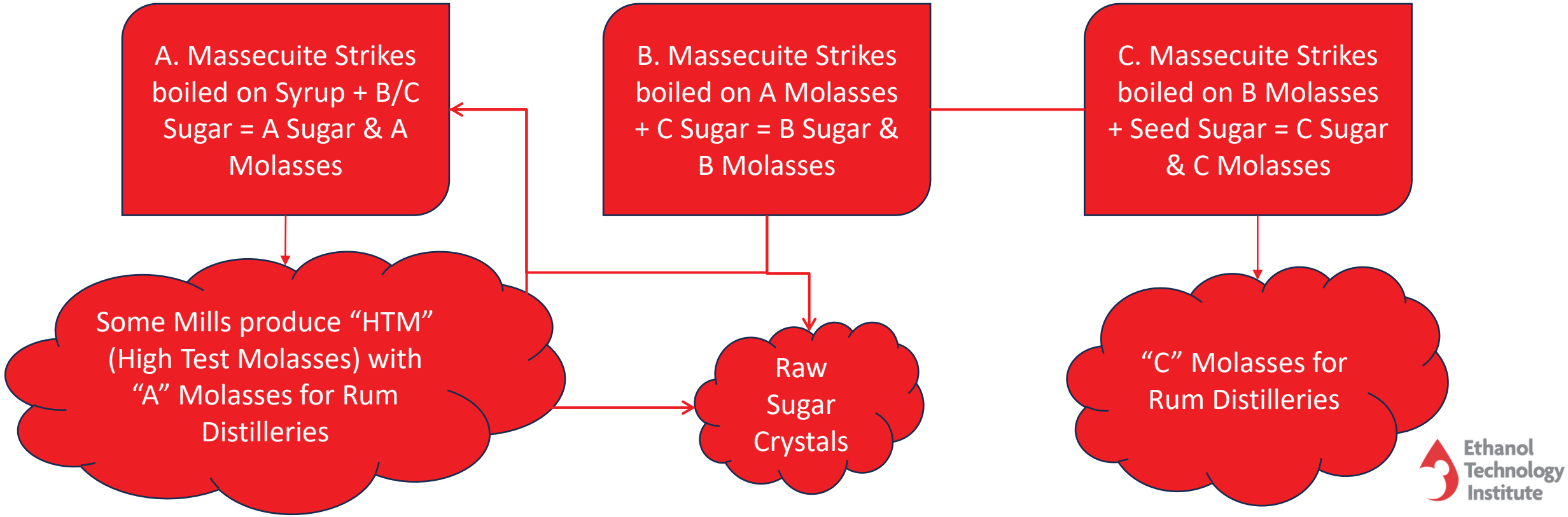
Molasses Quality

- A vast majority of the Sugar Mills (Producing Raw Sugar) utilizes a three boiling scheme where commercial raw sugars, including three grades of molasses, are produced:



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Rum Distillers Alternatives of Raw Materials (Actual – Future)

Alternative 1: ("C" Molasses) - What is the cost to produce light Alcohol from Standard Molasses (@45% F.S.) ??

Price of Standard Molasses (US/Ton)	Cost of Fermentable Sugars (F.S)	Direct Molasses Cost of Light Alcohol ($ per liter AA) / Raw materials
US $120.00	US $0.27/ Kg	US $0.504
US $140.00	US $0.31/ Kg	US $0.589
US $160.00	US $0.35/ Kg	US $0.672
US $180.00	US $0.40/ Kg	US $0.756
US $200.00	US $0.44/ Kg	US $0.840
US $220.00	US $0.48/ Kg	US $0.924
US $240.00	US $0.53/ Kg	US $1.01
US $260.00	US $0.576/ Kg	US $1.095
US $280.00	US $0.622/ Kg	US $1.18
US $320.00	US $0.71/ Kg	US $1.34

Notes: Based on a light Rum Distillery of 40,000 Liters/ day; with 85% Fermentation Efficiency and 99% Distillation Efficiency.

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Rum Distillers Alternatives of Raw Materials (Actual – Future)

Alternative 2: (HTM) - What is the cost to produce light alcohol from HTM @70% F.S.) ??

Price of US HTM (US $/ Ton)	Cost of Fermentable Sugars (F.S) (US $/ Kg)	Direct HTM Cost per Liter AA of Light Rum (Raw material)
US $250.00	US $0.34 / Kg	$0.67
US $300.00	US $0.40 / Kg	$0.80
US $350.00	US $0.47 / Kg	$0.933
US $400.00	US $0.54 / Kg	$1.067
US $450.00	US $0.61 / Kg	$1.20
US $500.00	US $0.71 / Kg	$1.330
US $550.00	US $0.785 / Kg	$1.467

Note: HTM (High Content Molasses) from "A" Molasses or "concentrated syrup"

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Rum Distillers Alternatives of Raw Materials (Actual – Future)

Alternative 3: (Raw Sugar @ 98% purity) - What is the cost to produce light Alcohol; directly from Raw Sugar Crystals @ 98% Purity

Price of Raw Sugar Versus Direction Production of Rum(Light)

Cost of Raw Sugar Crystals US $/ Kg	Direct Production Cost of "Light Rum" (US $ per liter AA) (Raw Material)
US $0.30/ Kg	US $0.574
US $0.40/ Kg	US $0.765
US $0.50/ Kg	US $0.956
US $0.60/ Kg	US $1.147
US $0.70/ Kg	US $1.338
US $0.80/ Kg	US $1.530
US $0.90/ Kg	US $1.721
US $1.00/ Kg	US $1.912

Notes: Raw Sugar F.S. content: 96%

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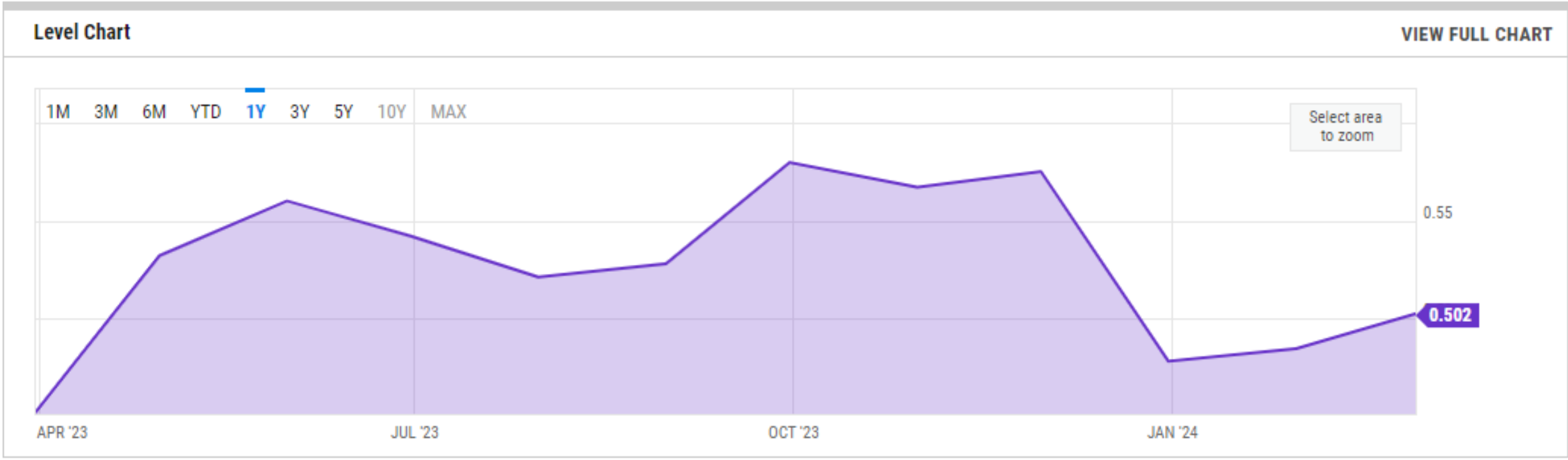
Graph of Price of World Sugar – US$/Kg (Last 12 months)



Forecasted "Average" for the next 12 months = US$0.535/Kg

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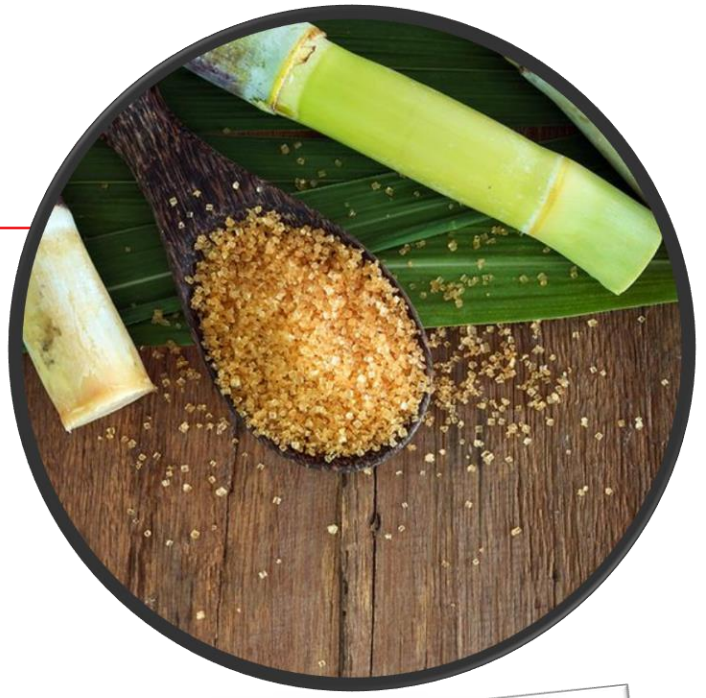
Conclusions



A. The sugar mills could provide the “stand alone” Rum Distilleries with five (5) feedstock alternatives as raw material:

1. HTM (High Test Molasses) at 60 – 80° Brix (from “concentrated syrup”)
2. Molasses “A” (converted to HTM)
3. Molasses “B”
4. Molasses “C” (Blackstrap)
5. “Raw Sugar Crystals” in Bulk Bags (1.0 ton)

B. “Joint” Objective:

- **Rum Distilleries shall be working with integrated plans with Sugar mills to continue the sugar cane farming, factories and infrastructure.**

Final Result = Mutual Sustainability of Sugar Mills and Rum Distillers - Producers

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Thank You!!

- Questions?

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