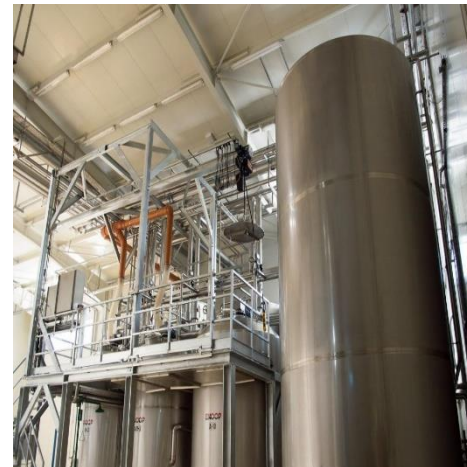


Abstract for Sugar Production



Ensymm abstract for Sugar Production



INTRODUCTION

The sugar cane is a genus of tropical grasses which requires strong sunlight and abundant water for satisfactory growth. Some varieties grow up to 5 meters in high.



The cane looks like bamboo cane and it is here where the sucrose is stored. In the ideal climate the cane will grow in 12 months and, when cut, will re-grow in additional 12 months, presupposed the roots are undisturbed. Typical sugar content

for mature cane would be around 10% by weight but the figure depends on the variety and varies from season to season and location to location. Equally, the yield of cane from the field varies considerably but a rough and ready overall value to use in estimating sugar production is 100 tons of cane per hectare or 10 tons of sugar per hectare.

Production Steps

Sugar first emerges from crushed sugar cane in the form of a deep brown juice. This sugar cane juice is extracted by first harvesting the cane at the sugar plantation, washing it, and then chopping and shredding it in preparation for milling. In Brazilian sugar mills especially, great care to avoid waste

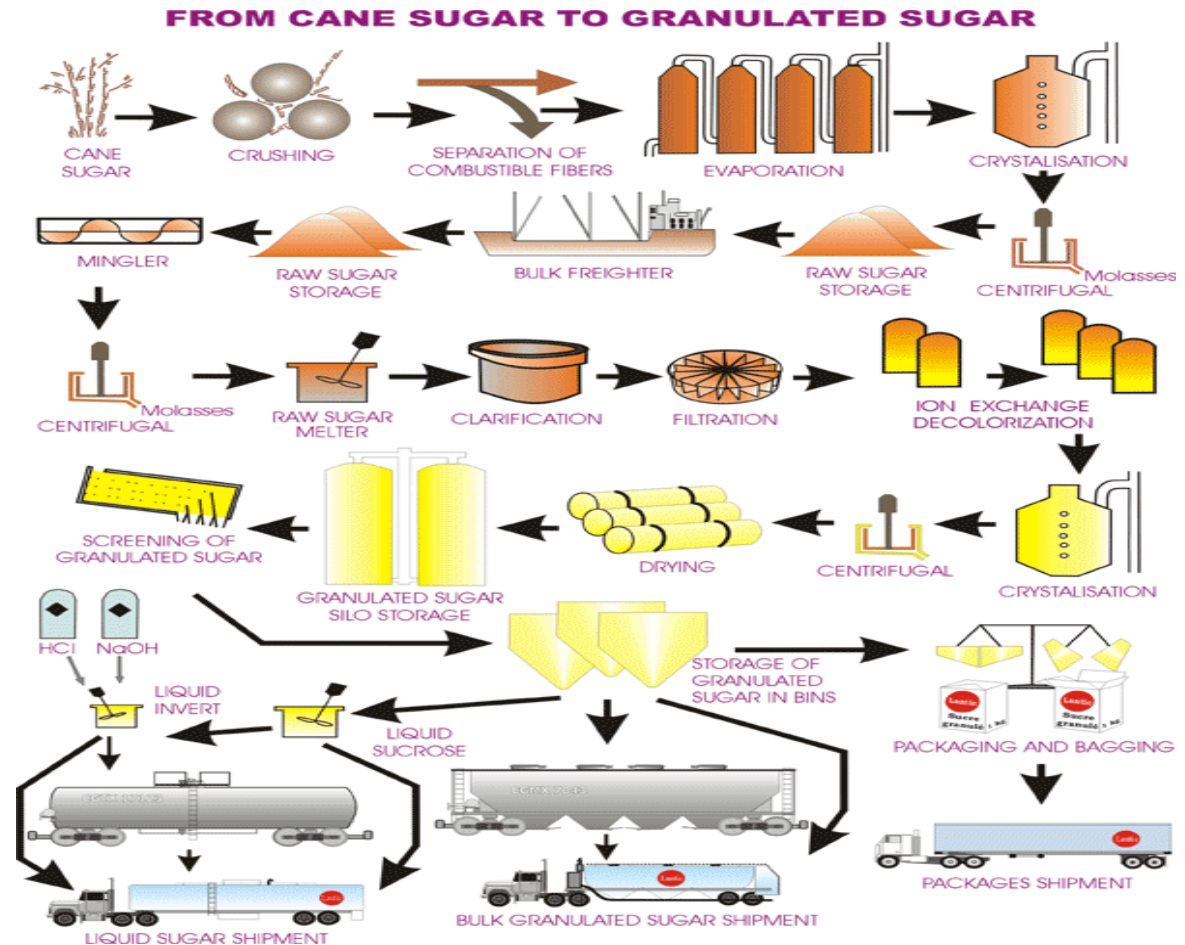
of the cane or any of the sucrose rich juice which is extracted from it. The shredded cane travels through rollers and mills where it is crushed and as the sugar juice pours out it is collected for processing. Quite often the juice has small pieces of cane floating within after the crushing process is complete and these pieces of cane are scooped up from the top of the sugar juice and put through hot rollers in order to separate the juice from the bagasse which is a term for the non-soluble part of sugar cane. The bagasse is often used to power the sugar mill, or sold for recycling elsewhere. Once the juice has been collected and strained to remove any large contaminants, it is ready

SUGAR PRODUCTION STEPS

for the next processing stage. What form this stage takes very much depends on whether the sugar is to be left raw, turned into VHP raw sugar, or directly refined into white sugar.

Sugar Beet

Sugar beet is a temperate climate biennial root crop. It produces sugar during the first year of growth in order to see it over the winter and then flowers and seeds in the second year. It is therefore sown in spring and harvested in the first autumn/early winter. As for sugar cane, there are many cultivars available to the beet farmer. The beet stores the sucrose in the bulbous root which bears a strong resemblance to a fat parsnip. Typical sugar content for mature



SUGAR PRODUCTION STEPS

beets is 17% by weight but the value depends on the value depends on the variety and it does vary from year to year and location to location. This is substantially more than the sucrose content of mature cane but the yields of beet per hectare are much lower than for cane so that the expected sugar production is only about 7 tons per hectare.

Production Steps from Beet

Sugar beet harvesting begins in September. The entire process is referred to as "the campaign". Samples are taken from each load of beets delivered to determine sugar content and other important elements. The amount of soil still on the beets is also analyzed.

The prices for the beets and feedback given to beet farmers are determined based on the results of these tests. The beets are unloaded either by dumping or using a water jet. After being thoroughly washed, they are sent directly to the processing line or to the storage facility.

The beets are sliced into thin strips, preheated in a cossette scalding and are then sent further to an extraction tower.



Water at 70°C is poured through the device to extract the sugar and produce raw juice. The used cosettes are dried by means of screw presses and hot air.

A lime kiln is used to produce the natural substances lime and carbon dioxide, which are added sequentially to the raw juice to bind and precipitate out the non-sugar impurities. A clear, thin juice with a sugar content of about 16 % will remain.

The juice is concentrated by heating to make a thick, golden brown juice with a sugar content of about 67%. The thick juice is boiled until crystals are formed, which obtain a glowing golden yellow color because they are covered with syrup. The syrup is separated from the crystals for the

PRODUCTION STEPS FROM BEET

next step in a centrifuge. Hot water is used to rinse off any residual syrup. The remaining sugar crystals are clear as glass and the light refracted from it is white as snow. This sugar is dissolved and re-crystallized to produce refined sugar - sugar that is extremely pure.

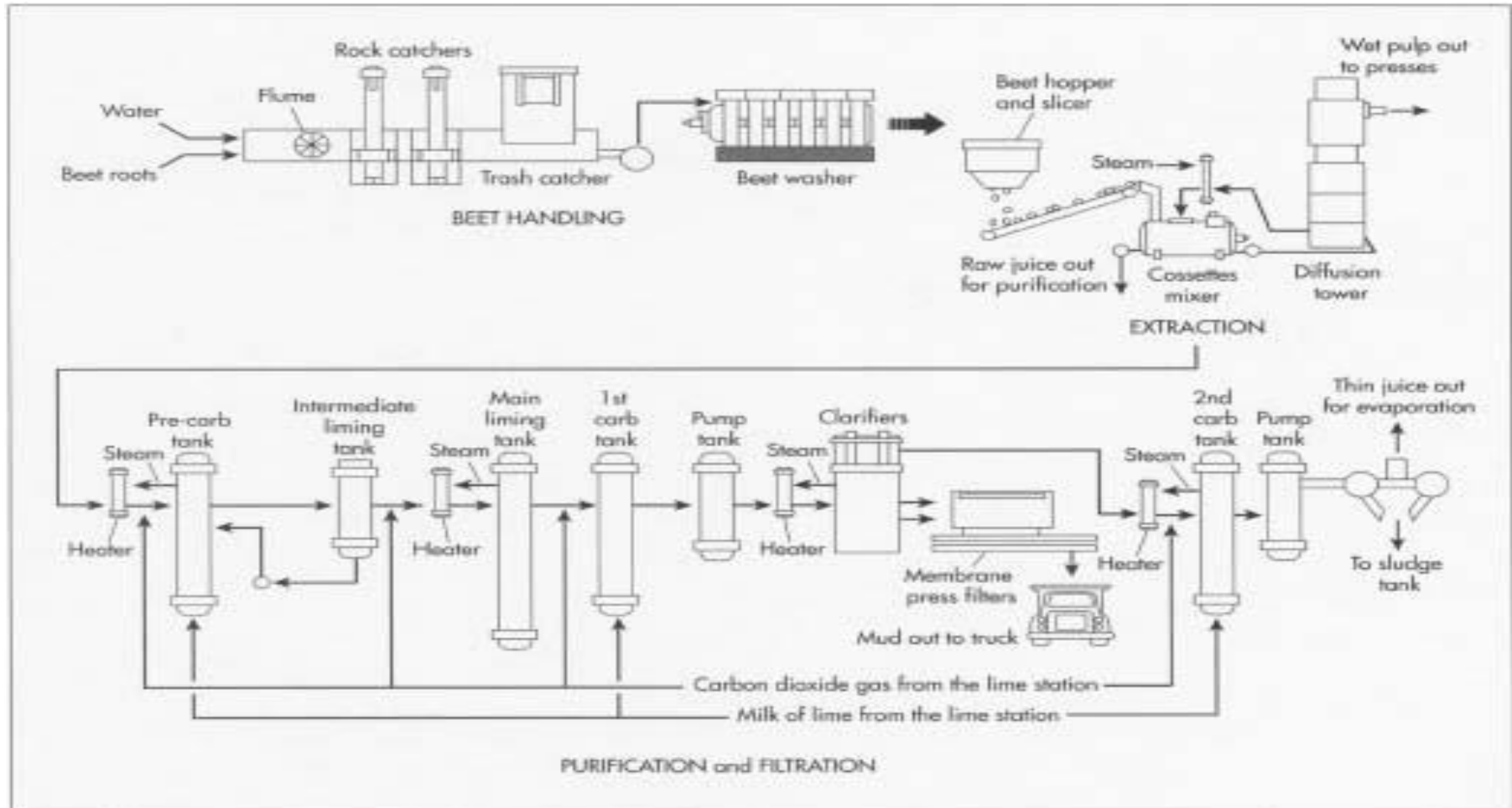
The finished sugar is dried, cooled and stored in silos and is subsequently withdrawn and further processed or packed.

Over eighty percent of the sugar is shipped to the converting industry, which uses it to make confectioneries, beverages, baked goods, etc. Just under twenty percent of the sugar is converted to various types of household sugar and packaged.

All the by-products of this process are returned to the natural cycle. The pressed slices of sugar beet are used as animal feed. The "Carbokalk" (carbolic lime) that is a by-product of processing the juice is an excellent fertilizer.



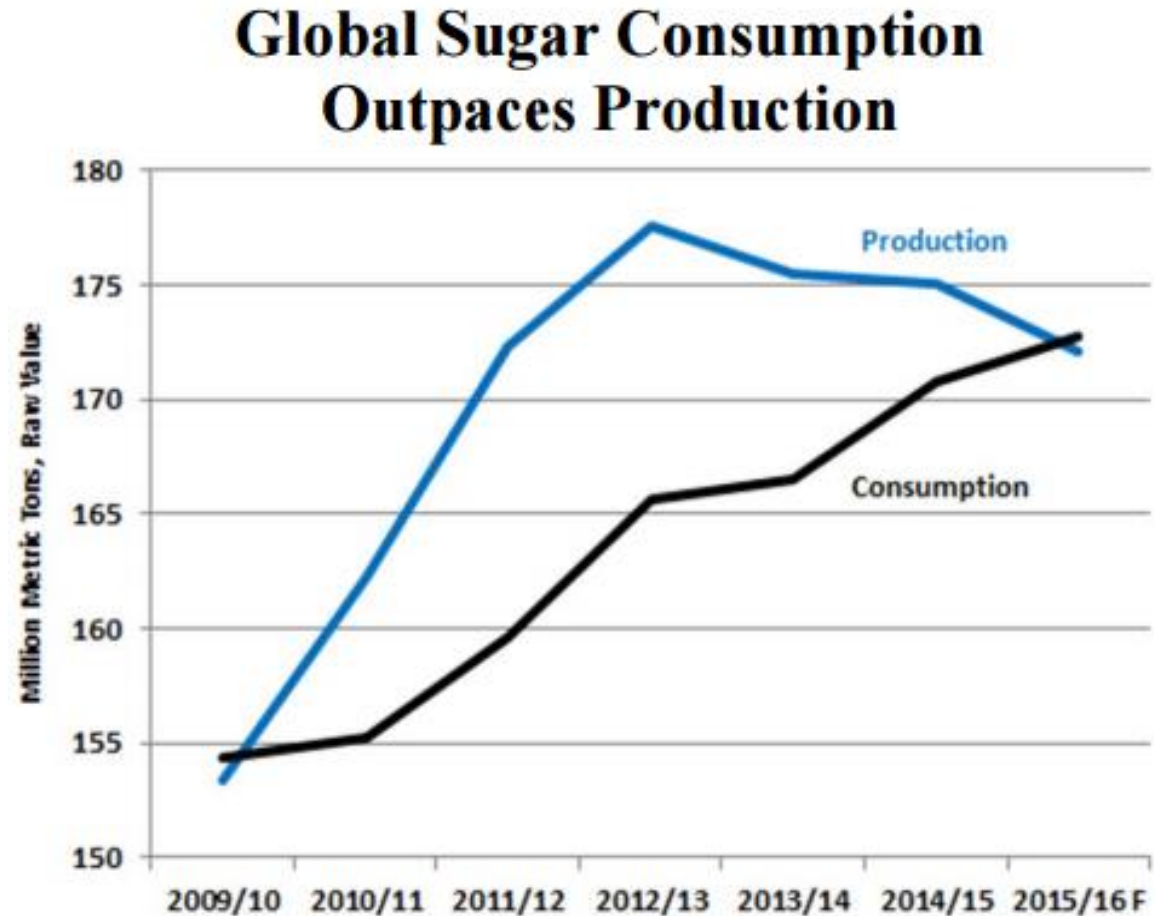
PRODUCTION STEPS FROM BEET



SUGAR MARKET AND CONSUMPTION

Sugar industry is responsible for the supply of sugar which is considered as integral part of human diet.

Sugar is produced in over one hundred countries world wide. According to the report of *United States Department of Agriculture*, global sugar production for 2015/2016 is forecasted to decrease by 3 million metric tons (raw value) at 172 million, where as consumption is projected to reach a record of 173 million metric tons. Global imports are estimated to raise to a record of 52 million tons.



TOP GLOBAL EXPORTER

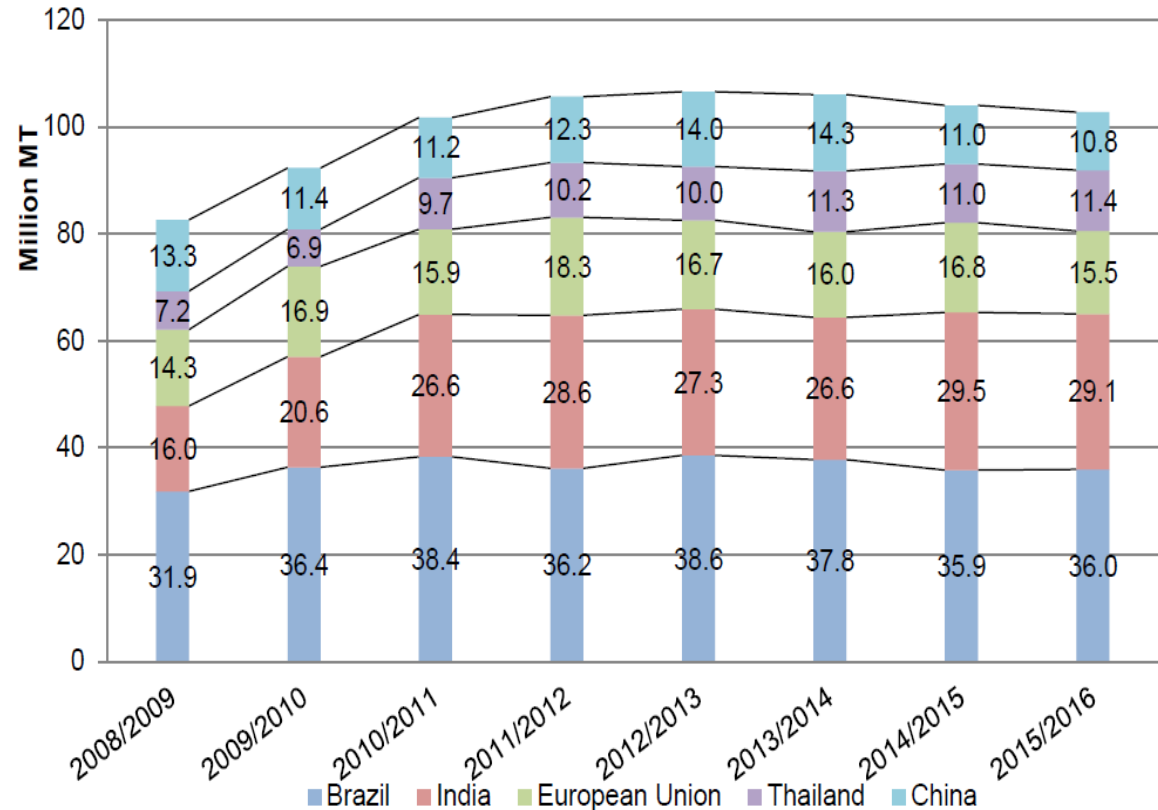
Top sugar producer are situated in Brazil, India, European Union and Thailand.

Brazil has dominated the global sugar market in terms of production and export.

Sugar cane production systems themselves are very diverse in nature. The crop is grown in many location, on many soil types and in many climates under different kinds of business model from small scale to large multi unit management.

In this context there are numbers of indicators which show sugar sector's potential for rapid growth.

Production of top global producers, 2008/09 to 2015/16



Note: Top producers have accounted for between 57 and 63 percent of global production.

Source: Foreign Agricultural Service, USDA.

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