ALPHA INVESCO RESEARCH SERVICES LTD.

INDIAN SUGAR & ETHANOL INDUSTRY

10/30/2018

In the below article we have covered about Indian Sugar Industry and possible alternate income sugar mills can generate through its by-product Ethanol.

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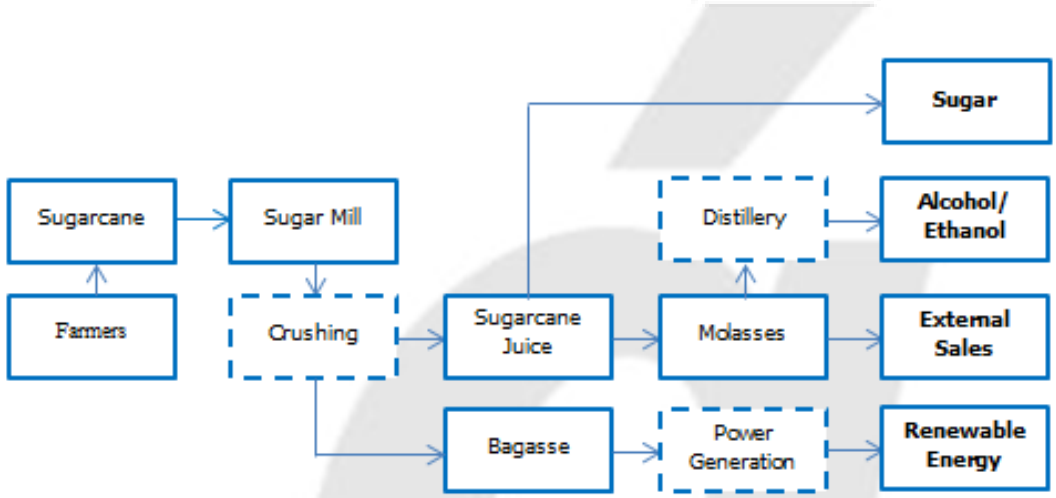
Indian Sugar Industry – A Brief Overview

Sugar Production Process

Globally, sugar is mainly extracted from either sugarcane or sugar beet. Around 80% of global sugar is extracted from sugarcane, and remaining 20% from sugar beet. In India, sugar is extracted from sugarcane.

Sugar extraction process has by-products which also can be sold / processed for additional source of revenue. The process is as following:



Sugarcane from farmer is crushed to get sugarcane juice and Bagasse as the by-product, which can further be used in power generation, partly used for captive consumption and remaining is sold. The sugarcane juice is further processed to get sugar and Molasses, which can either be sold directly or further processed in the distillery to give Alcohol. This Alcohol can either be Industrial Alcohol which is sold to Chemical companies for industrial consumption or potable Alcohol (liquor); or Ethanol which can be used for blending in the fuel. On an average, 95 kg of sugar and 10.8 litres of ethanol can be produced from 1 tonne of sugarcane.

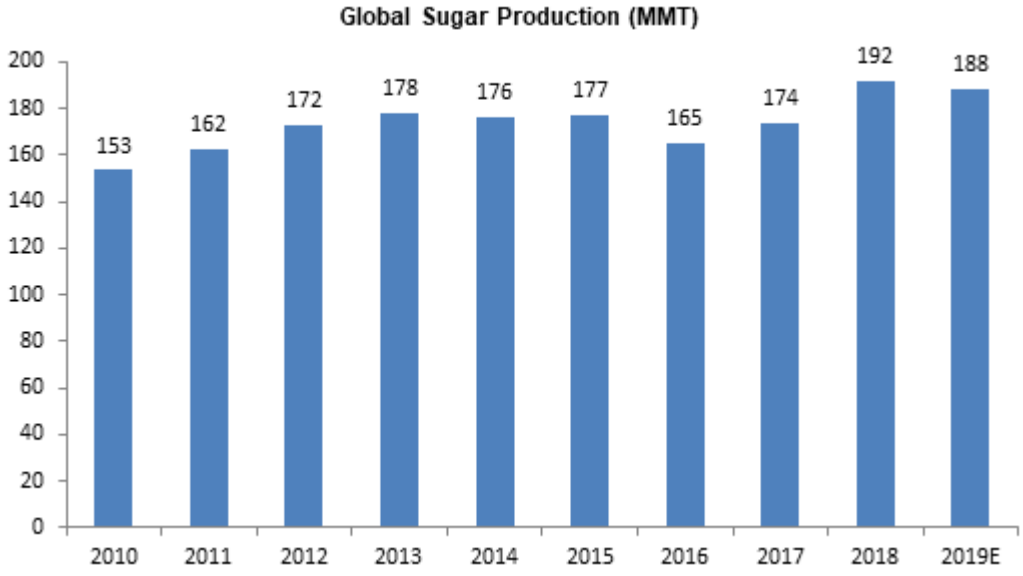
Sugar Industry

Global Sugar Industry

Top ten sugar producing countries are as following:

Production in MMT	2012-13	2013-14	2014-15	2015-16	2016-17
Brazil	38.6	37.8	36.0	34.7	39.1
India	27.4	26.6	30.5	27.4	21.9
European Union	16.7	16.0	18.5	14.3	16.5
Thailand	10.0	11.3	10.8	9.7	10.0
China	14.0	14.3	11.0	9.1	9.5
US	8.1	7.7	7.9	8.2	8.0
Mexico	7.4	6.4	6.3	6.5	6.6
Pakistan	5.0	5.6	5.2	5.3	6.0
Russia	5.0	4.4	4.4	5.2	6.1
Australia	4.3	4.4	4.7	4.9	5.1

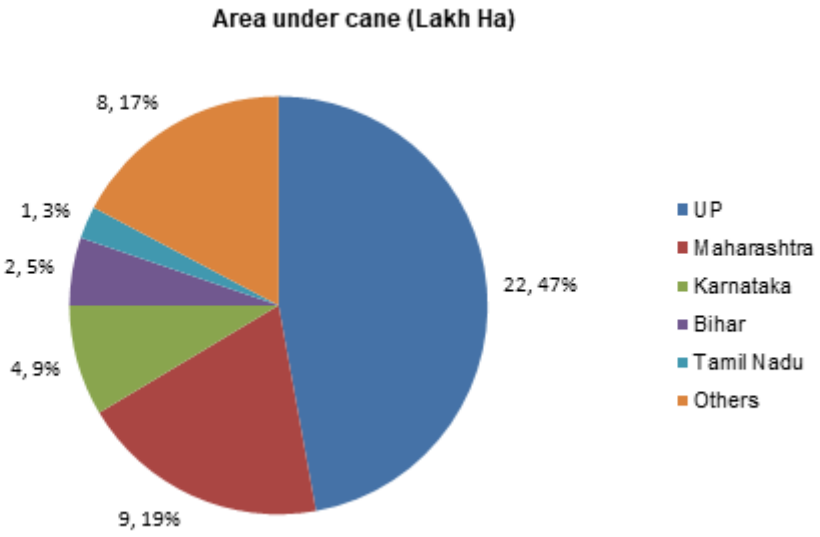
2016-17 and 2017-18 numbers are estimates
Source: USDA



Brazil, India, EU and Thailand together account for over 50% global sugar production. India is 2nd largest sugar producer in the world and the largest sugar consumer country. Brazil is the largest sugar producer with 50-60% of sugarcane used for production of Ethanol as a substitute for the fuel.

Indian Sugar Industry

Indian sugar industry is worth more than Rs. 80,000 cr (from sugar and its by-products). The Indian sugar industry supports ~5 crore sugarcane farmers across India and hence has high political importance as well. Major statistics about Indian sugar industry can be found at the ISMA website (http://www.indiansugar.com/Statics.aspx). As of 31st July 2017, there are 732 sugar mills in India with total sugar production capacity of ~34 mn tons of sugar. Roughly 50% of the mills are private. Indian sugar demand is around 25 mn tons. Indian per capita consumption of sugar was 18.8 kg v/s world average of 23 kg as of 2016. Total acreage of India is ~47 lakh ha. Acreage of sugarcane crop in different states is as follows:



Sugarcane Yield **:** It is the amount of sugarcane grown per unit area of farmland. Sugarcane yield of Maharashtra (~75-80 tons/ha) is higher than that of UP (~67-73 tons/ha). Indian cane yield is ~70-72 tons/ha.

Sugar Recovery Rate **:** It is percentage of sugar produced in tons per ton of sugarcane crushed. Average recovery rate in Maharashtra is ~11.5% v/s. that of ~10.5% in UP.

UP has ~115 sugar mills, with most of them being private mills. Whereas, Maharashtra has more of co-operative mills. Also, average UP sugarcane crop age is 9.6 months v/s 12.85 months in Maharashtra. So UP farmers can grow some other crops for remaining time, like Wheat & Paddy. Additionally, UP cane requires 1/3rd of irrigation water compared to Maharashtra cane.

	Frequency of irrigation	Average sugarcane yield (tonnes/hectare)	Irrigation water required to produce 1 kg of cane (litres)
Maharashtra	32	82.1	292
Uttar Pradesh	8	60.5	99
Karnataka	32	90.3	266
Tamil Nadu	25	103.6	181
Punjab	13	72	135
Andhra Pradesh	28	80.1	262

Source: Indian Institute of Sugarcane Research, Lucknow,
National average of sugar recovery from sugarcane is 10.5%; Maharashtra has a sugar recovery rate of 11-12% and Uttar Pradesh, 10%

UP Sugar Industry

UP sugar industry accounts for more than 25% of Indian sugar production and is mainly comprised of private mills. Out of ~10 mn tons of sugar produced in UP, only 1/3rd is consumed by the state and remaining is sold out of UP, mainly to Kolkata and North Eastern market. The cost of production of sugar is higher in UP than other states in India.

The average per month return (Rs / ha) is highest for sugarcane crop compared to other crops like wheat and paddy in combination (considering sugarcane is a completely irrigated crop, hence it is compared with paddy and wheat cultivated as fully irrigated crops). However, sugarcane bears a longer risk cycle as compared to wheat and paddy due to its duration of ~9-10 months in UP as compared to 3-4 months for the latter. During 2010, the per month return of sugarcane in UP was Rs. 4,511 per hectare which is more than the combined per month return of wheat and paddy. The net rate of return (%) is 80% in sugarcane crop, whereas it is only 29% for wheat and 23% for paddy. Additionally, the Co 0238 cane variety recently introduced in UP is more profitable for the farmers than the traditional crop, leading to even higher inclination of farmers towards the crop. Last year ~35% of UP cane land was growing Co 0238 cane variety and by the end of this year ~50% of cane land is expected to grow Co 0238 cane variety. This would lead to more sugar production from same acreage of cultivation.

Sugarcane Crop And Sugar Demand & Supply

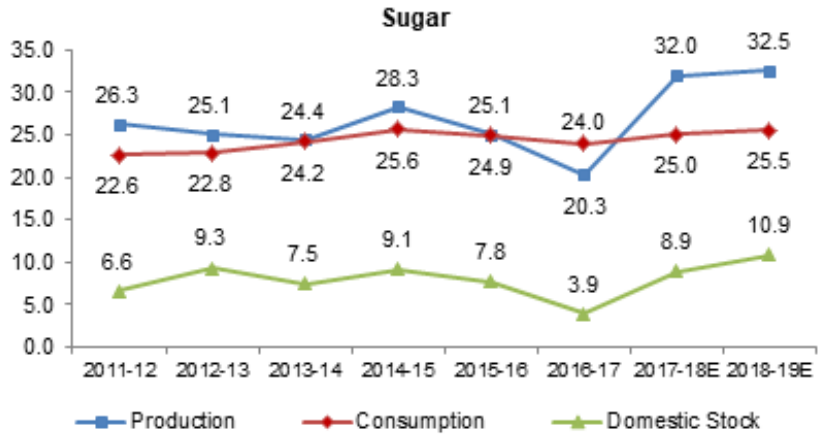
Sugarcane crop is a 'ratoon' crop. The new crop is grown from the stubble of the crop already harvested. So, the life of the crop planted is of multiple years, and generally new crop is not planted in the same farm area for few years.

There are 3 variants of sugarcane crop in India:

1. Spring crop sown in March
2. Adsali crop sown in July
3. Autumn crop sown in September

Maturity time for adsali & spring crop is 18 months, whereas for autumn crop is 12 months. In India, the sugar season (SS) is form Oct-Sept. So SS17 means Oct'16 to Sept'17, with harvesting beginning in Oct'16. Total sugarcane crop production in India is ~300 mn tons.

Sugar Production And Consumption



State-Wise Sugar Production

For SS17-18, UP & Maharashtra produced ~10+ mn tons of sugar each, out of the total ~30 mn tons of domestic sugar production, accounting for 2/3rd of Indian sugar production. State-wise sugar production historically has been as following:

Sugar prodcution: **(mn tons)**

State	2013-14	2014-15	2015-16	2016-17	2017-18E
UP	6.6	7.1	6.8	8.8	12.0
Maharashtra	7.7	10.5	8.5	4.2	10.7
Karnataka	4.2	5.0	4.1	2.1	3.6
Tamil Nadu	1.4	1.3	1.4	1.0	NA
Gujarat	1.2	1.1	1.1	0.9	NA
Andhra Pradesh	1.0	0.9	0.8	0.5	NA
Others**	2.3	2.5	2.4	2.8	NA
Total	**24.4**	**28.4**	**25.1**	**20.3**	**32.0**

**Includes Telangana*

***Mainly Haryana, Punjab, Bihar, Uttarakhand and Madhya Pradesh*

Key Variables And Sugar Cycles

Factors Affecting Sugar Realisations In India

Indian sugar industry is highly regulated. Quantity of sugar to be sold and exported by mills is decided by the government, but at the same time government also bails out the industry with subsidies during the bad times.

Sugar is a cyclical industry. If one needs to predict the sugar realisation, one should focus more on supply of sugar than its demand, as the demand is more or less stable around 25 mn tons and is growing slowly and steadily. ~70% of the sugar demand is B2B (FMCG sector) and only ~30%

demand is from B2C side. It is the supply of sugar which is more volatile and affects the sugar prices. The same can be seen in the chart above showing the production and consumption of sugar. Eg: In 2016-17, when the sugar production (supply) was 20.3 mn tons compared to consumption (demand) of 25 mn tons, it lead to increase in sugar prices. The supply of sugar depends majorly on the following factors:

Factor	Result	Impact on prices
Lowered acreage	Drop in cane cultivation areas in major sugar producing states due to droughts cause farmers to shift to other crops	Increase
Payment arrears	Pending payments result in farmers diverting to other crops resulting in reduced cane availability for the next crushing season.	Increase
Monsoon dependence	Any significant changes in production estimates resulting from poor monsoons can decrease inventory levels.	Increase
Increased consumption	Any increase in consumption levels leads to an overt dependence on sugar stocks.	Increase
Governmental policies	Governmental interventions to curb inflation usually stabilise sugar prices.	Decrease

(Source: ICRA, NBHC)

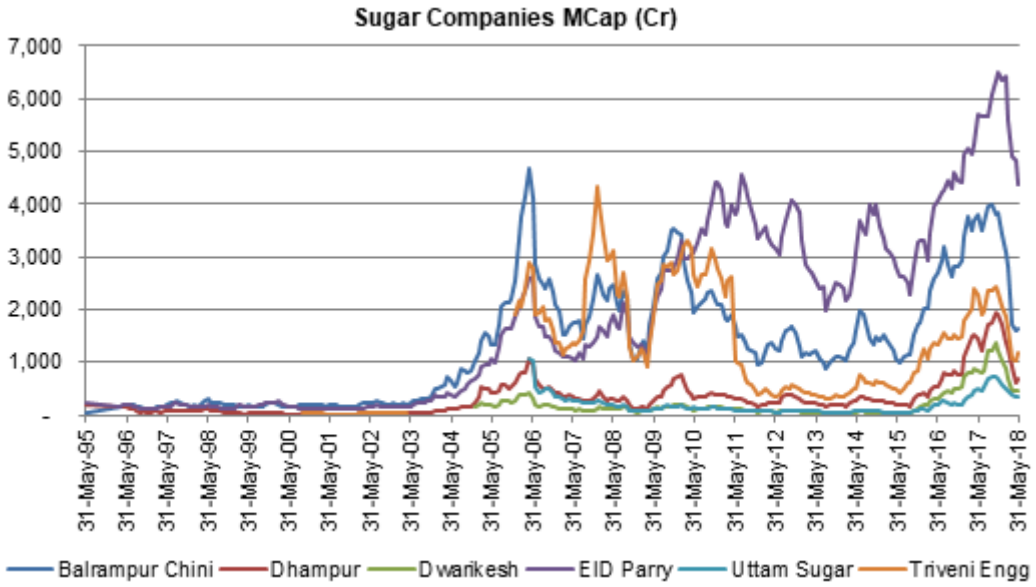
2016-2017 Sugar Cycle

SS16-17 was a cycle when all the sugar stocks (specially UP based) gave multibagger returns. It was a sweet situation for UP sugar mills as the Maharashtra sugarcane production halved to ~4.5 mn tons, which lead to national level sugar supply shortage and increase in sugar price, and at the same time UP had bumper productions, allowing all UP based sugar mills to improve its results tremendously. Entire increase in realisation trickles down to PBT, as there is no parallel increase in prices, leading to margins expanding exponentially. The same can be seen through some sugar companies' reported financials:

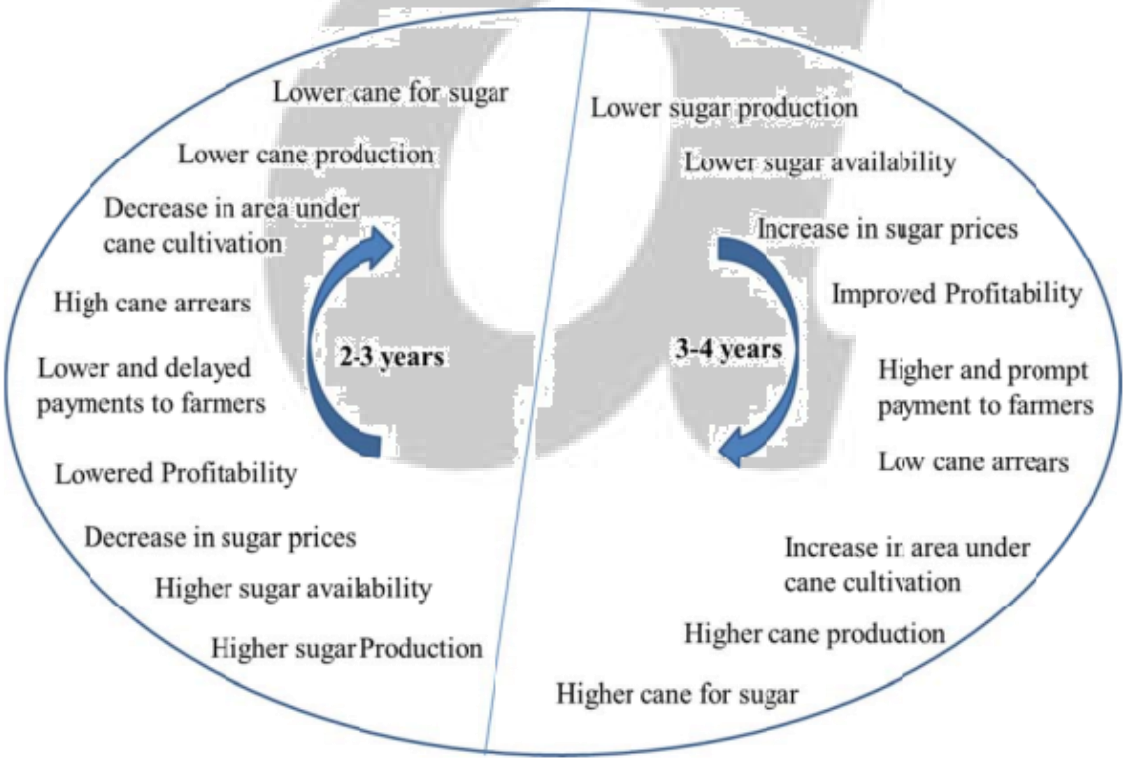
Company	Revenue (Cr)		PAT (Cr)	
	FY16	FY17	FY16	FY17
Balrampur	2,806	3,485	100	591
Dwarikesh	803	1,200	39	158
Dhampur	2,258	2,608	26	238
EID Parry	15,513	14,550	177	708
Uttam Sugar	814	1,085	15	109
Triveni Engg	1,941	2,868	-30	230

Based on the sugar cycles, the market price of the sugar companies also fluctuate, and these price movements are very quick. One can both make and lose money very quickly by investing in sugar companies' stock. Let us have a look at market cap of some sugar companies in past 2 decades. We can see how market cap have already fallen by more than 50% even before the results of 1st loss making quarters had been declared by the companies. This is how much volatile are the prices of

sugar companies' stock. We can see similar speed and volatility even while increase in stock prices during industry uptrend.



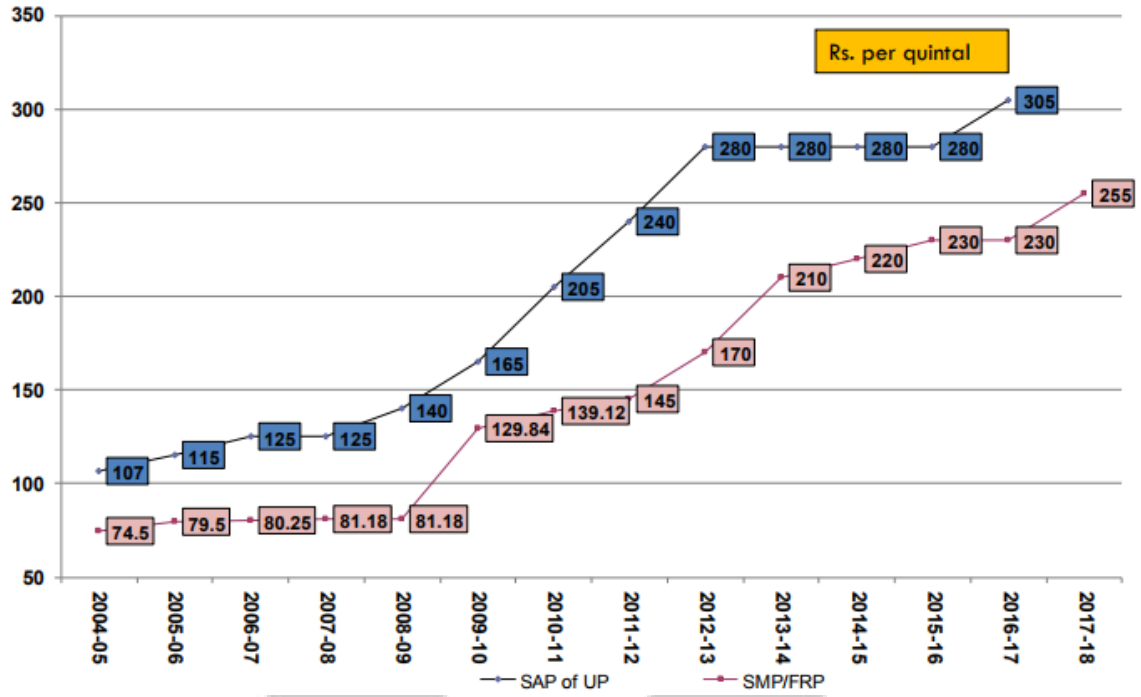
Sugar cycle in a nutshell is explained by the following diagram:



Sugarcane Prices

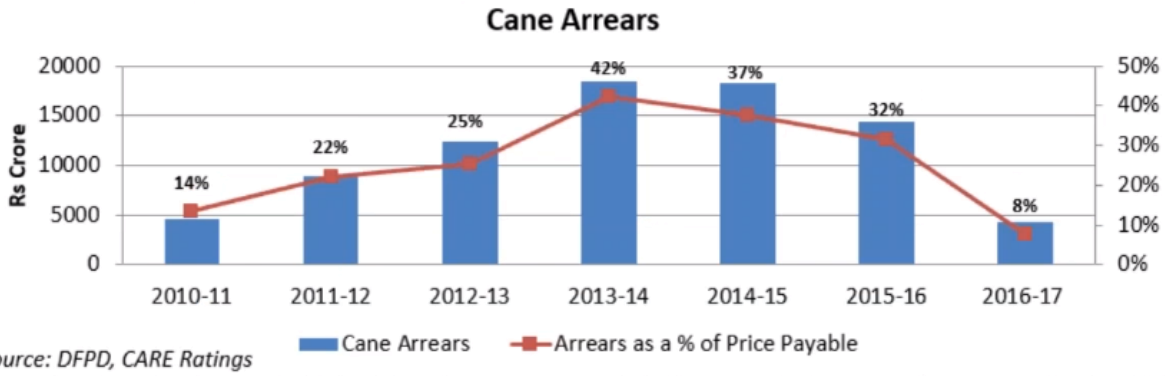
From Oct 2009, the concept of Statutory Minimum Price (SMP) of sugarcane was replaced with the 'Fair and Remunerative Price' (FRP) of sugarcane for 2009-10 and subsequent sugar seasons. FRP is the minimum price that a sugarcane farmer should receive for his cane. Though, some states like UP have State Advised Price (SAP) which is generally higher than the FRP.

FRP v/s. SAP in UP has been as following:



Cane Arrears

Cane Arrears is the amount pending to be paid to the sugarcane farmer by the sugar mills. As per rule, mills need to pay farmers within 14 days of receipt of sugarcane. If failed, interest rate of 15% per annum is charged to the mills. Higher cane arrears discourages farmers to grow sugarcane in the next season.



Source: DFPD, CARE Ratings

By May'18 end, cane arrears had reached over Rs. 20,000-22,000 cr due to dramatic fall in prices on the back of over production of sugar in this season. This 20,000 cr arrears is staggering ~25% of the total 80,000 annual amount to be paid to the farmers for their cane.

By-Products Of Sugar Industry

Cogeneration

1 tonne of sugar can produce ~300 kg of Bagasse which can be converted to ~130 KWh of power. The power generated by an integrated sugar mill is partially captively consumed and remaining is exported. India's sugar industry has potential to export 7500 MW power, and total installed cogeneration capacity in all sugar mills is ~4200 MW, of which ~3200 MW is being exported by sugar mills to the grid.

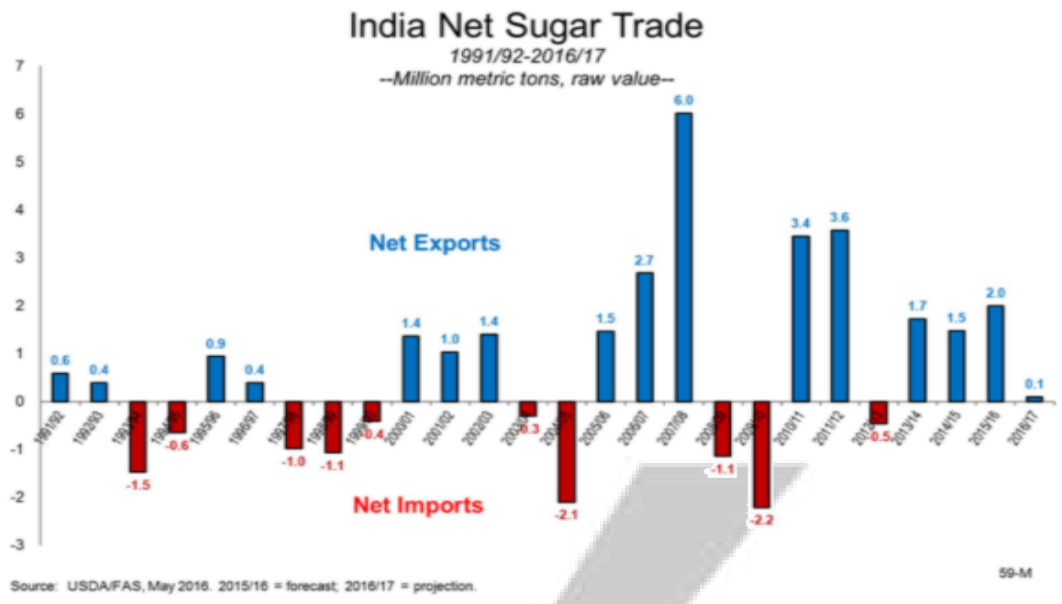
State-wise installed capacity is as follows

State	No. of mills	Capacity (in MWh)		State	No. of mills	Capacity (in MWh)
Uttar Pradesh	60	1050		Maharashtra	66	1000
Karnataka	54	1000		Tamil Nadu	30	563
Andhra /Telengana	21	259		Gujarat	-	-
Bihar	7	89		Punjab	8	154
Others	10	108		**TOTAL**	**255**	**4223**

Ethanol

Ethanol is a very key by-product for integrated sugar mills. We will elaborate on Ethanol in detail in our next blog.

Import/Export Of Sugar



A solution to over production of sugar is to export sugar. Our 2 neighbouring countries, Bangladesh and Sri Lanka collectively import ~3.5 mn tonnes of sugar annually. Also, India has bilateral and SAARC free-trade agreements with both the countries. So if India is able to export some amount of additional production, it can help in stabilising the sugar supply and hence the sugar prices. Currently, the government has allowed 2 mn tons of sugar export till September 2018 to clear up surplus sugar stocks. If there is normal monsoon this year (CY2018), leading to production of another 32-33 mn tons of sugar in SS2018-19, India will have to export 5-6 mn tons of sugar next year.

Rangrajan Committee

The Rangrajan Committee had made salient recommendation to the government in 2012 to stabilise the sugar industry. The recommendations are as following:

Rangarajan's recommends:		
Government Control	Recommendation	Remarks
Sugar crop area	Do away with reserved area. Give farmer option to trade with any mill.	Empowering the farmer to do better business.
Mill distance	Do away with minimum distance between mills.	To enable competition.
Pricing of Sugar	1. Give the farmers FRP price at the 1st stage and do away with SAP.2. Share 70% of the sold value of sugar+molasses+bagasse+press mud at the 2nd stage.	Double stage strategy to have better cash flow to mills.Putting proper system for remuneration.
Packaging	Do away with the jute packaging	Can save about 1000 crores.
Levy of Sugar	Do away with the 10% sale to the central government. Instead, pass on the subsidy to state government, which can buy the sugar from the market and give it subsidized.	Can ease central subsidy tension. The levy savings is about 2000 crores.
Market	Ease the market control of government on export and import.	The move is to help India(17% of world production) to enable its exports(only 4% of world export), but leaving it all to the market is risky.

Most of these recommendations have been approved by state governments of Maharashtra and Karnataka. However, the recommendations are yet to be levied by the UP government.

Recent Regulatory Updates

Recently, due to oversupply of sugar, the prices of sugar have fallen leading to sugar mills selling sugar at losses and hence the mills are finding it difficult to clear their cane arrears. Cost of production of sugar is ~32-34 rs per kg (28-23 rs of sugarcane purchase cost and ~3-4 rs of conversion cost), so sugar mills need to sell sugar at 34-35+ rs per kg ex-mill prices to make profits. Currently the ex-mill sugar price is 26-27 rs leading to huge losses for sugar companies. The quantum of loss is such that it undermines the EBITDA level profits from Cogeneration and Distillery division, leading to even consolidated EBITDA level losses for the sugar companies. The cane arrears have reached Rs. 20,000 + cr. To stabilize the situation, the government is considering following options:

- Cess on sugar (Rs. 1-1.5 per kg) to create a fund which will be used to clear the cane arrears.
- Production-linked subsidy on cane.
- Reduction of GST on ethanol from current 18% to 5%.
- Creating a buffer sugar stock of ~3 mn tons by the government.
- Fixing minimum ex-mill prices.

Going Forward

There seems to be a possible structural level change in the sugar industry via stable revenue from ethanol. There is another blog elaborating on this possibility, which I would encourage you to read next.

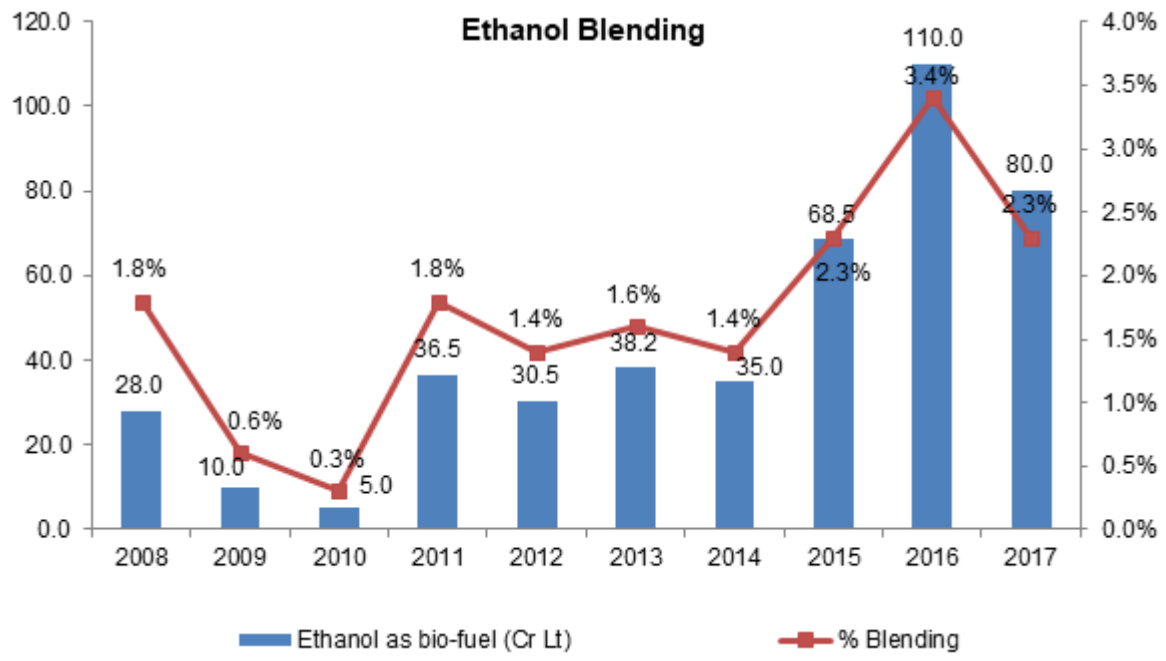
Ethanol Industry – The Saviour For Sugar Mills?

Overview

Ethanol is a very key by-product for integrated sugar mills. On an average, 10.8 lt of Ethanol can be produced from 1 tonne of sugar. B-Heavy molasses have better yield of Ethanol (explained in detail later on in the article) than the molasses currently used for Ethanol production.

Ethanol is blended in the fuel to reduce the dependence of the country on crude imports generally, and also ethanol is a cleaner fuel. 'E20' is a term to express 20% blending in the fuel.

India has ~330 distilleries which can produce over 4 bn litres of rectified spirit (alcohol) per year. Of these, ~162 distilleries have the capacity to distil over 200 cr litres of conventional bio-ethanol. India produces conventional bio-ethanol mostly from sugar molasses and partly from grains. Production of advanced bio-ethanol is still in the R&D stage.



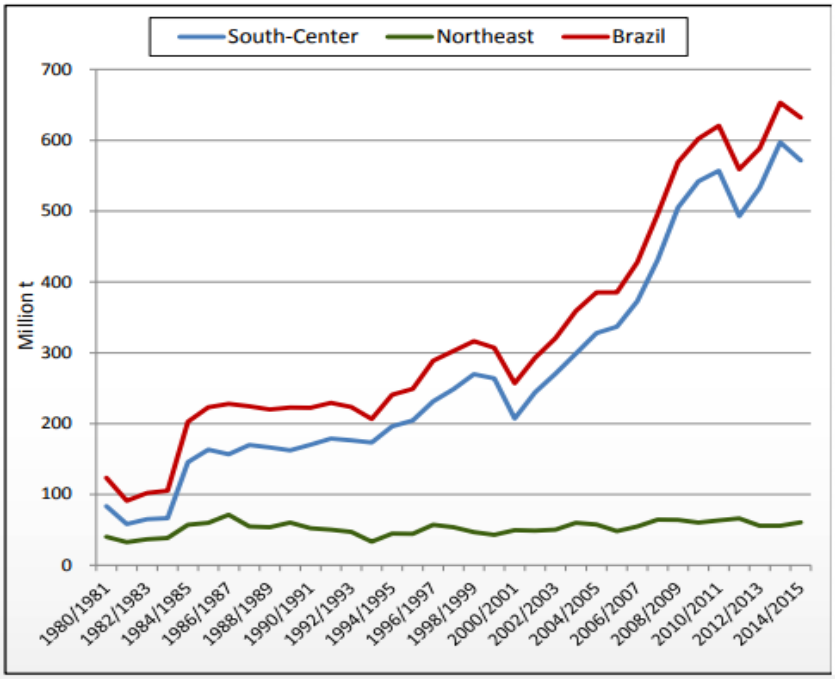
To understand the potential of ethanol, let us have a brief look on the Brazil sugar industry initially, which is considered to have the world's first sustainable biofuels economy.

Brazil Sugar Industry

Brazil has a sugar production of ~40 mn tonnes and consumption of ~10-11 mn tonnes. Most of the sugarcane grown is used to manufacture ethanol for domestic gasoline blending and sugar for exports.

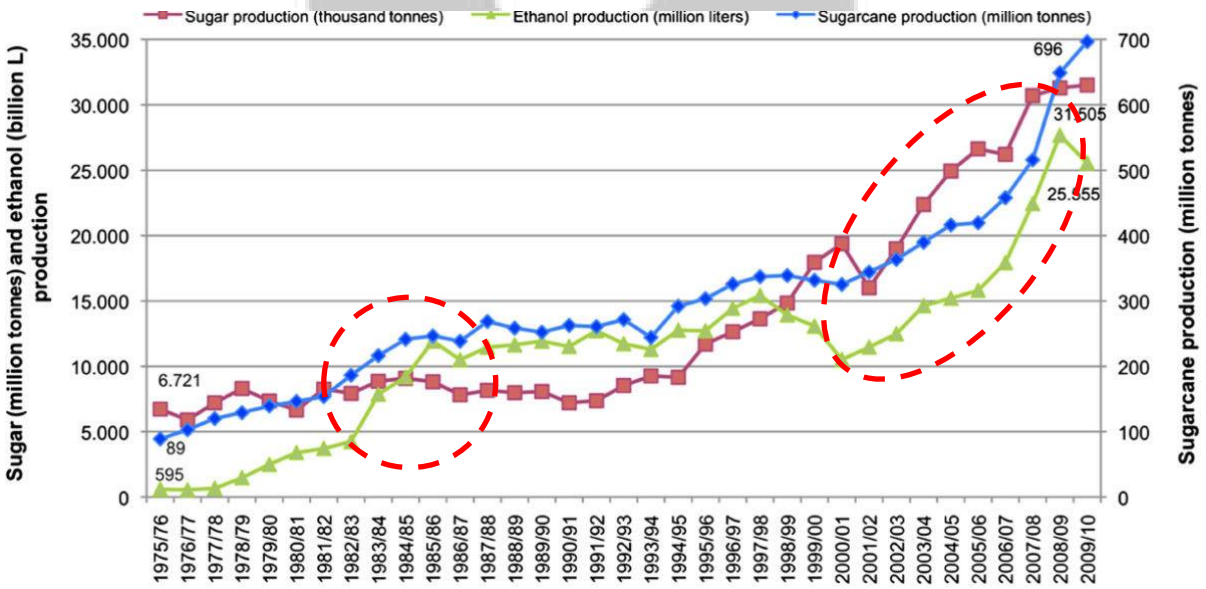
Past 4 Decades Of Brazil Sugar Industry

The Centre-South region (CS) constitutes for 90%+ of the total sugarcane production in Brazil. The sugarcane production in Brazil has become 6x in last 35 years.



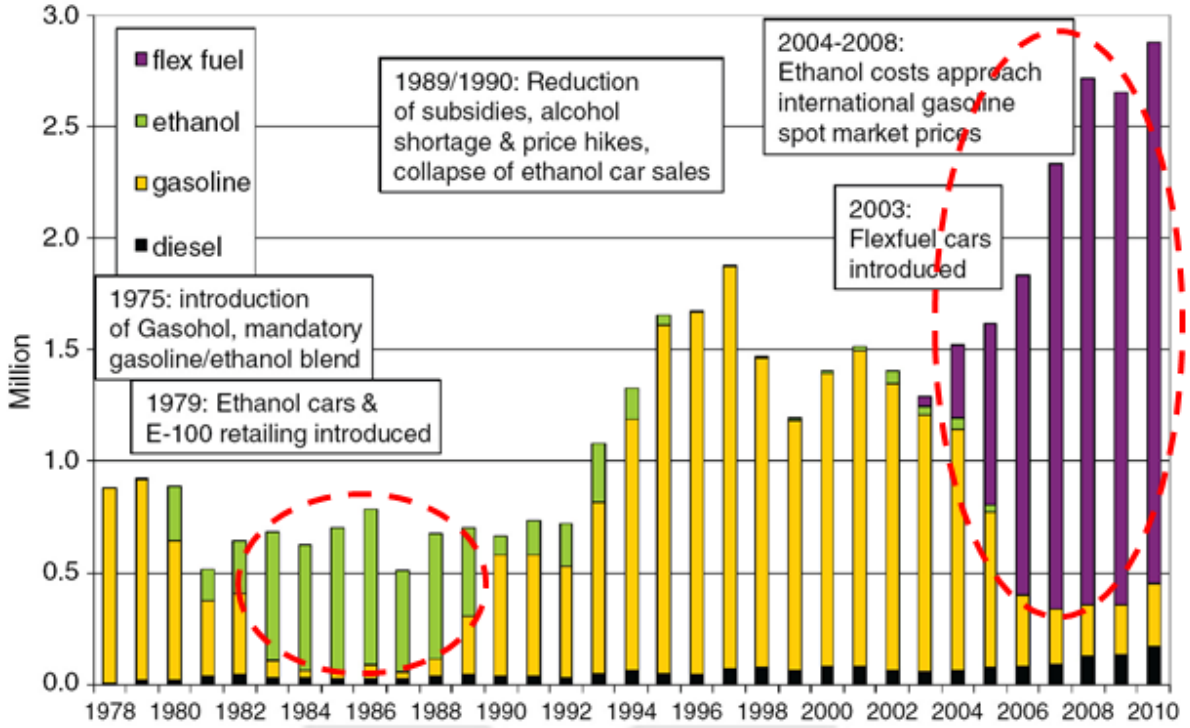
Sugarcane production in selected regions in Brazil (1980 – 2015).
source: UNICA (2015) own calculations.

Ethanol production was virtually zero in Brazil during 1975. Ethanol production saw a sustainable jump from ~7 mn tonnes to ~13 mn tonnes during the 1980-1985 period. However, ethanol production was stagnant in Brazil from 1985 to 2000, after which the ethanol production jumped again rapidly.

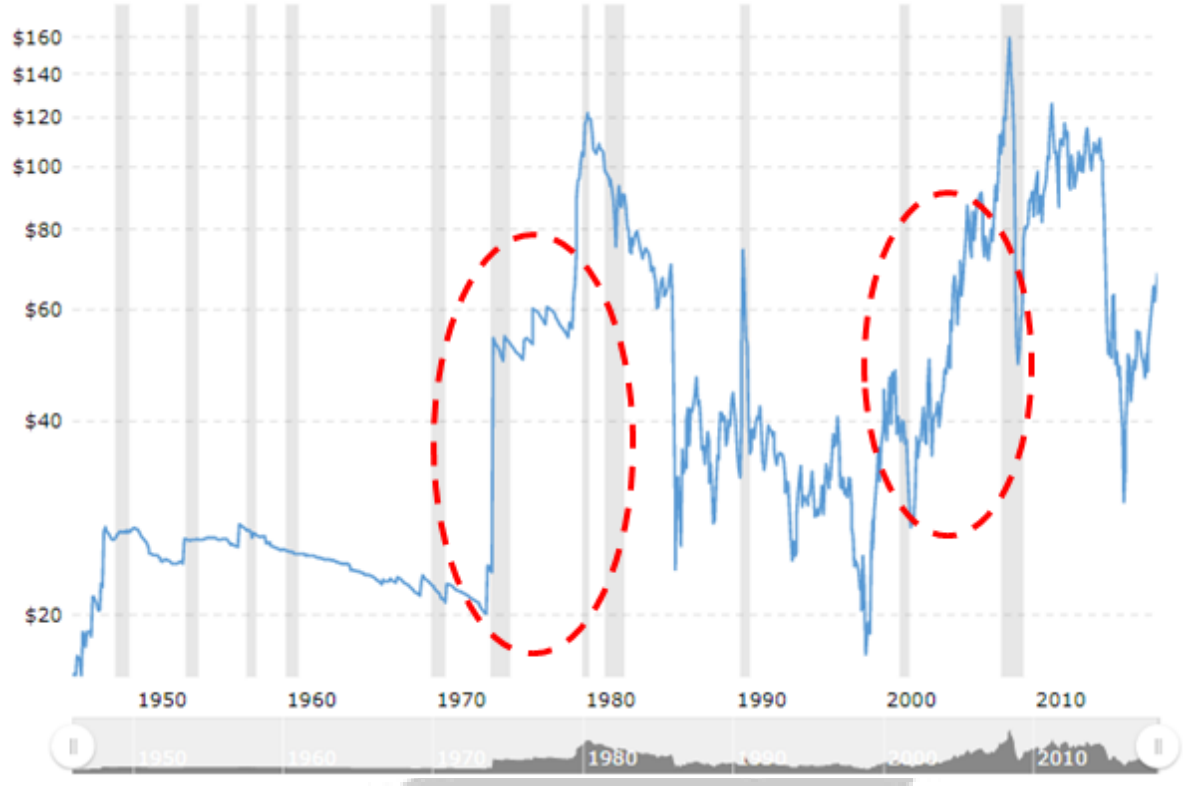


We can see a similar trend in vehicular fleet in Brazil. Due to rise in oil prices around 1975, the Brazilian government introduced ethanol based vehicles from 1980s, which were pretty much in

demand, but started getting replaced by gasoline vehicles around 1990 (probably because of stabilizing of oil prices). However, there was again huge jump in usage of flex-fuel vehicles post 2004-2005 after another rise in oil prices, and the flex-fuel fleet count has kept on rising in Brazil since then. Brazil has increased the E20-E25 flex fuel fleet by over 5 times from 4.6 mn in 2007 to 26.2 mn in 2016, and parallely reduced gasoline vehicles from 15.1 mn to 9.7 mn in the same time period.



The corresponding movement in oil prices can be seen below:



To encourage growth of ethanol based fuel, the Brazilian government took following steps:

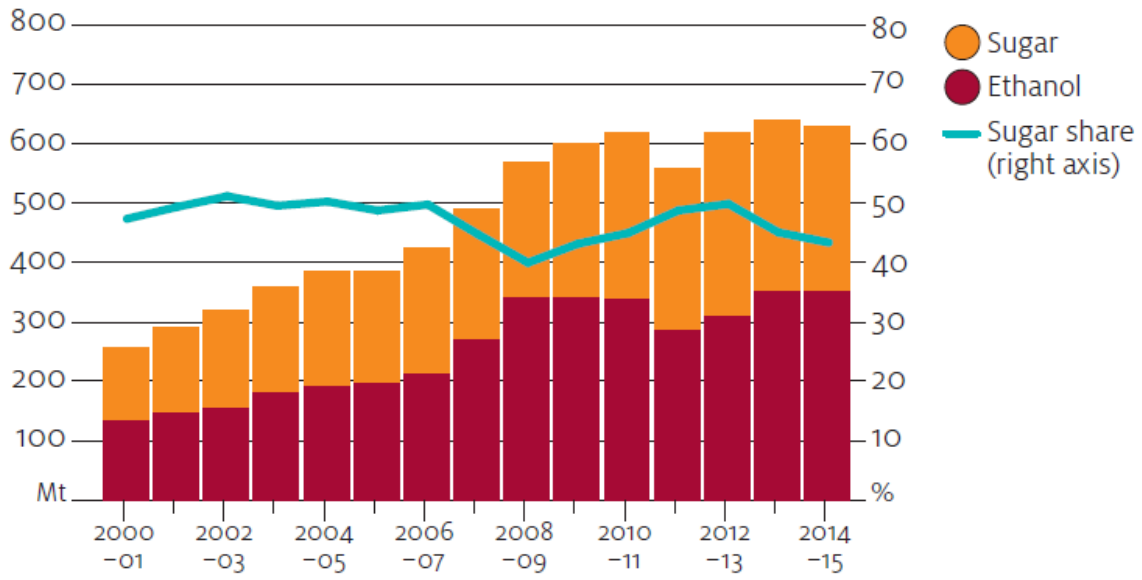
- Guaranteed purchases of ethanol by the state-owned oil company Petrobras
- Low-interest loans to agro-industrial ethanol firms
- Lower excise taxes on ethanol than on petrol
- Fixing of hydrous ethanol prices at 59% of the government-set gasoline price at the pump

Other factors which benefited the growth were:

- Favourable climate
- Land availability
- Abundant low-cost labour

Less than 50% sugarcane is used for sugar production since 2000, with remaining sugarcane used for ethanol production. The share of sugar from sugarcane over past 15 years can be seen in the following chart:

Sugarcane production and allocation, Brazil, 2000–01 to 2014–15



Note: Data are presented by Brazilian crop year (April to March). This reflects crop year in south-central region, where most of the crop is grown.
Sources: ABARES; Brazilian Sugarcane Industry Association (UNICA 2016)

Let us have a look at recent financials of a major Brazilian sugar company named Sao Martinho. ~90% of sugar produced by the company is being exported and only ~10% sold domestically. At the same time, ~90% of the ethanol produced by the company is for domestic consumption.

FINANCIAL PERFORMANCE

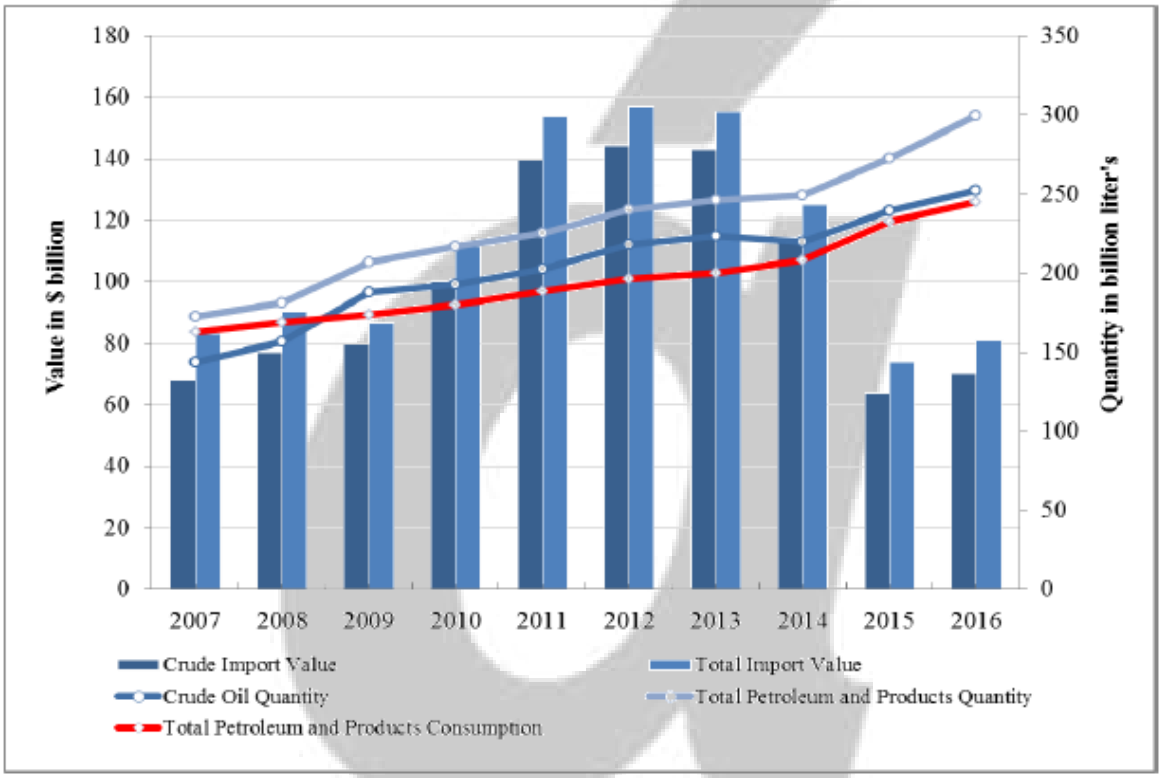
NET REVENUE BREAKDOWN R$ '000	4Q17	4Q16	Chg. (%)	12M17	12M16	Chg. (%)
Domestic Market	**407,339**	**438,791**	**-7.2%**	**1,521,316**	**1,443,122**	**5.4%**
Sugar	60,535	29,786	103.2%	161,813	102,226	58.3%
Hydrous Ethanol	82,181	161,231	-49.0%	400,621	415,915	-3.7%
Anhydrous Ethanol	224,531	237,587	-5.5%	720,424	665,196	8.3%
Energy	29,122	2,923	n.m.	152,089	185,573	-18.0%
Real Estate Development	320	333	-3.9%	21,289	23,210	-8.3%
Other	10,650	6,931	53.7%	65,079	51,002	27.6%
Export Market	**486,931**	**379,355**	**28.4%**	**1,601,032**	**1,388,002**	**15.3%**
Sugar	462,085	362,404	27.5%	1,482,817	1,156,501	28.2%
Hydrous Ethanol	7,709	16,951	-54.5%	74,824	85,972	-13.0%
Anhydrous Ethanol	16,753	-	n.m.	43,008	134,579	-68.0%
Other	384	-	n.m.	384	10,950	-96.5%
Net Revenue*	**894,270**	**818,146**	**9.3%**	**3,122,348**	**2,831,124**	**10.3%**
Sugar	522,620	392,190	33.3%	1,644,630	1,258,727	30.7%
Hydrous Ethanol	89,890	178,182	-49.6%	475,445	501,887	-5.3%
Anhydrous Ethanol	241,284	237,587	1.6%	763,431	799,775	-4.5%
Energy	29,122	2,923	n.m.	152,089	185,573	-18.0%
Hydrous Ethanol	320	333	-3.9%	21,289	23,210	-8.3%
Other	11,034	6,931	59.2%	65,463	61,952	5.7%

*Excludes the effects from Hedge Accounting of foreign-denominated debt and PPA.

Indian Scenario

India imports 70% of its annual crude petroleum requirement (~110 mn tons). At 10% blending of Ethanol, 313 cr litres of Ethanol is required. Additionally, 1 mn tons of sugar can be replaced by 60 cr litres of ethanol. However, currently there is no policy to convert sugarcane directly to Ethanol.

There have been many attempts to stabilise the sugar industry by having a stable ethanol revenue, with efforts being taken since over a decade. Additionally, our current import bill of crude oil is around Rs. 7 lakh crore, and the government plans to save atleast 1 lakh crore of this amount by shifting to higher ethanol blending in the fuel. However, the government has not been successful in achieving higher ethanol blending in the past since over a decade. Recently, the government has made statements on targeting 10% ethanol blending (also called as E10).



Source: Petroleum Planning and Analysis Cell, government of India (GOI),
Time scale in Indian fiscal year

Total Ethanol production capacity in India is 223.87 cr lt per annum.

State-wise Ethanol Production Capacities:

State	# of Mills	Capacity (Cr Lt)
UP	28	65.76
Maharashtra	50	60.60
Karnataka	17	31.20
Andra/Telangana	14	14.85
Tamil Nadu	8	9.60
Gujarat	8	7.86
Bihar	5	7.42
Haryana/Uttarakhan	2	1.65
Punjab	1	1.20
Total	**133**	**200.14**

Note: There are 24 standalone distilleries with capacity of 23.73 cr lt p.a.

Ethanol capacity breakup based on private and cooperative companies is as following:

(in Cr Lt)

Pvt Mills	Co-op Mills	Standalone	Total
142	58	24	224

140 cr lt of blending has been finalized by OMCs for 2017-18, which is highest ever done. At 140 cr lt of ethanol, the blending would be ~4.5%, which is still way lesser than the targeted 10% blending which would require 313 cr lt of Ethanol. In 2016-17, OMCs achieved a blend of only 2.3% against the mandated 5%. However, the 140 cr lt (4.5% blending) being the highest ever blending proposal, there are hopes that going forward higher ethanol blending targets might be successfully achievable.

Ethanol Generation From Different Sources

1st generation (1G) biofuels are made from sugar and vegetable oils; whereas 2nd generation (2G) biofuels can be manufactured from lignocellulosic biomass or woody crops, agricultural residues or waste like rice & wheat straw, cotton stalk, etc.

As the sugar mill's capacity isn't enough to supply the required 313 cr lt of ethanol for E10, government is looking for 2nd generation ethanol production. Steps have been taken in that direction, and OMCs (IOCL, BPCL, etc.) have already started placing orders for 2nd generation ethanol plants. These 2nd generation plants will take atleast 18 months to come online. Parallely, some sugar companies are also increasing their ethanol capacities to benefit from E10 blending.

Classification	Organic Molecule To Be Converted To Ethanol	Raw Material
1st Generation	Sugary (Glucose, Fructose, Sucrose)	C and BH molasses
		SJ and MCJ
		Sweet sorghum (stalks) juice
	Starch	Grains (Corn, Sorghum, Rice, Wheat, Millet)
		Cassava
2nd Generation	Cellulose and Hemicellulose	Lignocelluosic biomass (Bagasse, Sugar cane trash, Corn cobs, Rice straw etc.)
	Complex Mixed Organics	Pet coke and Municipal solid waste

B Heavy Molasses

Ethanol also can be extracted via B Heavy molasses route to get higher yield of ethanol per ton of sugarcane. Conventionally, sugar is extracted in 3 stages, with very little sugar left to be extracted after the 3rd stage. Left over after the 3rd stage is the molasses, which has very lesser sugar content left, and this molasses is processed in a distillery for ethanol generation traditionally.

As per the B Heavy Molasses route, the sugar extraction process is stopped after the 2nd stage extraction and the molasses post 2nd stage which are still rich in sugar content are used for extraction of ethanol. B Heavy molasses has Ethanol yield of over 300 lt per MT of molasses, whereas the yield of current molasses produced post 3rd stage is 230-250 lt per MT of molasses. Additionally, this process leads to overall ~2% reduction in recovery of sugar. This can serve 2 purposes: 1) Blending of the fuel by more ethanol; and 2) Conversion of extra sugarcane to ethanol rather than sugar which helps to solve the issue of oversupply of sugar during the years of overproduction of sugarcane.

The B heavy route is not possible from current distilleries. However, minor capex on existing distilleries would make them capable of extracting ethanol via B Heavy route.

National Policy On Biofuels – 2018

The Union Cabinet, chaired by the Prime Minister Shri Narendra Modi has approved National Policy on Biofuels – 2018 in May'18. The key points of the policy as are following:

- *Funding*: Policy would fund Rs. 5000 cr to 2G ethanol bio refineries over 6 years in addition to tax incentives, higher purchase price compared to 1G fuels. (Note – These steps are similar to those taken by Brazilian government to support the growth of ethanol as a bio-fuel market)

- *Forex Savings*: 1 cr lt of E10 would save Rs.28 cr of forex. So with current supply of ~150 cr lt of ethanol for 2017-18, it will help to save ~Rs. 4000 cr of forex.
- *OMC Capex*: 100 KLPD bio refinery would cost ~Rs. 800 cr investment. Currently, OMCs are in process of setting up 12 2G bio refineries with an total investment of Rs. 10,000 cr. This should lead to capacity addition of ~1200 KLPD.

Brazil is a benchmark for ethanol production stabilizing the volatility of the sugar industry. Can Indian sugar industry see ethanol evolving as a major stable end-product like it occurred in Brazil? If it happens, it will lead to a structural level change in Indian sugar industry, making it comparatively non-cyclical to some extent.

Going Forward

The Indian government has made many announcements recently to boost the ethanol blending and save the import bill on crude imports. This would also include introducing new vehicles supporting higher blending and also vehicles running 100% on ethanol.

If there is stable ethanol demand with stable prices, it will stabilize the sugar industry to great extent. Also, if there will be stable on-time export of sugar during times of overproduction, it can help stabilize the sugar prices.

With recent rise in crude prices, it makes even more sense to increase the blending of fuel with bio-fuels and to save on higher crude prices. In the current scenario of over production of sugar in India and on global level, it is a win-win situation to produce as much of ethanol as possible for India and Brazil, and simultaneously lower the production of sugar. As we can see in the above graphs, it is exactly what Brazil has done when crude prices have sky rocketed over past few decades.