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Pandey, Adya Prasad

Banras Hindu University

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INDIAN SUGAR INDUSTRY - A STRONG INDUSTRIAL BASE FOR RURAL INDIA

Dr. Adya Prasad Pandey *

ABSTRACT

Indian sugar industry, second largest agro-based processing industry after the cotton textiles industry in country, has a lion's share in accelerating industrialization process and bringing socio-economic changes in under developed rural areas. Sugar industry covers around 7.5% of total rural population and provides employment to 5 lakh rural people. About 4.5 crore farmers are engaged in sugarcane cultivation in India. Sugar mills (cooperative, private, and public) have been instrumental in initiating a number of entrepreneurial activities in rural India. Present paper is an attempt as to review progress of sugar industry in India, understand its problems and challenges in context of ongoing liberalization process. Indian sugar industry can be a global leader provided it comes out of the vicious cycle of shortage and surplus of sugarcane, lower sugarcane yield, lower sugar recovery, ever increasing production costs and mounting losses. It needs quality management at all levels of activity to enhance productivity and production. Attention is required on cost minimization and undertaking by product processing activities.

Keywords : Indian Sugar industry , Sugar , Adya Prasad Pandey

* Reader, Department of Economics ,B.H.U. Varanasi

INDIAN SUGAR INDUSTRY - A STRONG INDUSTRIAL BASE FOR RURAL INDIA

Dr . Adya PrasadPandey*

India is the fourth major sugar producing country in the world, the first three being Russia, Brazil and Cuba. Sugar industry occupies an important place among organised industries in India. Sugar industry, one of the major agro-based industrial in India, has been instrumental in resource mobilization, employment generation, income generation and creating social infrastructure in rural areas. Indeed, sugar industry has facilitated and accelerated pace of rural industrialization. At present, there are 553 registered sugar factories having capital investment of Rs. 50,000 crores and annual production capacity of 180 lakh metric tonnes (ISMA Report, 2004). The annual turnover of industry is to the tune of Rs. 25,000 crores. The central and state governments receive annually Rs. 2500 crore as excise duty, purchase tax, and cess. More than 4.50 core farmers are engaged in sugarcane cultivation and about 5 lakh rural people have got direct employment in the industry. Sugar industry has brought socio-economic changes in rural India by way of facilitating entrepreneurial activities such as dairies, poultries, fruits and vegetable processing, and providing educational, health and credit facilities.

SUGAR PRODUCTION IN ANCIENT PERIOD IN INDIA

Sugarcane has been one of the major crops of India since times immemorial. *Iksu*, the term of sugarcane, is found in the Atharvaveda¹, Vajasaneyii², Maitrayani³ and Taittiriya⁴, Samhitas and the subsequent Sutras⁵. The Aryans knew the plant from a very early time⁶ and the fact that sugarcane is indigenous to India is beyond dispute. The word *Iksu* has no parallel in any other Indo-Aryan language, which suggests that the Indo-Aryans only came to know about the plant only after entering India. This is, supported by the fact that little evidence of sugar or sugarcane is found in any archaeological site of

* Reader, Department of Economics ,B.H.U. Varanasi

the prehistoric or early historical period, however, this negative evidence is no proof that it was unknown.

The cultivation of sugarcane caught the attention of the Greek visitors to India so something singular and strange. They speak of it as 'reeds that make honey without the agency of bees'⁷. This phenomenon of sweet juice produced from reeds was ingeniously explained by Megasthenes⁸. According to him, the sweet juice was due to the water which the cane absorbed from the soil being so warmed by the sun's heat that the plant was virtually cooked as it grew.

In addition, Indian literature provides enough evidence of availability of sugarcane in the ancient period. Sugarcane plant and its juice find mention in the medicinal works of Caraka⁹ and Susruta¹⁰.

In the Jatakas, there is a reference to pressing of sugarcane in machines¹¹. The occupation of cane pressing¹² and the machine used in the process are specifically mentioned¹³. The sugarcane press and allied machines were known by the name of *mahajanta* (*mahayantra* or *kolluka*)¹⁴ (compare with vernacular word kolhu). The Vyavahara Bhasya refers to sheds where such pressing machines were installed. India early evolved the technique of manufacturing sugar. The Arthasastra includes the manufacture of sugar from cane juice in a list of works called Simbanika.¹⁵

Caraka¹⁶, in his medicinal work states that *ksudra guda* is formed by evaporating the juice of sugarcane down to a quarter, a third or half of the original volume. *Guda* is a purified product and contain few impurities. Even more refined are *matsyandika*, *khanda* and *sarkara*, each of which is purer than the preceding one. Caraka notes the medicinal properties of these four types, which are in fact four stages in the process of manufacturing granulated sugar Susruta¹⁷ mentions *phanita*, *guda*, *matsyandika*, *khanda* and *sarkara*, these being in order of purity. The Arthasastra¹⁸, under *kasra* refers to *phanita*, *guda*, *matsyandika*, *khanda* and *sarkara*.

From early Buddhist works¹⁹, it seems that sugarcane was a common crop and sugarcane juice a popular object of consumption. Sugarcane fields greeted the eyes of a traveller wherever he went.²⁰

Kautilya²¹ notices it in the list of principal crops cultivated. But, he remarks sugarcane is the least profitable of crops, for it is subject to various evils and requires much care and expenditure.

Manu²² at one place says that garlic and sugarcane grow in the same fashion as seeds. Probably what Manu means is that these two crops are not normally propagated by sowing seeds but are grown from offshoots. In ancient works, *Iskuda*²³ and *Iksumati*²⁴ occur as the names of two rivers. These names indicate that the Indians had a knowledge of soil that best suited for sugarcane cultivation and recognised that the soil irrigated by certain rivers was very suitable for the crop.

Describing a sylvan village on the outskirts of the Vindhya forests of Harsacarita²⁵ gives a graphic picture of a sugarcane field, this refers to the cultivation of sugarcane plants in enclosures, to the harm done to them by antelopes and rabbits, and to the careful tending needed for the crop.

Advanced knowledge of sugarcane cultivation is clear from the classification of the plants into several types, differing according to their qualities. Caraka²⁶ mentions two varieties paundraka and vamsaka. The Amarakosa²⁷, though by name mentioning only the pundra and kantara types, implies many others also in the word adayah. Ksiravamin, the commentator, names some of these. But Susruta mentions twelve varieties- Paundraka, bhiruka, vamsaka, sataporake, tapaseksu, kasteksu, sucipatraka, naipala, dirghapatra, nilapora and kosakrt.²⁸

In the Vedic period it thus seems that, though the Aryans were acquainted with sugarcane, they had not acquired the knowledge of manufacturing sugar from its juice. On the basis of the reference to the word in the early Buddhist literature, one can assign the beginning of sugar manufacturing in Aryan India to somewhere about the eighth century B.C assuming some necessary antecedent period for the knowledge to grow.²⁹

In 399 A.D., the Chinese Buddhist pilgrim Fa-Hien entered India to the east of the Indus and he writes, "As you go forward from the mountain, the plants, trees and roots are all different from those in the land of the of ban except the bamboo, the pomegranate and the sugarcane".³⁰ Three hundred years later, he was followed by the Hiuen-Tsang who travelled in 629 AD observed, "They feed themselves generally on cakes of parched gram, which they mix with milk, cream, butter, solid sugar and mustard oil. The juice of grapes and sugarcane is the food of the Khatriyas. The fermented product of grains is of Vaisyas. The Brahmans drink the juice of grapes which differs completely from that distilled from wine".³¹ Cunningham³² wrote, "Gandhara of Swat (Peshwar) produce also much sugarcane of which they make stone honey". He mentioned, "Punjab (Pounatch)³³ produces much sugarcane but no grapes". Regarding Kosambhi located on Jumuna thirty miles above Allahabad, he writes "This place harvests a large quantity of rice and some sugarcane."³⁴

Hiuen-Tsang during his visit (671-95) to India, "There are sweet melons, sugarcanes and tubers and abundant....". When strangers are entertained in a monastery ghee, honey, sugar and other eatables are offered." A pill consisting of equal parts of the bark of yellow myrobalans, ginger and sugar is prescribed for diarrhoea and solid or dry sugar can satiate hunger and thirst when eaten."

SUGAR PRODUCTION IN MEDIEVAL PERIOD

In 1213 AD, the Chinese ambassador, Ch-u-ts-ai reported to Jenghiz Khan "In this century sugarcane is cultivated. The people make wine and sugar from juice."³⁶

In 1498, Vasco de Gama also saw large quantities of sugar at Calicut³⁷ Ludovico di Verthema³⁸, an Italian who travelled in the East in 1503-8, on seeing an immense quantity of sugar at Zibit in Arabia, a hundred miles north of Perim and a Bathacala, a little south of Goa on the Malabar Coasts recorded "a great abundance of sugar especially candied according to our way."

In Aln-i-Akbari written by Abul Fazal in 1590, cane is stated to have been of various kinds, but mainly of two sorts, one called *paunda*, one species is so tender and so

soft, so full of juice that a sparrow by specking could make the juice flow, the other species is hard. The former was grown for eating and the latter for sugar making-brown sugar candy, common sugar, white candy, and refined sugar useful for the preparation of all kinds of sweetmeats.

It is evident that cultivation of sugarcane was prevalent all over India.

REVIEW OF LITERATURE

A review of the existing literature on commercial agriculture in India must start with the writings of B.B. Chaudhuri on Bengal. Central to Chaudhuri's analysis is a distinction between the old and the new credit agencies in the Bengal countryside.³⁹

To digress briefly into the historiography of agriculture in colonial U.P., Sulekh Gupta and Imtiaz Hussain concentrated in 1960s on 'Landlords' and 'Tenants' as legal categories created by British revenue policy in the early years of the nineteenth century and Walter Neale highlighted the incomplete articulation of the two in an imperfectly developed market for land and tenurial rights for the whole span of colonial rule.⁴⁰ Concerned primarily with the intricacies of tenurial rights, these studies by and large ignored the actual conditions of agricultural production.

Analysing the effects of early nineteenth century revenue settlements, Asiya Siddiqi has commented that the subsistence element in (the peasant) economy was undermined and monetization was induced, not because (the peasant) had a surplus to exchange but because of the necessity of paying his instalment of revenue forced him to sell even his food and stock⁴¹ **Siddiqi and Bayly** have highlighted the linkage of regional production of indigo, cotton and sugar to the overseas and a growing home market in the first half of the nineteenth century.⁴²

Elizabeth Whitcombe has painted a rich picture of the late nineteenth century U.P. countryside, based on the voluminous records of the Revenue and Irrigation Department and on district settlement reports.⁴³

According to Mintz,⁴⁴ he feels that sugar, whether its origin is from cane or beet, is today regarded as a mass consumption item and it also accounts for a large share of the total calorie intake of an average household. This universality of sugar is of recent origin and is closely related to the global expansion of European power. The author attempts to review the link between the increasing European, especially English, household sugar consumption and the English economic power.

According to Minz, sugarcane was first domesticated in New Guinea around 8000 B.C. and was carried to India about 2000 years later, though it is evident from *Atharvaveda* and *Charaka Samhita* that India was the home of sugarcane since ancient times. However, it was only around the eleventh century that evidence of European knowledge is available (Southern Europe from Italy) and Asian or Arab sugar in significant quantity arrived in Europe. During the 10th to 12th century, knowledge about sugar spread throughout Europe. Till the 16th century, sugar was used as medicine rather than as sweetener in Europe leave alone as a food item. From medicine to a luxury sugar became a necessity only in the 19th century.

Mintz uses both historical and anthropological skills in exploring the importance of sugar in the consumption basket of European households, both because it is so recent and so obviously linked to the outward expansion of Europe.

Finally, Mintz discusses how questions of power, social status and hierarchy are inevitably intermeshed with questions of how people live their lives, how they organise their livelihood, the habits associated with consumption, production and so on. Sugar contributed not only to the enrichment of the imperial ruling class, but also helped in winning over to the latter side the growing proletarian class by making it a product whose increasing consumption visibly symbolised their upward social visibility. This was also strengthened by the arguments that the readiness of working people to work harder in order to be able to earn and thus consume more was a crucial feature of the evolution of modern patterns of eating.

The story of sugar and slaves has been told differently by Mintz. According to him, there are two types of slaves : those who work on plantations and those in the working class home - craving for sweetness.

The research done by 'Sanjaya Baru'⁴⁵ on 'Structural Changes in the International Sugar Economy' is also in similar vein. It supports the argument that two hundred years after enslaving people to work on sugar plantations, rich countries are enslaving them again by ruining their plantations and for any of the poor countries to rely on them.

According to Galloway⁴⁶, the history of sugar is linked with a trio of institutions which were anything but sweet. These are plantation, slavery and slave trade.

Amin⁴⁷ focusses attention on the cultivation of sugarcane by small farmers in Gorakhpur region. He analyses the socio-economic and cultural conditions, under which these small farmers became dependent upon traders, landlords and other intermediaries for marketing sugarcane for the production of crystal sugar.

The most significant contribution on sugarmaking in ancient period is by Lallanji Gopal.⁴⁸ This is a well researched piece of work giving the origin of sugarcane and its cultivation and the art of sugarmaking using as sources ancient documents like *Atharvaveda*, *Charaka Samhita* and *Sushruta Samhita* and the subsequent *sutras*. It elaborates on various forms of sugar which were made from cane juice and its uses. The paper also lists various fruits used as a source of sugar.

Naquvi⁴⁹ describes various centres of sugar production in upper India during 16th to 18th centuries. She dwells upon methods of sugar manufacturing, practices of sugarcane cultivation and the regional variations. She elaborates upon the trade in sugar covering various centres from where sugar was being exported and places to which it was being exported on account of the East India Company.

Attwood Donald⁵⁰ has studied another dimension "Capital and the Transformation of Agrarian Class System. A Case Study of Sugar Production in India". In this paper the author has raised two issues : (i) Why do some agrarian systems generate more economic growth than others" and (ii) Why do some undergo structural transformation leading to

further growth, while others stagnate? These issues have been discussed in terms of different kinds of agrarian class systems which either promote or inhibit economic innovations, and economic forces in terms of different levels of capital investment and managerial skills required for different levels of production and distribution systems. His conclusion is that ownership control of land is not relevant to the productivity of sugarcane farm in Maharashtra while R.K. Gupta⁵¹ feels that it is the landed interest which could increase sugarcane cultivation and in turn sugar production in Birbhum district of West Bengal.

In 1973, S.L. Saxena in his book "*Labour Problem in Sugar Factories in Eastern U.P.*" has studied deep about problems of sugar industry in India. In 1950, M.S. Veshen in his book "*Labour Problem in the Sugar Industry of Gorakhpur and Deoria*" has narrated in detail about the labour problems of sugar industry in Gorakhpur and Deoria districts of Uttar Pradesh (India). In his book "*Problems of Sugar Industry in Eastern U.P.*", Bhgawati Prasad Khetan has narrated about labour problem of sugar industries. In 1965, D.U. Artha Vijnana Sasthy described the various aspects of location of Sugar Industry in his book "*Location of the Sugar Industry in India*". Dr. Jitendra Kr. Jain in 1992 has described the development of Sugar Industry in his book "*The Sugar Industry in India*". In 1992 Dr. D.K. Grover and S.S. Singh studied about different aspects of labour, finance, raw materials in his book "*Problem of Sugar Industry in India*". In 1992 Shri Satya Prakash has worked on Working Performance of the U.P. Sugar Corporation. In his study he has studied about various aspects working of sugar mills.

Survey of literature reveals that there is a need to undertake a systematic study of progress of sugar industry in India, understand its problems and challenges in context of ongoing liberalization process. The present study is aimed to fulfil these requirements.

FIVE YEAR PLANS AND SUGAR INDUSTRY

The sugar industry was granted protection till 1950. Since independence there has been an overall increasing trend in sugar production in India. Production of sugar has increased by leaps and bounds in the planning period. To meet the increasing sugar

requirement during different plan periods targets of sugar production were fixed as depicted in table 1.

Table -1 Progress of Sugar Industry During Five Year Plans

<u>Plan</u>	Production Target (lakh tonnes)	Actual Production (lakh tonnes)	No. of Sugar Mills
First Plan (191-56) last year	18	19.34	138
Second Plan (1956-61) last year	25	30.29	175
Third Plan (1961-66) last year	35	35.32	200
Fourth Plan (1969-74) last year	47	39.50	229
Fifth Plan (1974-78) last year	54	58.42	298
Sixth Plan (1980-85) last year	76	61.78	356
Seventh Plan (1980-85) last year	102	109.90	414
Eight Plan (1992-97) last year	143	-	412
Ninth Plan (1997-2002) last year	148	185	434
Tenth Plan (2003-04) last year	-	170	461

Source : Yojana Nov. 1999, ISMA Report 2004 and Internet.

Before the commencement of First Plan there were 138 sugar factories with an installed annual sugar production of 19.34 lakh tonnes. During the plan period, to achieve targets of sugar production, licences were issued for setting up of new factories and for many of the existing units to expand the size of the units. The number of the sugar factories increased to 143 in the first plan, 175 in the second plan. The production increased to 30.29 lakh tonnes in the second plan. During second plan the target of production was 22.5 lakh tonnes which was increased to 25 lakh tonnes but the actual production exceeded upto 30.29 lakh tonnes which was slightly more than demands. This resulted in decontrol upto some extent. In the third plan the target of production was 35 lakh tonnes. Due to short fall in production of the cane in first three years of the Third plan the target could not be fulfilled but at the end of the plan the target of production was achieved with production of 35.32 lakh tonnes of sugar. Although the sugar

production upto 3rd Plan was more than target but due to seasonal variations the target could not be achieved in fourth plan. Again in Fifth plan the production was more (28.42 lakh tonnes) than target (54 lakh tones). In the Sixth plan the target was 76 lakh tonnes but the production was only 61.76 lakh tonnes. Again in Seventh plan it was more than target. In Eight plan the target further could not be achieved. Although the production of sugar decreased in 1992-93 and 1993-94 but it increased to 146 lakh tonnes in 1994-95 and India became largest sugar producing country in the world. In 2002-2003 the production of sugar in India was 28 lakh tonnes which decreased to 170 lakh tonnes in 2003-04. IN 1950-51 there were 138 sugar mills in India but upto 31st March 2004 this number increased to 461. At present their are 553 registered sugar factories having capital investment of Rs. 50,000 crores and annual production capacity of 180 lakh metric tonnes (ISMA Report, 2004) and presently sugar industry is the second largest agro-based industry of India.

SUGAR POLICY OF THE GOVERNMENT

Sugar is a controlled commodity in India under essential commodities act, 1955. Government of India initiated de-licensing policy in sugar industry on 11th September, 1998 in view of globalization process, and since then industry has experienced significant changes. De-licensing of sugar industry has led to mushrooming growth of sugar mills. During 1988-89 to 1991-92, government had introduced partial control in accordance with levy-free sugar ratio was 45:55. It was 40:60 during 1992-93 to 1996-97. Decontrol of sugar trade got momentum in due course and at present (2005), levy free sugar ratio is 10:90. The Committee appointed by government under chairmanship of S.K. Tuteja recommended decontrol of free sale sugar by October, 2005. Central government announced statutory minimum prices (SMP) of sugarcane and on this basis state governments fix state advised prices (SAP). Unfortunately, SAP is being used as a political tool and has been main concern of sugar mills as it results in escalation of production costs.

PRODUCTION

Both area and production of sugarcane fluctuate considerably from year to year. This is due to variations in climatic conditions, the vulnerability of areas cultivated under rainfed conditions, fluctuations, in prices of gur and Khandsari, and changes in returns from competing crops. Despite this instability, both area and production of sugarcane have increased considerably over the past three decades.

The chief raw material for sugar production in India is Sugarcane. The data shows that area under sugarcane and production had shown a mixed growth during 1994-95 to 2003-04. Out of 10 years of the study, area under sugarcane had positive growth during 7 years and negative growth was observed during 1997-78, 2002-03 and 2003-04 (Table 2). As far as sugarcane production is concerned, it had negative growth during 1996-97, 2000-01, 2002-03 and 2003-04 due to lower rainfall. There had been considerable variations in area under sugarcane, sugarcane production, and yield of sugarcane during 1994-95 to 2003-04.

Table 2 : Progress in Sugarcane area, production and yield 1995-96

Year	Area ('000' ha)	Production ('000' tonnes)	Yield/ha
1994-95	3867	275540	71.30
1995-96	4147 (7.24)	281100 (2.01)	67.80 (-4.91)
1996-97	4174 (0.65)	277560 (-1.25)	66.50 (-1.92)
1997-98	3930 (-5.84)	279541 (0.71)	71.10 (6.92)
1998-99	4055 (3.18)	288722 (3.28)	71.20 (0.14)
1999-00	4223 (4.14)	299324 (3.67)	70.90 (-0.42)
2000-01	4316 (2.20)	295956 (-1.13)	68.60 (-3.24)
2001-02	4430 (2.64)	297208 (0.42)	67.40 (-1.75)
2002-03	4361 (-1.55)	281575 (-5.26)	64.60 (-4.15)
2003-04	3995 (-8.39)	236176 (-16.12)	59.10 (-8.51)

Source : Report of the committee on revitalisation of sugar industry, Government of India, Dec. 2004 Cooperative sugar, Vol. 12, August 2001.

Note : Figures shown in brackets indicate percentage change over previous year.

Fluctuations in sugarcane prices also led to under or over production of sugarcane during this period. Sugarcane yield had negative growth during 7 out of 10 years of study. As a result, sugar industry had storage of sugarcane. Sugarcane yield (per hectare) in India was 59.10 tonnes during 2003-04. It is too low in comparison with sugarcane yield in Kenya (100 MTs), Hawaii (150 MTs), and Australia (75 MTs). In view of this situation, India needs to increase sugar cane yield at par with global competitors to assure viability of sugarcane cultivation and sugar industry. Government should provide irrigation facilities, adequate, and regular power supply to agriculture sector.

In India, 65-70% of available sugarcane is used for manufacturing sugar, and 30-35% for making gur and khandsari. During 1994-95, there were 408 operating sugar factories in India. The number of sugar factories rose to 461 over period of 10 years, registering an increase by 12.99% (Table 3). Over the period of 10 years of study, sugar production saw substantial variations. During 1994-95, sugar produced by 408 factories was 14.64 million tonnes. A moderate increase in sugar production (i.e. 12.97%) was observed during 1995-96 over 1994-95 but succeeding two years saw a substantial decrease in sugar production.

Table 3 : Number of operating sugar factories, production, and recovery

Year	No. of operating sugar factories	Sugar production ('000 tonnes)	Recovery (%)
1994-95	408	14643	9.92
1995-96	416 (1.96)	16543 (12.97)	9.42 (-5.04)
1996-97	412 (-9.06)	12905 (-21.99)	9.90 (5.09)
1997-98	400 (-2.91)	12852 (-0.41)	9.95 (0.50)
1998-99	427 (6.75)	15541 (20.92)	9.86 (-0.90)
1999-00	423 (-0.94)	18200 (17.11)	10.20 (3.45)
2000-01	436 (3.07)	18511 (1.71)	10.48 (2.74)
2001-02	434 (-0.46)	18529 (0.09)	10.27 (-2.00)
2002-03	453 (4.37)	20100 (8.48)	10.36 (0.88)
2003-04	461 (1.77)	17000 (-15.42)	N.A.

Source : Report of Indian sugar mills association, 2004.

Note : Figures shown in brackets indicate percentage change over previous year.

The data shows that there was negative growth of sugar production during 1996-97, 1997-98 and 2003-04. As far as sugar recovery is concerned, it remained below 10% during 1994-95 to 1998-99, and slightly above 10% during 1999-00 to 2002-03 (Table 3). Use of low yield varieties, unscientific harvesting of sugarcane and delays in crushing are some of reasons responsible for low sugar recovery. Global competitors, such as Australia have sugar recovery between 14.25%, 16% in Kenya, Columbia and Hawaii have above 12%. In the context of competitive global scenario, Indian sugar industry urgently needs to undertake research and development activities to increase sugar recovery.

AS RAW MATERIAL SUPPLIER :

Sugar industry is a major supplier of molasses for alcohol and ethanol producing units. Bagasse is used for power generation as well as paper production. Ethanol can be used as fuel. The data given in Table 4 shows production of molasses and ethanol during 1995-02. Sugar industry produced 64.97 thousand tonnes of molasses and 12147 thousand litres of ethanol. There had been ups and downs in production of molasses and ethanol over period of 8 years of study. Molasses production had decreased by 28.35% in 1996-97, 5.54% in 1997-98 and 2.49% in 2000-01 over preceding years. Ethanol production and its consumption had a moderate increase. Ethanol consumption increased from 9000 thousand litres in 1994-95 to 12663 thousand litres in 2003-04. The ethanol consumption increased by 40.70% during decade. At present, oil refineries are allowed to add 5% ethanol in fuel. It may be increased to 10% in future which is essential to enhance economical viability of ethanol producing units.

Table 4 : Production of molasses, and ethanol consumption

Year	Molasses ('000' tonnes)	Ethanol ('000' litres)	Ethanol consumption ('000' litres)
1994-95	64.97	12147	9000
1995-96	82.85 (27.52)	15491 (27.53)	9450 (5.00)

1996-97	59.36 (-28.35)	10669 (-31.13)	9922 (4.99)
1997-98	56.07 (-5.54)	12632 (18.40)	10418 (5.00)
1998-99	69.76 (24.41)	13202 (4.54)	11486 (5.00)
1999-00	80.22 (15.00)	13801 (5.45)	10939 (5.00)
2000-01	78.22 (-2.49)	14427 (5.54)	12060 (4.99)
2001-02	80.66 (3.12)	15085 (4.56)	12663 (5.00)

Source : Report of Indian sugar mills association, 2004

Note : Figures shown in brackets indicate percentage change over previous year.

EXPORT, IMPORT AND DOMESTIC CONSUMPTION

Indian sugar industry contributes 15% of global sugar production. While its share in global sugar consumption is around 13.4%. Sugar exports from India had shown remarkable growth during 1998-99 to 2002-03, i.e. from 10000 MTs to 1410000 MTs. However, exports of sugar declined substantially during 2003-04 by 78.72% and 93.33% during 2004-05 over their respective previous years due to decreased sugar production and uncompetitive sugar prices (Table 5). Whenever there is lower production of sugar in the country, sugar is imported to meet domestic demand. Sugar imports during 1998-99 to 2003-04 had mixed growth trend. Domestic consumption of sugar in India had slight fluctuations during 1998-99 to 2003-04.

Table : 5 Export, Import and Domestic Consumption of Sugar

Year	Sugar exports ('000' MTs)	Sugar imports ('000' MTs)	Domestic consumption ('000' MTs)
1998-99	10	1075	16971
1999-00	25 (150)	438 (-59.26)	17296 (1.91)
2000-01	1360 (5340)	-	17845 (3.17)
2001-02	1130 (-16.91)	10 (-77.17)	19960 (10.73)
2002-03	1410 (24.78)	10 (-90.00)	19880 (1.11)
2003-04	300 (-78.72)	500 (4900)	19580 (-2.00)
2004-05 (Prov.)	20 (-93.33)	1800 (260)	19170 (-2.09)

Source : Report of Indian sugar mills association, 2004.

Note : Figures shown in brackets indicate percentage change over previous year.

CRITICAL ASSESSMENT

Sugar Industry occupies an important place among organised industries in India. Its main raw-material is sugarcane. The special thing for all kinds of the raw material is that it should contain the highest percentage of the content for which it is used as raw

material. But the quality of sugarcane of our country is not so good and researchers are trying to update it but due to lack of interest and proper attention from the government side, they are not succeeded yet today. Per hectare production of the sugarcane is also not improving which is a matter of great concern. It is probably due to lack of land fertility and lack of irrigation facilities. Other countries of the world such as Cuba, Fizzy & Caribbean's, which are very small in comparison to India, are producing much more sugarcane per hectare than India.

The share of India in the total production of sugarcane in the world is 37%. But the production of sugarcane is only 15 tones per acre whereas in Java it is 56 tones and in Hawaii it is 52 tones i.e. almost four times than India. The production cost of sugar is also high due to inferior quality of Indian sugarcane. Since sugar mills are running to loss so they are unable to pay the cane grower growers timely. So the quality improvement in cane grower is the need of the time.

The sugar policy of the Government has been seriously lacking a long-term perspective. Controls, decontrols, partial controls, etc. have been used in past in an adhoc manner. It is necessary to assure supply of sugar to poorer sections at reasonable rate. But government policy on cane prices, control of price of sugar, dual pricing etc. have been designed and implemented for the benefit of sugar mill owners and distributors and rarely for benefits of cane growers or for benefit of consumers of sugar. Much of the illness and problems of sugar industry are the result of the government's policy.

In the sugar industry several by-products specially bagasse and molasses are found. At one time bagasse was used as fuel, which sugar factories didnot know what to do with the accumulating molasses, a health hazards. Small cottage industries may be established for disposing these by-products in a positive way for preparing paper, cardboards, alcohol, fertilizers, cattle field etc. Apart from it manufacturing process of sugar also needs certain modification so that yield may be improved.

CHALLENGES FOR SUGAR INDUSTRY

India ranks first in sugar consumption and second in sugar production in world but its share in global sugar trade is below 3%. Indian sugar industry has been facing raw material, and resource as well as infrastructural problems. Globalization has brought a number of opportunities but at the same time posed certain challenges before sugar industry. Most of sugar units in India utilize production capacity below 50%. Low capacity utilization and inadequacy of raw material led to closer of 100 sugar factories in India. Mounting losses and decreasing networth of sugar factories have been responsible for sickness of sugar industry. Sickness in sugar industry has reached to an alarming proportion. Indian sugar industry has been cash striven for decades. Low cash inflow due to piling stocks leads to serious financial crisis and finally to closing sugar factories. Sugar prices have been a political issue rather than economical issue. Many a times it worsens economy of sugar factories.

The main concern of sugar industry in India is fluctuations in sugarcane production due to inadequate irrigation facilities, lower sugarcane yield, and frequent droughts in tropical and sub-tropical areas where sugarcane is grown on a large scale. In addition, sugarcane yield has been lower (59 Mts per hectare). Sugar recovery is also lower in comparison with other sugar manufacturing countries. This leads to escalation of production costs and weakness competitive edge of the industry. Most of sugar mills in India are having daily sugarcane crushing capacity of 1250 tonnes. These mills cannot have economies of scale so they have to incur high production costs. Indian sugar industry is characterized by high production costs. Therefore, daily crushing capacity should be extended to 2500 tonnes. Obviously, industry has a great challenge of existence in global market. In recent years, sugarcane production in India has decelerated to a great extent due to water and power shortage. Special attention is needed to be given on water resource management. All the area under sugar cultivation should be brought under drip irrigation to conserve water as well as fertilizers. Adequate and regular power supply to sugarcane growers and sugar factories would increase production and productivity. To enhance share of Indian sugar industry in global trade, quality and quantity of sugar needs to be enhanced.

CONCLUSION & SUGGESTIONS

Sugar industry is the second largest agro-based industry in India. Sugar factories, particularly cooperative sugar factories in Maharashtra and other states have been instrumental in building confidence among rural people and strengthening industrial base in rural India. In the era of globalization, sugar industry needs more competitive edge which can be given by way of modernization, enhancing productivity, and manufacturing excellent quality sugar at competitive prices. It needs quality management at every level of activity to enhance its performance. The need of the hour is to liberalize industry from clutches of unprofessional people. Most of the sugar units do not have byproduct utilization plants. Projects based on bagasses and molasses should be initiated. Ethanol, alcohol, and paper projects have tremendous scope for development in India. In future, 10-15% ethanol may be allowed to be blended with petrol. Bagasses based power generation projects installed adjacent to each sugar factory would fulfill need of power. NABARD should provide adequate and timely refinance to these projects at concessional interest rates. New sugar units should be set up taking into consideration sugarcane availability. Research programme should be undertaken in area of sugarcane cultivation, enhancing sugarcane productivity, and sugar recovery. Sugarcane prices should be fixed on basis of sugar recovery. Attention is to be given on manufacturing quality sugar as per international standards at competitive prices.

NOTES

1. 34.5
2. XXXV.1
3. III.7.9 of cf.IV.2.9. for *iksukanda*.
4. VII.3.16.1.
5. *Asvalayana Grhya Sutra*, II, 7; Kausika Sutra, 23.
6. J.B.O.R.S., IV, p. 436 R.V., X.60.4, A.V., XIX.39.9 Vedic Index 1p.75.
7. Nearchos in Strabo XV, 1.20 McCrindle, *Ancient India as described in Classical Literature*, p. 122., f.n.3.
8. Frag. XI, McCrindle, *Ancient India as described by Megasthenes and Arrian*, p.55.
9. Sutra, 27.233 ff.

10. Sutra, 45.148 ff.
11. II.240.
12. *Atthasalini*, 274 f.
13. *Jataka*, I 339, *Dhammapada commentary*, IV, 199.
14. *Uttaradhyayana Sutra*, 19.53 Brhatkalpa Bhasya Pithika, 575, A.K. Majumdar, *Chaulukyias of Gujarat*, p. 260.
15. II. 15, p.95 as cited in Gopal, Lallanji, Sugar-making in Ancient India, *Journal of Economic and Social History of the Orient* 1964, Vol. VII, No. 13, p. 61.
16. *Sutra*, 27.235.6.
17. *Sutra*, 45.158 ff.
18. II.15.
19. *Mahavagga*, VI 35.6 *Jataka*, 1.333, II, 240, IV 160f, VI 339.
20. Cf. *Manusmriti* VIII, 346, as quoted in Gopal, Lallanji, Sugar making in Ancient India, *Journal Econ., Social History of the Orient* 1964, Vol. VII No. 13, p. 58.
21. *Artha*, II. 24. Also II. 15, XIV.2.
22. IX.39, as quoted in Gopal, Lallanji, Sugar-making in Ancient India, *Journal Econ., Social History of the Orient* 19964, Vol. VII No. 13. p. 58.
23. *Matsya Purana*, CXIV 31.
24. Rama, S.R.I. 70.3, II.68.17, Panini, IV 2.86, VIII, 2.9, *Bhagavata Purana*, V. 10,1 *Visnu Purana*, II 13.53.
25. Cowell and Thomas, as quoted in Gopal, Lallanji, Sugar-making in Ancient India, *Journal Econ. Social History of the Orient* 1964, Vol. VII No. 13, p. 59.
26. *Sutra*, 27, 234.
27. II, 4.163.
28. Jadavji Triikumji Acharya, Ed. N.S.P., 1915, *Sutra*, 45, 138-139.
29. Gopal, Lallanji, Sugar-making in Ancient India, *Journal Econ. Social History of the Orient* 1964, Vol. VII No. 13, p. 62.
30. *Records of the Buddhist Kindgoms*, trans. Legge, Oxford, 1869, p. 24.
31. *Si-yu-ki*, trans. Beal *Buddhist Records of the Western World*, London, 1900, pp. 88, 120, 140, 163, 269.
32. *Ancient Geography of India*, ed. Majumdar, Calcutta, 1924, p. 55.
33. *Ibid*, p. 187.
34. *Op. cit.* 65, p. 213. *op.cit.* 64, p. 282.
35. *Records of the Buddhistic Religion and the Malay Archipelago*, trans J. Takakusu, Oxford, 1869, pp. 40, 90, 134, 140.
36. Bretshneider, *Notes on Chinese Medieval Travellers*, Shanghai, 1878, p. 118.

37. Ramusio, *Navigationie Viaggi*, Venice, 1550, 1. p.210.
38. *Navigations and Voyages of Vartheam...* trans. R. Eden in Hakluyt Society Publications, p. 50.
39. B.B. Chaudhari, 'Growth Commercial Agriculture in Bengal 1859-1885, I.E.S.H.R., 7 : 1-2 (Mar-June, 1970).
40. S.S. Gupta, *Agrarian Relations and Early British Rule : A Cast Study of Ceded and conquered Provinces (Uttar Pradesh)* (Bombay, 1963), Imtiaz Hussian, *Land Review Policy in North India : The Ceded and Conquered Provinces* (Calcutta, 1967); W.C. Neale, *Economic Change in Rural India; Land and Reform in Uttar Pradesh, 1800-1955* (Yale, 1962).
41. Asiya Siddiqi, *Agrarian change in a Northern Indian State : Uttar Pradesh, 1819-1833* (Oxford, 1973), pp. 132ff.
42. C.A. Bayly, *The Age of Hiatus : The North Indian Economy And Society, 1830-50*.
43. Elizabeths Whitecombe, *Agrarian Conditions in Northern India, Vol. I : The United Provinces under British Rule, 1860-1900* (California, 1971), pp. 173-77.
44. W.S. Mintz, *Sweetness and Power, The place of Sugar in Modern History*, Penguin Book, 1986, pp 274.
45. Baru, Sanjaya, *Structural Changes in the International Sugar Economy*, Social Scientists, April-May 1987, No. 167-168, pp. 58-76.
46. Galloway, J.H., *The Sugarcane Industry : An Historical Geography from its origins to 1914*, Cambridge, Cambridge University Press, 1989, pp. 266.
47. Amin, S., *Sugarcane and Sugar in Gorakhpur : An Inquiry into peasant Production for Capitalist Enterprises in Colonial India*, Delhi, OUP, 1984, pp. XXII, 336.
48. Gopal, Lallan Ji, *Sugarmaking in Ancient India*, Journal of Economics Social History of the Orient, 1964, Vol. VII, No. 13, pp. 55-72.
49. Naqui, R.K. *Urban Centres and Industries in Upper India : 1556-1803*, Bombay, 1968.
50. Attwood, Donald W, *Capital and the Transformation of Agrarian Class Systems : Sugar Production in India, Agrarian Power and Agricultural Productivity in South Asia*, OUP, 1984, pp. 20-50.
51. Gupta, R.K. *The Sugar Industry in a Bengal District Birbhum from the last decade of the Eighteen Century to Mid-Nineteenth Century*, Ph.D. Thesis, 1963.

REFERENCES :

Agrawal, R.N. - *Sugar Industry in India, My Recollections*, Bombay, 1952.

- Amin, Shahid - *Sugarcane and Sugar in Gorakhpur - An Industry into peasant production for capitalist enterprises in colonial India*, Oxford University Press, Delhi, 1984
- Dutta & Sundaram - *Indian Economy*, S. Chand and Company, Ltd., New Delhi, 1996.0
- J.H. Galloway, *The Sugarcane Industry*, Cambridge University Press, 1989.
- Pandey, A.P., *Development Banking in India (with Special Reference to UPFC)*, Bharati Prakashan, Varanasi, 2002.
- Pandey, A.P., *Financing of Small Scale Industries in Eastern Uttar Pradesh*, An unpublished Major Research Project.
- Rai, Prem Shankar - *Uttar Pradesh Mein Chini Udyog Ki Punjee Sunrachana-2001* (An unpublished Ph.D. thesis of Deptt. of Economics, B.H.U., Varanasi).
- S. Pruthi, *History of Sugar Industry in India*, Reliance Publishing House, New Delhi, 1995, pp. 1-29.
- Cooperative Sugar Monthly*, New Delhi.
- Economic Survey Yearly*, Govt. of India.
- Indian Sugar Monthly*, New Delhi.
- Reports of Indian Sugar Mills Association*.
- Indian Sugar Year Book*, New Delhi.
