TREND AND COMPETITIVENESS OF INDIAN SUGAR

ABSTRACT

Sugar is one of the most produced and traded commodities in the world. India is the second-largest producer and largest consumer of sugar in the world. Therefore, the study was conducted to assess the position of Indian sugar in the international market. The study was based on Time seriesdataof years 1999-2018. To assess the trend, trend analysis was done and, for appraising the competitiveness,export performance ratio and nominal protection coefficient was computed.The cubic model was found best fit for all the particulars considered in the models.Results revealed that production, import quantity and value of sugar had increasing trend while export quantity, value, unit price of export and import of sugar exhibited fluctuating trend. The trade of Indian sugar was found inconsistent in the international market. The higher NPC value pointed out a matter of concern as the Indian sugar was non-competitive in the international market.

Keywords: Competitiveness**,** Export, Nominal protection coefficient, Sugar, Trend.

Introduction :

Sugar is an integral part of daily consumption of every household and is used in various forms across the globe (Jati, 2013).India is acknowledged as the original home for both sugarcane cultivation and sugar manufacture. Sugar is one of the most important commodities which is produced and consumed around the world. Sugar is produced in over 124 countries worldwide but over 70 per cent of world sugar production is consumed domestically and the remaining is traded in the world (FAO, 2020). Sugar is obtained mainly from sugarcane and sugar beet. Around 80 per cent of sugar is derived from sugarcane and is largely grown in tropical countries. The remaining 20 per cent comes from sugar beet grown mainly in the temperate zones in the North(Deokate, 2013). Nearly 70 per cent of countries produce sugar from sugarcane, 20 per cent from sugar beet and 10 per cent from both. Generally, the costs of producing sugar from sugarcane are lower than those for sugar beet.

The total world production of sugar is around 18 million tonnes. Brazil had been at the top of the list of sugar producing countries since 2001-02 barring 2018-19 when India was the top producer.The major sugar-producing countries are Brazil (23.38%), India (18.77%), European Union (8.18%), China (5.84%), United States (4.69%), Thailand (4.21%), Mexico (3.43), Pakistan (3.34), Russia (3.20%) and Australia (2.41%) andthese countries collectively contribute 80 per cent of the total world's sugar production (USDA, 2021).

The global sugar consumption is around 172 thousand MT. India is the largest consumer of sugar with 28,000 thousand MT accounting for around 16.30 per cent of total world consumption followed by the European Union (9.66 per cent), China (9.02 per cent), United States (6.40 per cent) and Brazil (5.91 per cent). These countries

taken together consumes around 50 per cent of the total sugar consumption. Indonesia (4.33 per cent), Russia (3.50 per cent), Pakistan (3.34 per cent) and Mexico (2.45 per cent) are other less important sugar consuming countries (USDA, 2020-21).

Brazil being the largest exporter of sugar exports approximately 32 million MT of sugar and alone accounts for approximately 50 per cent of the total global sugar export of 64284 thousand MT. The other leading sugar exporting countries are Thailand (11.36 per cent), India (9.33 per cent), Australia (5.19 per cent), Guatemala (2.69 per cent) and Mexico (2.47 per cent). These countries contribute 80 per cent of the total world sugar export(USDA, 2020-21).

The major sugar importing countries are Indonesia (9.63 per cent), China (9.08 per cent),United States (5.45 per cent), Bangladesh (5.30 per cent), Algeria (4.54 per cent), Malaysia (3.94 per cent), European Union (3.71 per cent), South Korea (3.52 per cent), Nigeria (3.48 per cent) and Saudi Arabia (2.77 per cent). These ten countries collectively constitute around 50 per cent to the total world sugar import of 53,986 thousand MT(USDA, 2020-21).

The whole value chain of sugarcane to sugar, molasses and ethanol is under the control of government in India and are confronted with stringent government regulations (Mahadevan, 2009; Sukhtankar, 2012; IIFT, 2011; Singh *et al.,* 2008). The sugar (control) order 1966, levy sugar supply order 1979, sugar (packing and marking) order 1979, jute packaging materials (compulsory use of jute in packaging) and commodities act 1987 (ISMA, 2011) are major legal interventions in India. These legal barriers are depriving the market from fair competition among firms. Anyhowthe sugar industry of India had started to be nurtured, after theextension of the Industry Protection Act, 1932 and introduction of financial supports. The sugar production got

affected in a cyclical manner in India due to the above strict interventions. Due to the unequal production trends in sugarcane yield, sugar production has tracked in a 6 to 8 year cycle in which a 3 to 4 year boom phase with surplus production has been followed by 2 to 3 years of lesser production (Kumar and Sheetal, 2013).

Indian sugar exports are occasional and cyclical and production is quite fluctuating(Sheetal and Kumar, 2015). It has also been observed that the international price of Indian sugar over the years has been lower than the domestic price (Department of Commerce, 2018-19). Hence, the study was carried out to examine if there has been any change in the trend over the years under consideration and to analyze the pattern of export competitiveness of Indian Sugar.

METHODOLOGY

The study is based on time seriessecondary data pertaining to the period from 1998-99 to 2017-18 with respect to production and export of sugar. The datawere collected from the official website of FAO-STAT and from various other published sources such as government reports of various seminars, symposia and workshops.

The overall period was divided into two sub-periods- Period I (1999-2008) and Period II (2009-2018).

Trend analysis

To trace the path of process, different parametric trend models as given in the table below were used.

Table 1: List of different parametric models with equations

Sr.No.	Functions	Equations
1	Linear	$Y = b_0 + (b_1{}^{*} t)$
2	Logarithmic	$Y = b_0 + (b_1{}^{*} \ln(t))$
3	Quadratic	$Y = b_0 + (b_1{}^{*} \mathrm{t}) + (b_2{}^{*} t^{**} 2)$
4	Cubic	$Y = b_0 + (b_1{}^{*} \mathrm{t}) + (b_2{}^{*} t^{**} 2 + (b_3{}^{*} t^{**} 3)$
5	Compound	$Y = b_0{}^{*} (b_1{}^{**} t)$
6	Power	$Y = b_0{}^{*} (t^{**} b_1)$
7	Exponential	$Y = b_0{}^{*} (e^{**} (b_1{}^{*} t))$
8	S-curve	$Y = e^{**} (b_0 + \left(\frac{b_1}{t}\right))$
9	Inverse	$Y = b_0 + \left(\frac{b_1}{t}\right)$

From the above mentioned competitive trend models, the best model was selected based on the goodness of fit which was measured in terms of R^2 value.

Export Performance Ratio (EPR) was worked out by the formula-

$$\mathrm{EPR} = \frac{S_{it}}{S_{wt}}$$

Where,

S_{it} = Share of sugar in India's total export, and

S_{wt} = Share of sugar in the total world export

If the EPR > 1it shows comparative advantage in the export of commodity and vice versa.

Nominal Protection Coefficient (NPC) is the ratio of domestic price of sugar (P_d) and international price of sugar (P_r).

$$\mathrm{NPC} = \frac{P_d}{P_r}$$

NPC > 1 indicates protection of commodity in the international market, vice-a-versa.

RESULTS AND DISCUSSION

Trend analysis

Trend analysis is, basically, a method for understanding how and why things have changed – or will change – over time. Trend analysis is used in wide variety of disciplinary contexts within which it is discussed. Hence, its universal definition is somewhat difficult, but for the purposes of clarity, it can be defined as an approach to analysis which collates data and then tries to find out patterns, or trends, within that data for the purposes of understanding or predicting behaviors. This typically involves the elimination of "noise" or error in a time-series dataset.

Different trend models as mentioned in Table 1 were used for trend analysis of sugar production, export quantity and value, import quantity and value, the unit price of export and import.The cubic model was found to be the best fit with the highest value of R square. Results of the other models are given in Appendices: I-VII.Graphical representation of the cubic model for different parameters under study is given to elaborate the findings of the study.

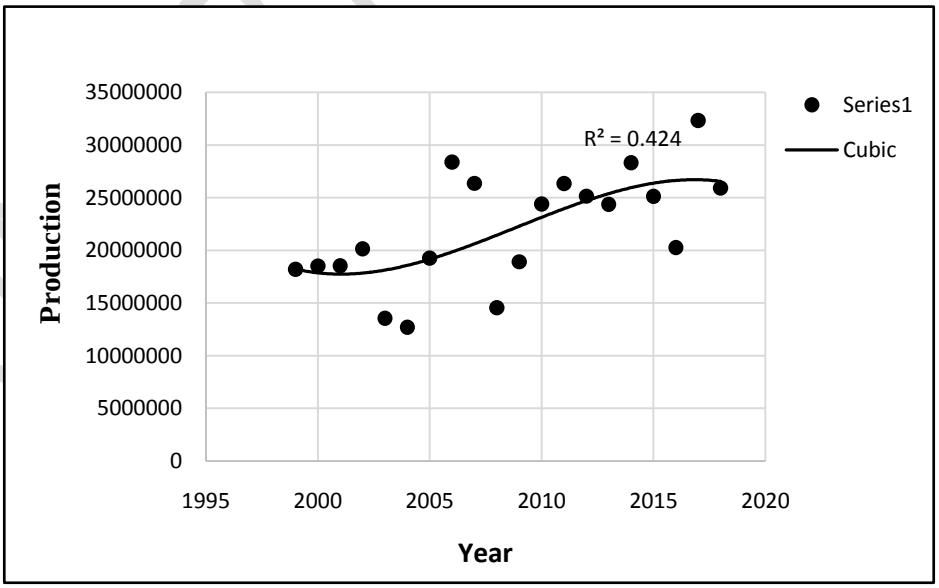

Fig. 1: Growth trend of Production of Indian Sugar

It is evident from Fig. 1 that growth rate of sugar production had an increasing trend over the study period. In 2001-02 to 2003-04, the trend was found declining, and then started escalating from 2004-05 and subsequently depicted an increasing trend. Similar result was reported by Pandey, 2007. The trend in production is probably due to the India's sugar production cycle of 6 to 8 years in which 3 to 4 years of higher production is followed by 2 to 3 years of lower production. Again for the two consecutive years i.e. 2007-08 and 2008-09, the sugar production had lower growth, which resurged in 2009-10 and thereafter (India's Sugar Industry: Analyzing Domestic Demand and Recent Trends, 2010-11). The similar trend is observed in the Fig 1. This then led to the surplus amount of sugar in the country and the production by the mills kept on adding to it. But, during 2017-18 onwards, the cubical curve was found declining. The reason for this decline in sugar production might be due to the over production of sugar in the previous sugar season and the shift of cane juice towards ethanol production instead of sugar production (Bhati, 2020).

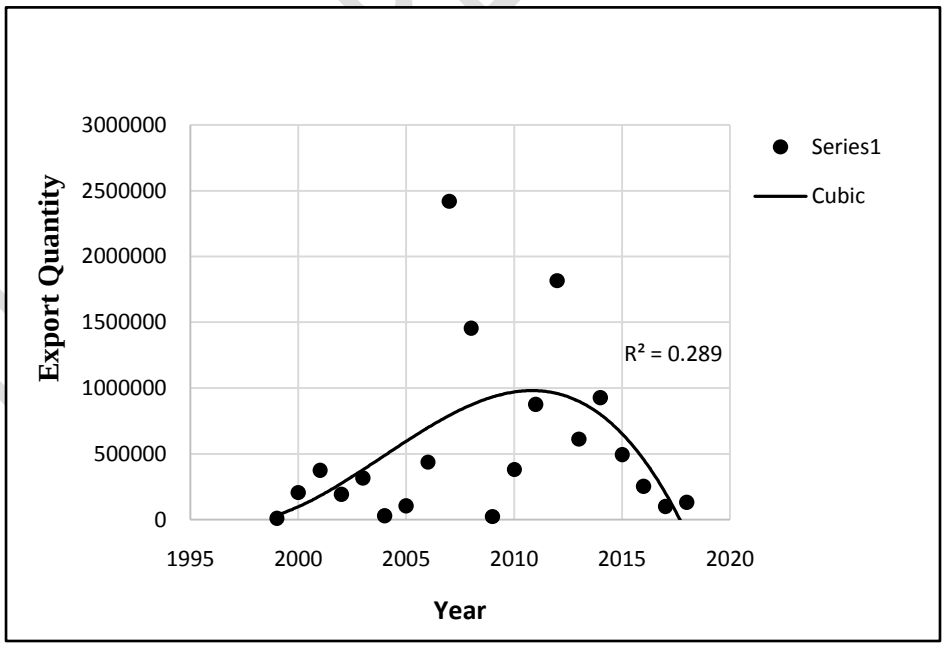

Fig. 2: Growth trend of quantum of exported Indian Sugar

Fig. 2 depicts the growth rate of quantum of sugar exported from India. It shows an increasing trend in the beginning of study period which gradually seemed to be declining after 2010-11 and the declining trend continued till the end of study period i.e. 2018-19. During 2009-10, the sugar production was higher as there was no diversion of cane for the production of alternative sweeteners which may be the reason that the quantum of sugar exported found comparatively high during 2009-10 to 2011-12. The Government of India had sustained the export incentives after 2010-11, which might have discouraged the sugar exporters, leading to a decrease in the export of sugar from India (India's Sugar Industry: Analyzing Domestic Demand and Recent Trends, 2010-11). During the year 2017-18, the international sugar prices subdued which might also be the reason for the weak export of sugar. (Bhati, 2020).

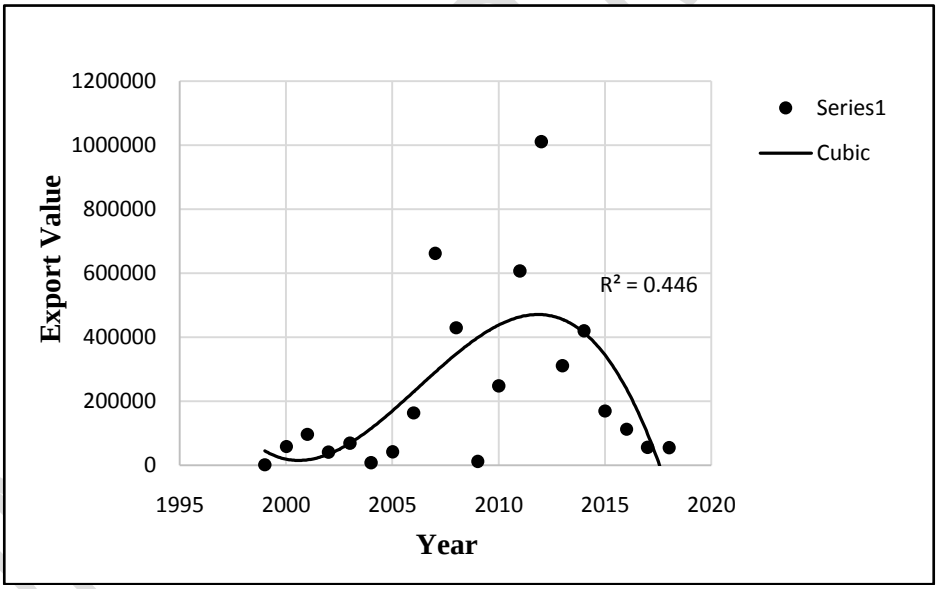

Fig. 3: Growth trend of value of exported Indian Sugar

Fig. 3 represents the trend of monetary value of sugar exported from India over time. It clearly shows that as the time passed by, the value of exported Indian sugar declined with the export quantity. It may be due the weak export of sugar resulted in lower export value.

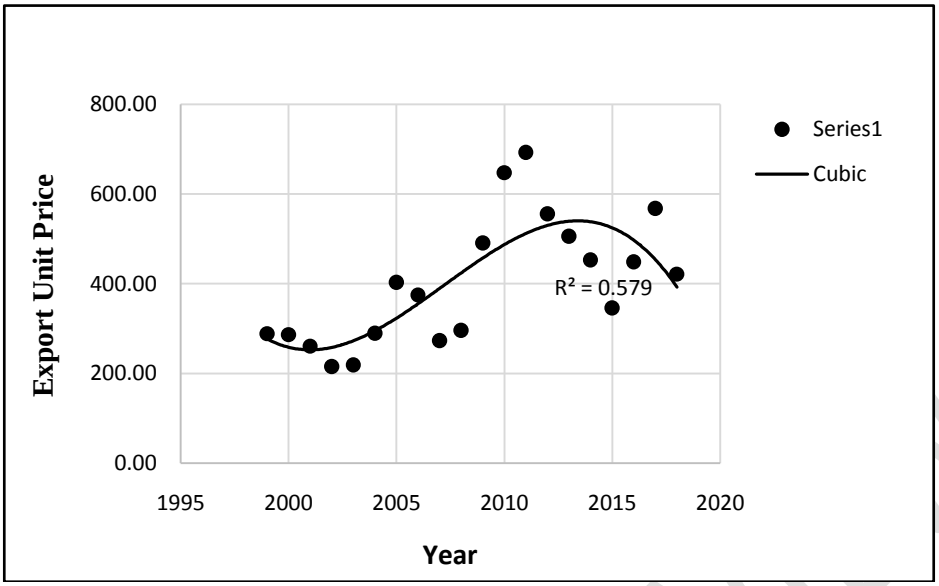

Fig. 4: Growth trend of unit price of exported Indian sugar

Fig. 4 shows that the unit price of sugar exported from India has an uneven cubical curve. During 2000-05 there was surplus sugar in the country that led to the export of Indian sugar at a lower price. Also, India did not meet the quality standards of importing countries which gave lowerreturns from international market (The Indian Sugar Industry, Sector Roadmap 2017- June 2007). A similar situation was seen after 2015-16, India dumped the sugar in international markets which also created a problem in the international market as India's export unit price was not even equal to the cost of sugar production of own country but also of the other competitive countries. The cost of manufacturing sugar was 15 per cent more than the international price obtained by exporting sugar. (Final Report of the Task Force: Sugarcane and Sugar Industry, March 2020).

From Fig. 5, it is clear that, the growth rate of imported quantity of sugar in India had an increasing trend over the study period. In 2009, the Government of India relaxed the norms for duty-free import of raw sugar under the Advance Licensing Scheme (ALS). The Government of India also extended the duty-free

imports of raw sugar and white sugar from the levy sugar obligation and market quota release system applicable to domestic sugar. The reason for this relaxation of import restrictions were severe domestic shortages and abnormally high sugar prices. This may have encouraged the import of sugar to India (India's Sugar Industry: Analysing Domestic Demand and Recent Trends, 2010-11).

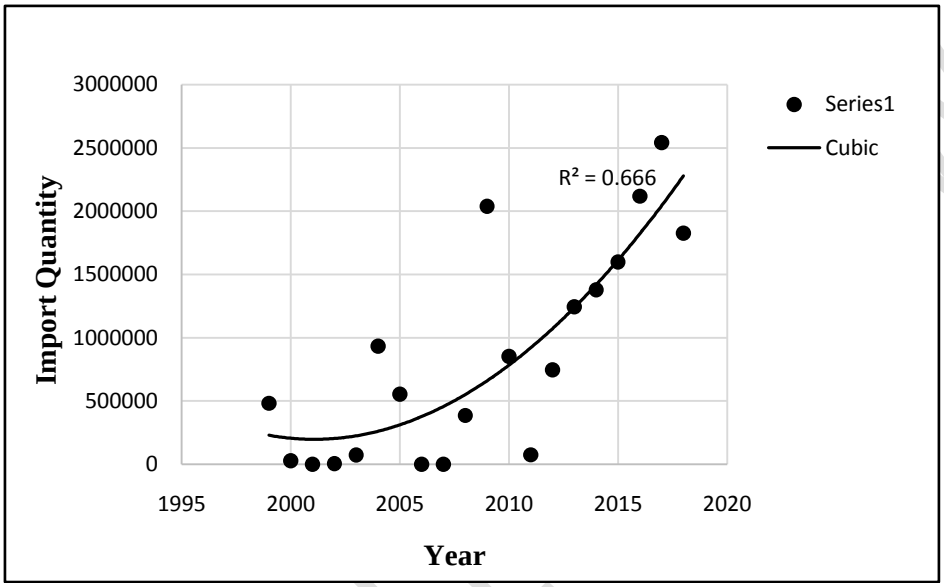

Fig. 5: Growth trend of imported quantity of Sugar in India

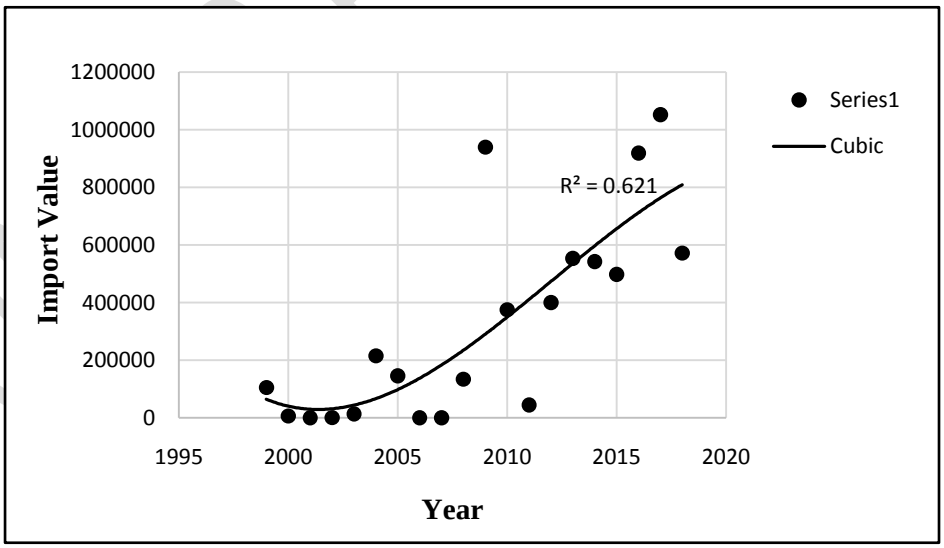

Fig. 6: Growth trend of imported value of Sugar in India

Fig. 6 portraits the growth rate of sugar imported in India during the period under study in monetary terms. The curve gave almost similar trend as that of

imported value of sugar which resulted from the fact that an increase in the quantum of imported sugar led to an equal increase in import value of sugar.

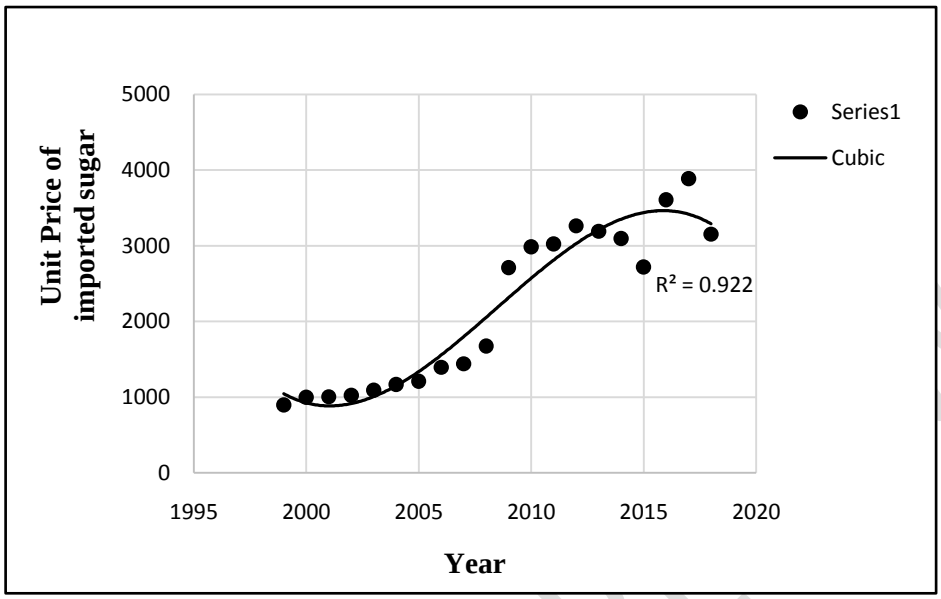

Fig. 7: Growth trend of unit price of Sugar imported in India

The growth of unit price of imported sugar has been shown in Fig. 7. The curve shows a fluctuating trend. The reason for low unit price during the initial years of the study period may be due to the allowance of duty-free import by the Government of India. On the other hand, the curve shows an increasing trend towards the end of the period under study. Devaluation of Indian (Indian currency) and increase in the import duty during the study period may be the probable reasons for such an observation.

Export Performance Ratio

The most important question arises, whether Indian sugar has a comparative advantage in terms of export as compared to other competitors in the international market or not. In order to find out the answer to this question the EPR for the entire period was calculated and the same has been presented in Table 2.

From table 2, it is evident that Indian sugar consistently showed a mixed picture of EPR values during the entire study period. During the last decade, 2001 (1.86), 2003 (1.29), 2006 (1.74), 2007 (3.92) and 2008 (3.92) enjoyed the comparative advantage with their EPR values registering more than one. Butin the years 1999 (0.04), 2002 (0.62), 2004 (0.16) and 2005 (0.63), the export of sugar from India was comparatively in a disadvantageous position as the EPR values found less than one. The year 2000 showed neutrality as the EPR value was found approximately one (0.99) indicating that the country was neither inadvantageous position nor in disadvantageous position so far export of sugar from the country was concerned.

Table2: Export Performance Ratio of Indian Sugar

Period I										
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
EPR	0.04	0.99	1.86	0.62	1.29	0.16	0.63	1.74	3.92	3.29
Period II										
Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
EPR	0.09	1.22	1.68	1.82	0.54	0.96	0.50	0.45	0.18	0.16
Overall Period- 1.11										

The EPR value for three consecutive years 2010 (1.22), 2011 (1.68) and 2012 (1.82) were more than unity which indicated that export of sugar was advantageous to the country. Remaining years of period II, i.e. 2009 (0.09), 2013 (0.54), 2014 (0.96), 2015 (0.50), 2016 (0.45), 2017 (0.18) and 2018 (0.16) with EPR value less than one gave an indication that the export of sugar from the country during the periods were in a disadvantageous position.

The overall period reported an EPR value of more than one (1.11) which indicated that India hada relative advantage in the international trade of sugar.

Competitiveness of Indian Sugar in Global Sugar Market

To find out the divergence of the domestic price of Indian sugar from the international price, competitiveness was analysed using Nominal Protection Coefficient (NPC). It explains the level of protection of Indian sugar. Table 3presents year-wise Nominal Protection Coefficient of Indian Sugar for the entire period under study.

Table 3: Nominal Protection Coefficient (NPC) of Indian Sugar

Period	Year	Domestic prices (P_d) (Rs/q)	International prices (P_r) (Rs/q)	NPC (P_d/ P_r)
Period I	1999	897	1243	0.72
	2000	998	1288	0.78
	2001	1005	1231	0.82
	2002	1025	1047	0.98
	2003	1091	1022	1.07
	2004	1168	1350	0.87
	2005	1211	1827	0.66
	2006	1395	1653	0.84
	2007	1441	1131	1.27
	2008	1675	1288	1.31
Average (Period I)			**0.93**	
Period II	2009	2711	2377	1.14
	2010	2987	2961	1.01
	2011	3024	3234	0.94
	2012	3264	2970	1.10
	2013	3192	2953	1.08
	2014	3096	2766	1.12
	2015	2721	2221	1.23
	2016	3608	3016	1.21
	2017	3888	3701	1.10
	2018	3154	2882	1.14
Average (Period II)				**1.11**
Average (Overall Period)				**1.02**

CONCLUSION

The picture that emerged from the on-going discussion pointed out that the growth trends were increasing for production, import quantity and value. Whereas, for export quantity and value, the unit price of import and export, the growth trends found uneven. The Indian sugar had a relatively comparative advantage during overall study period. Hence, there exists an export potential for Indian sugar. Steps should be taken to increase the productivity of sugarcane by providing market intelligence which will increase sugar export. Period-I showed competitiveness in the international market, but period-II and overall period faced non-competitiveness as the cost of sugarcane has been too high to have price competitiveness in the global market. Efforts should be made to import the raw sugar from other countries and after refinement it should be exported to the other countries. Even though India has remarkable price competitiveness in the international market, India enjoys freight competitiveness in the Indian Ocean region. The other major sugar exporters unable to supply sugar at a lower price than that of India due to the high transportation cost.. Therefore, India should focus on the countries of the Indian Ocean to enhance the sugar export.

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* The present paper is based on the doctoral thesis titled "Trade and Domestic Market: An Econometric Analysis of Sugar in India" to be submitted to the Department of Agricultural Economics, Dr. Rajendra Prasad Central Agricultural University, Bihar, Pusa, Samastipur by first author, Gaware Utkarsha Pramod.

APPENDICES

Appendix-I: Trend analysis of Production of Indian Sugar

Equation	R Square	Parameter Estimates			
		Constant	b_1	b_2	b_3
Linear	0.41	15990732	578182.71		
Logarithmic	0.31	14231846	3698920.3		
Inverse	0.14	23697770	-9095264		
Quadratic	0.41	16438876	455961.42	5820.06	
Cubic	0.42	18858755	-778800.7	149291.13	-4554.64
Compound	0.38	16120230	1.03		
Power	0.28	14949482	0.17		
Exponential	0.38	16120230	0.03		
S	0.12	16.951	-0.40		

Appendix-II: Trend analysis of Quantity Exported of Indian Sugar

Equation	R Square	Parameter Estimates			
		Constant	b_1	b_2	b_3
Linear	0.02	391289.62	15943.37		
Logarithmic	0.07	114490.06	209849.26		
Inverse	0.08	707668.09	-828148.5		
Quadratic	0.26	-412456.1	235146.73	-10438.26	

Cubic	0.29	-9471.12	29520.5	13454.13	-758.49
Compound	0.09	123142.38	1.08		
Power	0.20	49907.79	0.79		
Exponential	0.09	123142.38	0.07		
S	0.28	13.12	-3.48		

Appendix-III: Trend analysis of Export value of Indian Sugar

Equation	R Square	Parameter Estimates			
		Constant	b_1	b_2	b_3
Linear	0.08	96781.45	12621.78		
Logarithmic	0.13	-27444.93	121295.05		
Inverse	0.11	301559.06	-401635.30		
Quadratic	0.32	-240287.5	104549.67	-4377.52	
Cubic	0.45	99591.77	-68876.40	15773.43	-639.71
Compound	0.19	30356.44	1.12		
Power	0.32	10357.97	1.07		
Exponential	0.19	30356.44	0.11		
S	0.37	12.28	-4.20		

Appendix-IV: Trend analysis of Unit price of Exported Indian Sugar

Equation	R Square	Parameter Estimates			
		Constant	b_1	b_2	b_3
Linear	0.41	241.51	15.28		
Logarithmic	0.39	173.18	108.09		
Inverse	0.19	452.57	-281.31		
Quadratic	0.47	150.79	40.02	-1.18	
Cubic	0.58	310.66	-41.55	8.30	-0.30
Compound	0.48	246.52	1.04		
Power	0.43	207.54	0.29		
Exponential	0.48	246.52	0.04		
S	0.21	6.07	-0.72		

Appendix-V: Trend analysis of imported quantity of Sugar in India

Equation	R Square	Parameter Estimates			
		Constant	b_1	b_2	b_3
Linear	0.59	-291455	108124.42		
Logarithmic	0.39	-507730.90	638508.34		
Inverse	0.14	1095934.80	-1401344		
Quadratic	0.67	263304.66	-43173.68	7204.67	
Cubic	0.67	268870.07	-46013.47	7534.64	-10.48
Compound	0.31	2490.90	1.44		

Power	0.19	1239.71	2.15		
Exponential	0.31	2490.90	0.37		
S	0.04	12.29	-3.52		

Appendix-VI: Trend analysis of Import value of Sugar in India

Equation	R Square	Parameter Estimates			
		Constant	b_1	b_2	b_3
Linear	0.59	-145251.70	44859.69		
Logarithmic	0.41	-255278.90	274498.93		
Inverse	0.17	440832.33	-639608.10		
Quadratic	0.61	4215.26	4095.99	1941.13	
Cubic	0.62	102629.53	-46120.67	7775.97	-185.23
Compound	0.39	771.49	1.47		
Power	0.27	308.59	2.35		
Exponential	0.39	771.49	0.39		
S	0.07	11.48	-4.29		

Appendix-VII: Trend analysis of Unit price of Imported Sugar in India

Equation	R Square	Parameter Estimates			
		Constant	b_1	b_2	b_3
Linear	0.87	428.34	166.59		
Logarithmic	0.71	-135.56	1092.75		
Inverse	0.35	2683.46	-2812.39		
Quadratic	0.87	414.03	170.49	-0.19	
Cubic	0.92	1253.91	-258.06	49.61	-1.58
Compound	0.89	786.93	1.09		
Power	0.79	563.50	0.58		
Exponential	0.89	786.93	0.09		
S	0.43	7.84	-1.56		