



Is Sugarcane A Water Guzzler Crop : Fact or Myth? A Case Study of Dalmia Bharat Sugar Ramgarh

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ABSTRACT

The objective of this study is to assess and highlight the actual ground water requirement of sugarcane in the subtropical belt of the Uttar Pradesh. During surveys and studies conducted by different institutes and agencies it has been concluded that the sugarcane is a water guzzler crop which requires more water in comparison to other crops. In fact, the sugarcane is compared with the crops which are seasonal in nature while sugarcane is an annual crop takes 11-12 months' time. Its water requirement for Uttar Pradesh is around 1500-1750 mm out of which 50-55% comes through rains. In the study the actual ground water requirement of the sugarcane in its total life span of one year was studied and compared it with the ground water requirement of paddy and wheat in a year. The annual water requirement of paddy and wheat jointly was 1950-2650 mm which is 30-51% higher than sugarcane. During the study we found that the ground water requirement of sugarcane was also around 23% less than the paddy and wheat in a year. Besides the sugarcane stores that water in its stalks which is being extracted and used for the manufacturing of sugar and green powers generation. Therefore, considering the multiple contribution and less water requirement in comparison to paddy and wheat in a year considering sugarcane a water guzzler crop is not justified.

Keywords : Sugarcane, water guzzler, paddy, wheat, water requirements, ground water, subtropical zone, irrigation

INTRODUCTION

Sugarcane is a vital cash crop, playing a significant role in the world's economy. It is widely cultivated in tropical and subtropical regions, primarily for the production of sugar, ethanol, and other by-products like molasses, bagasse and pressmud etc.

Sugarcane is a water-intensive crop, requiring a consistent supply of water during its grand growth stages during monsoon season specially. Irrigation ensures adequate moisture levels in the soils during germination and tillering phase, promoting healthy crop development and high yields.

According to the reports of NABARD, the water guzzler paddy and sugarcane crop using more than 60 percent of irrigation water available in the country are largely being cultivated in the most water scarce regions of

the country restricting irrigation water availability for other major crops of the region. The relatively water abundant states in eastern region (eastern UP, Bihar, Jharkhand, West Bengal, Assam, and even Odisha), lag behind in production of these crops as they have not been able to erect suitable procurement structures for rice or attract sugar mills in these areas. This has led to a major mis-alignment in cropping patterns from the point of view of water availability. The hot-spots being Punjab-Haryana belt for rice and Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu for sugarcane (Gulati and Mohan, 2018).

The sugarcane crop in subtropical region requires around 1500 – 1750 mm water (upcane.org.in) of which 55% comes from rains and remaining 45% is met out through the irrigation. Nearly 5-6 times irrigation in the eastern and central Uttar Pradesh and 6-7 in western

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Region is found to be beneficial. Some of the earlier studies declared that the sugarcane is a water guzzler crop for the entire country which is not true. In this case study of subtropical zone of Uttar Pradesh, it was found that although the sugarcane is required more water for its growth but the total water requirement of sugarcane in a year is comparatively less than the water requirement of paddy and wheat in one year. In the studies conducted at the Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, the water requirement of rice has been estimated to be about 1,500 to 2,000 mm while the water requirement of wheat is 450-650 mm in Uttar Pradesh. Means in a crop year the total water requirement of Sugarcane is 1500-1750 mm and for the paddy and wheat jointly it's 1950-2650 mm (Gulati and Mohan, 2018).

It's very important to mention here that sugarcane contains in between 68-72% water and stores this water in its stalks which is extracted by the sugar mills at the time of crushing. Sugar manufacturing plants using this stock water to run process and treat the remaining water and send back for the irrigation again. If we consider sugarcane as a water guzzler crop without considering this fact it will make the study incomplete because other crops do not return water during their processing. <https://www.un.org/development/desa/publications/world-population-prospects-the-2017-revision.html>

MATERIALS AND METHOD

The field trial to assess the actual comparative ground water requirement for the irrigation in sugarcane, paddy and wheat were laid during 2022-23 at the command area of Dalmia Bharat Sugar, unit Ramgarh, UP. In this trial in the half portion of the plot, sugarcane was planted during spring season and in the other portion of the plot paddy and wheat were planted. In same agro-climatic and soil type we have provided measured irrigations during the different stages of crop growth as per requirement. Besides the published data of different institutes and agencies have also been analyzed to calculate the annual water requirement of sugarcane v/s paddy and wheat in a crop cycle year of 12 months. The findings of the analyzed data and trial conducted at DBSIL Ramgarh both are presented in this paper.

Comparative water requirement:

The comparative water requirement of sugarcane and paddy plus wheat are depicted in the (Figure 1), which clearly indicates that the water requirement of sugarcane is comparatively less than the paddy and wheat jointly in one crop season. https://sugarresearch.com.au/sugar_files//2017/09/Sugarcane-Advisor-Information-Kit-FINAL.pdf

It seems that at the time of water requirement assessment of sugarcane, the time required to complete

Max/Min water requirement (mm)

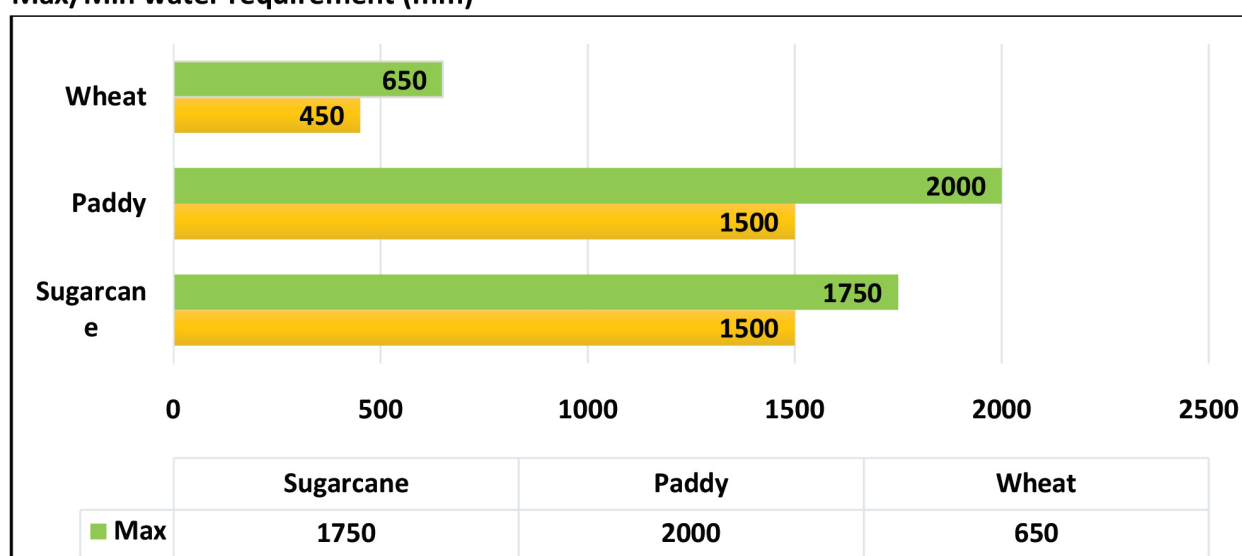


Figure 1 : Max/min water requirements (mm) for wheat, paddy and sugarcane

its life cycle has not been considered and it has been compared with other crops which are seasonal in nature. The sugarcane is an annual crop while paddy and wheat are the seasonal crops taking 5-6 months to complete their life cycle. Therefore, for the judicious assessment of the comparative water

requirement it should be calculated on yearly basis as the farmers are producing one sugarcane or one paddy and one wheat in a year. On the yearly basis the total water requirement of sugarcane is around 30-51% less than the combination of paddy and wheat, (Figure 2).

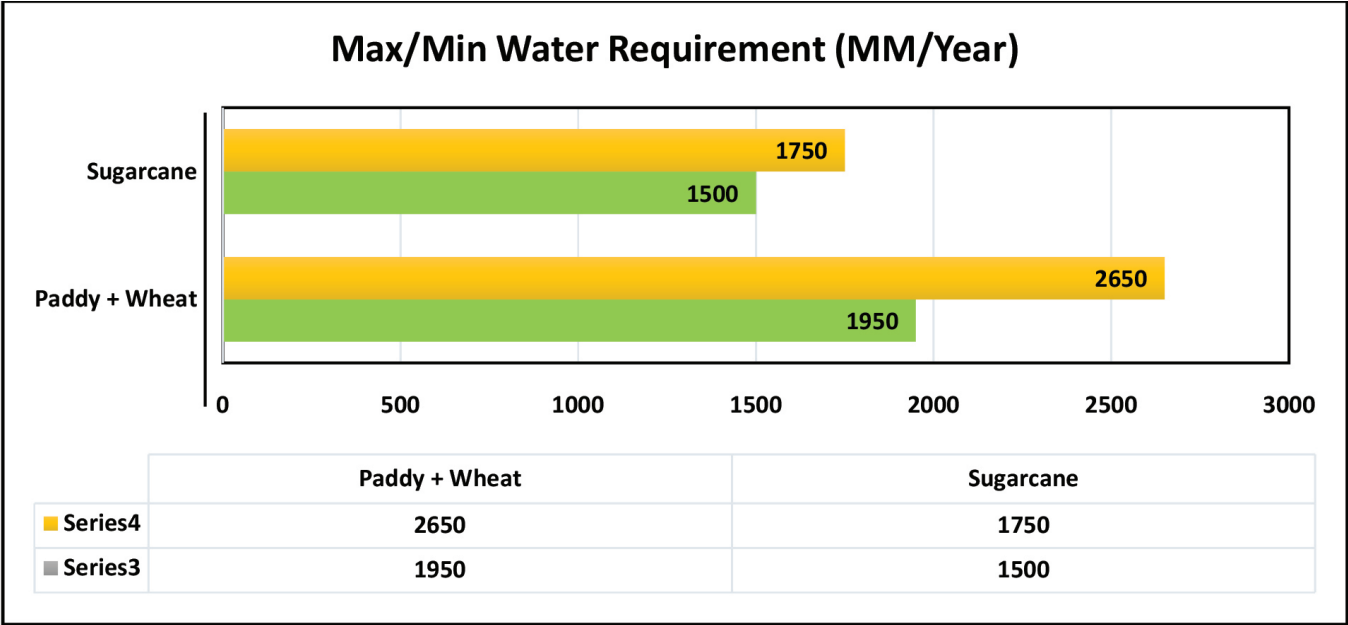


Figure 2 : Max/Min water requirements for sugarcane alone and combination of paddy + wheat
Water required for 1 kg production of final product–
(Data Source: CACP, NITI AYOg)

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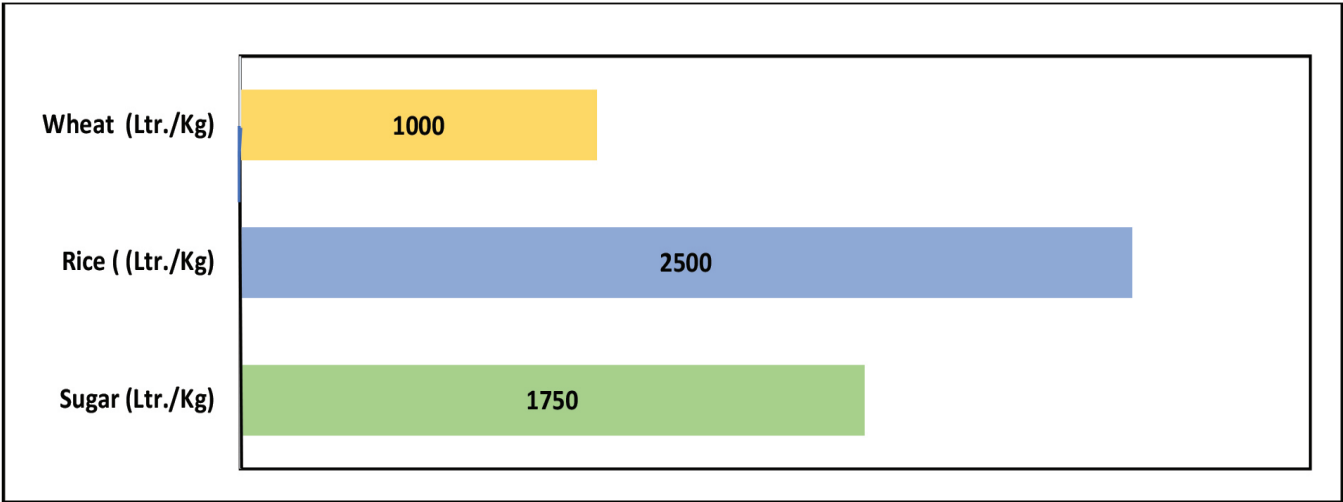


Figure 3 : Water requirement of sugar, rice and wheat (ltr/kg)

RESULTS AND DISCUSSION

Ground water requirements of sugarcane in comparison of paddy and wheat

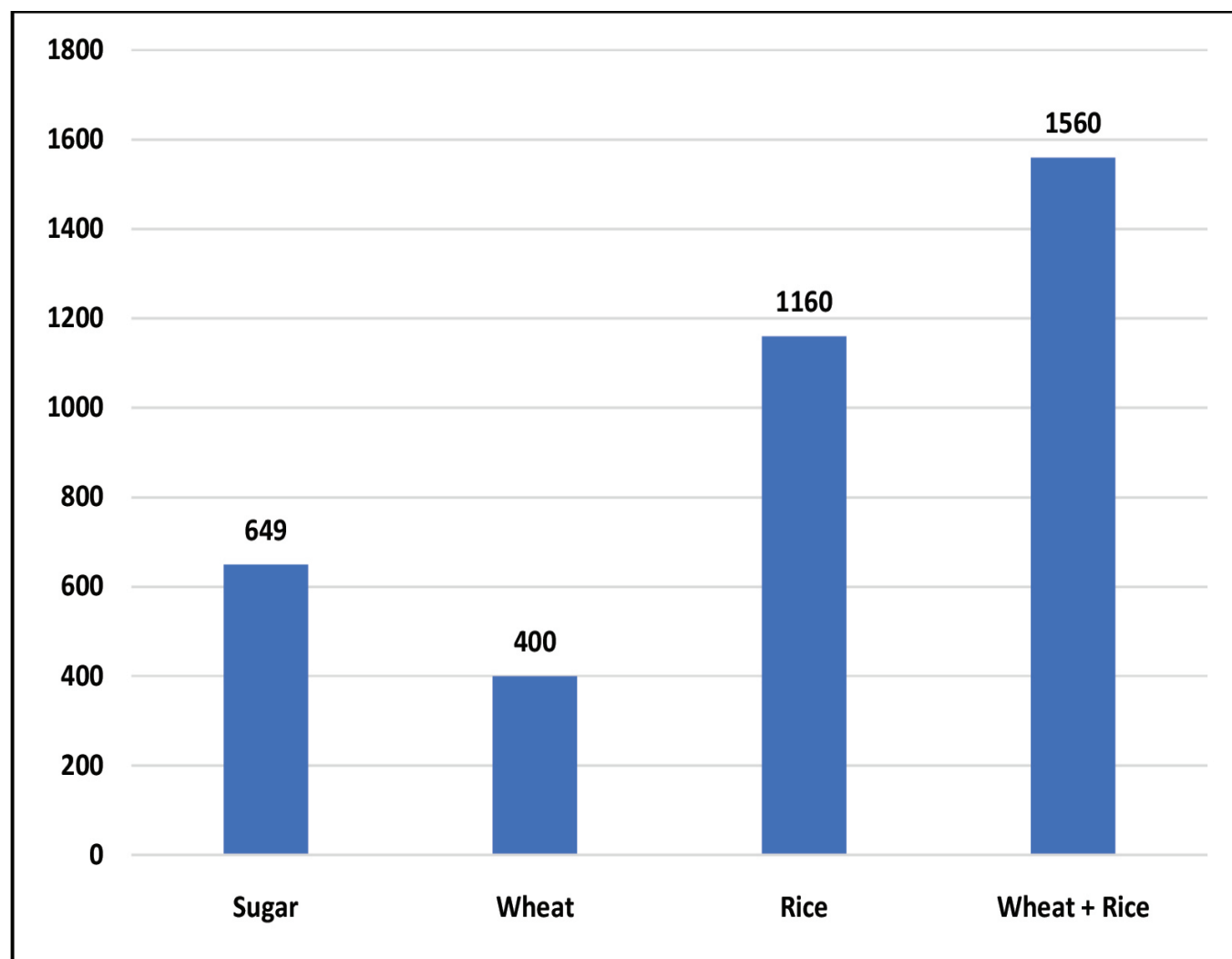
The present study was conducted at DBSIL Ramgarh to assess the ground water requirement for the cultivation of sugarcane, paddy and wheat, the findings are listed in (Table 1).

Table 1 : Ground water requirements of sugarcane in comparison of paddy and wheat at DBSIL Ramgarh

S. No.	Particulars	Unit	Sugarcane (1 Year)	Wheat	Paddy	Paddy + Wheat (1 Year)
	Ground Water Requirement					
1	1 Hect CM Irrigation	Lac LTR	1	1	1	1
2	Requirement of Water for one Irrigation	Hect. CM	8	5	7	12
3	Water Requirement per irrigation	Lac Ltr	8	5	7	12
4	No of Required Irrigation	Nos	7	4	7	11
5	Total Water Requirement	Lac LTR	56	20	49	69
6	Total Crop Age	Months	11-12	5	5.5	10.50
7	Crop Production	Qtls	750	50	65	115
8	Irrigation Water Requirement per Qtl.	LTR/Qtl	7467	40000	75385	60000
9	Production of Sugar, Wheat and Rice	Kg/Qtl	11.50	100	65	165
10	Water required for 1 Kg Sugar/Wheat/Rice	Ltr/Kg	649	400	1160	1560

The data depicted in the Table 1, clearly revealed that the ground water requirement for sugarcane is only 56 lac liters while in case of paddy plus wheat it was 69 lac liters. Means the sugarcane requires 23% less ground water than paddy and wheat in a year in the subtropical areas of Uttar Pradesh. Besides the per qtl/liter water requirement of sugarcane is 7467 liters only but the paddy and wheat requires around 60000-liter water in a year to produce one qtl grain (Singh and Rajendra Gupta et al. IISR).

In case of paddy, only seven nos' of irrigation was considered which included irrigation for nursery raring and puddling etc. During the study period the monsoon rains were normal and crop enjoyed around 960 mm rainfall. While in case of sugarcane seven no's of irrigation were considered which was on higher side as the state average is around six No's of irrigation for the plant cane in a year and only five no's of irrigations for ratoon crop. In case of pre-monsoon and summer rains the ground water requirement of the sugarcane would be reduced further.

Irrigation water required liter per kg -**Figure 4 : Ground water requirement for the production of 1 kg final product**

The results presented in Figure 4, indicated that even per kg of sugar the water requirement is only 649 liters while in case of wheat and rice it is 400 and 1160 liters respectively. It is also very clear that 1 kg wheat and 1 kg rice jointly required 1560 liters of water in a year but 2 kg sugar requires only 1298 liters of water which is also 20% less.

Water withdrawal from sugarcane

Sugarcane normally contains 68-72% water which stores in its stalks. During the crushing of the sugarcane this water is extracted in the form of sugarcane juice by the sugar mills. The boiling house of the sugar plant

separates this water by boiling from the sugarcane juice and use it for sugar manufacturing, the excess left-over water goes for the irrigation after the proper treatment.

The data of the extracted water from the sugarcane crushed in the season 2023-24 at DBSIL Ramgarh, is given in Table 2 which clearly indicates that sugarcane provide adequate water to the sugar plants to fulfill their water requirements for the manufacturing of sugar and boiler operations.

Details of extracted water from sugarcane crushed in season 2023-24 at DBSIL Ramgarh.

Table 2 : Water balance month-wise

		Nov	Dec	Jan	Feb	Mar	Apr	
1	Average Cane Crush (TCD)	6587	6510	6390	6168	5697	5737	6152
2	Solids available in cane							
A	Solids in Sugar	657	707	760	784	723	712	728
B	Solids in Bagasse	881	857	826	875	794	854	840
C	Solids in Molasses	221	281	265	264	248	302	261
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D	Solids in Mud	71	75	80	74	71	74	74
	Total solids in cane (TPD)	1830	1920	1932	1998	1836	1942	1903
3	Available water from cane for process	4757	4591	4458	4170	3861	3795	4249
4	Total available water % cane	72.22	70.51	69.77	67.61	67.77	66.15	69.06
5	Water consumption & losses in process							
A	Water in Sugar	0.26	0.28	0.29	0.30	0.26	0.25	0.27
B	Water in Bagasse	876	841	804	858	785	853	829
C	Water in Molasses	34	41	34	34	31	38	35
D	Water in Mud	230	227	234	217	200	207	220
E	Drift losses (1.5-1.65 % of Spray water)	1404	1426	1458	1512	1534	1431	1461
F	Vent losses	132	130	128	123	114	115	123
G	Drift losses @ (1.00-1.5%)	121	127	135	146	150	153	138
	Total water consumed (TPD)	2797	2792	2793	2891	2814	2796	2806
6	Available treated (TPD)	1960	1798	1665	1280	1048	999	1443
7	Plant requirement of Raw water							
A	Water requirement in sugar (TPD)	15	5	0	15	31	6	13
B	Water requirement in co-gen (TPD)	701	597	522	584	638	738	631
	Balance Water (TPD)	1245	1197	1143	681	379	255	799
8	Water available for irrigation (TPD)	0.19	0.18	0.18	0.11	0.07	0.04	0.13
9	Water Returned Ltr/Qtl	18.90	18.38	17.89	11.04	6.65	4.45	12.98

The data presented in the Table 2 clearly indicated that the sugarcane provides desired quantity of water to the sugar manufacturing units to fulfil their raw water requirement for sugar processing. Now the sugar mills are operating their plant with zero water

withdrawal as these units are using extracted water of the sugarcane for operating their power plants also and producing green energy without ground water withdrawal. It's a very good achievement of the industry.

CONCLUSION

The ground water requirement of the sugarcane which is an annual crop is 23% less than the its competitive seasonal crops of paddy and wheat. The water requirement is being compared with crop to crop therefore, it seems that the sugarcane crop is absorbing more water during its lifecycle of one year. However, this comparison should be made on the basis of ground water applied to the crops grown in a field for one year. The total water requirement of the sugarcane in a year is 1500-1750 mm whereas in one-year seasonal crops paddy and wheat requires 1950 - 2650 mm water in a year which is higher by 30 to 51%. During the study we found that 1 kg sugar requires only 649-liter ground water while 1 kg rice and 1 kg wheat requires 400 and 1160 liters of water, respectively. This data suggests that 2 kg grain rice + wheat requires 1560 liters of ground water for the irrigation while 2 kg sugar requires only 1298 liters irrigation water which is 20% less.

Besides above sugarcane provides following additional benefits –

1. The Sugarcane provides in between 68-72 liters/ qtl water during its crushing, sugar plants utilizing extracted water for the manufacturing of sugar; it also provides water for generation of green energy which is being supplied to grid.
2. Left over water around 13 liter/ qtl provides for the irrigation
3. Provides Molasses for production of Ethanol or country liquor and bagasse for cogen plants and paper mills.
4. Provides pressmud with around 70% moisture, being used as organic manure and CNG production.
5. Provides healthy nutritive green fodder for the cattle.

In fact, the sugarcane is a wonderful crop being grown around 50 lac hectare area of the country out of which 29 lac hectare area in UP only. It is an eco-friendly crop which provides lot of eco-friendly products for the community along with sugar. Hence, during considering its water requirement its contribution for green fuel in form of ethanol, green energy in form of electricity, and raw material for paper industry in form of bagasse, should also be considered.

In spite of multiple contribution, sugarcane is kept in the category of water guzzler crops which is not to be justified specially for subtropical belt of North India.

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