

## Enhancement in sustainable sugarcane and sugar production in U.P. towards secure food and yawning production gaps with future strategies

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### Abstract

India is the second largest producer of sugarcane (18.18%) and sugar (15.81%) and top most consumer of the sugar in the world. There are varying sugarcane productivities across various sugarcane producing regions of the country with widely varying sugar recoveries of obtained by the sugar factories. Keeping in view the prevailing sugarcane price fixation mechanism, cost of their inputs during the course of sugarcane juice processing and fluctuations in the prices of the sugar. The sugar industry is faced with a reality that sugar, molasses and bagasse can no longer be regarded as final product from a sugar factory. Thus, value additions, diversifications to be vigorously investigated as possible routes to new market and making sugar industry less dependent on a single commodity *i.e.* sugar. The northern states particularly Uttar Pradesh plays important role in improving national sugarcane productivity is obvious. Now days stagnation in sugarcane crop yield (72.37 t/ha) and sugar recovery (10.61%) in U.P. with decline in the factor productivity have raised a question during green revolution period. In order to maintain crop sustainability, applied researches are being conducted in different disciplines. Crop rotations, integrated nutrient management strategies and green cane harvesting have been resulted to increase irrigation and drainage efficiency, improvement in organic matter, its better effect on soil properties and sugarcane nutrition.

The Indian agriculture as a whole is undergoing several transformative changes. Growing population, changing life styles, expanding urbanization and accelerating climate change are creating new challenges for national agricultural research and development. Green revolution led to quantum jump in food grain production from 51 million tonnes in 1950-1951 to a record figure of 265.04 million tonnes in 2013-14. State like Uttar Pradesh comes in subtropical zone of the country, ended the sugar season 2016-17 as the highest sugarcane producer by leading Maharashtra, ending the season at 8.75 mt, a whopping 22.13% increase as compared to last year. The state also achieved an average yield of 72.37 t/ha, which is again the highest with an increase in the yield as compared to last year (during 2015-16). The sugar sector today not only has transformational opportunities that would enable it to continue to service the largest domestic markets but has also emerged as a significant carbon credit and green power producer and has potential to support ethanol blending programme of E 10 and beyond (Soloman, 2016). Declining fertilizer use efficiency and organic matter levels have been observed in soils and increasing the area of deficiencies including K, S and micro nutrients like Zn and Bo (Swaroop and Ganeshmurthy, 1998).

Uttar Pradesh states is located in subtropical region of the country and sugarcane planting lie on latitude of

35° N and 35° S with a 45 E (at elevation of 45 to 60 m above sea level). Daily minimum and maximum temperature averages in December – January and May – June are 4.2 and 40.5°C, respectively. Annual evaporation is around 2500mm. most of the rainfall occurs between July and September with an annual average of about 950mm.

Given the projected growth in domestic and international markets, the sector would need to produce at least 600 mt of sugarcane by 2030 to meet domestic requirement of sweeteners, bio electricity and ethanol for E 20 blending. In order to improve sugarcane and sugar productivity per unit area in U.P., greater investments in research and development with respect to improved cane varieties, seed nurseries, biofertilizers and adoption of improved farm practices will be key imperatives.

Sugarcane production cost per unit area in U.P. is higher as compared to other states. Land, agril. labours, capital, management and production technologies are the main basis of production. Proper utilization of these resources with maximum potential is very important for sugarcane production under low input or to reduce cost of sugarcane cultivation. Agricultural land is fixed and area under sugarcane could not be increased. Training of agricultural laborers and improvement in inter relationship of land owner and laborers may help in increasing their

work efficiency. Mechanization of cane setts cutting, planting, hoeing, earthing and chemical control of weeds etc. may help in reducing the cost of production.

**Autumn sugarcane based diversified crop production:** Autumn planted sugarcane crop produce about 12 -15 per cent higher cane yield and 0.5 units more recovery than spring planted cane. Area under autumn sugarcane is not increasing due to fear of farmers that loss in the *Rabi* crop like vegetables, spices, oil seed, pulses and cereals etc.

**Yawning productivity gapes with low sugarcane recovery during last five years in U.P. an analysis:** Uttar Pradesh has emerged fastly to give higher cane production in the country. The environmental condition of

U.P. is most congenial for cane and sugar production both. U.P. is divided into three different tracts on the basis of climatic and edaphic factors for sugarcane cultivation. Generally, the western U.P. is known to achieve higher cane and sugar production from plant and ratoon crops. But in the recent post the level of sugar recovery has been reported lower as compared to the precursor years of respected tract and to the other tracts like eastern and middle.

In the present situations, this subject has been proposed to analyze the reasons of low sugar recovery trends in western U.P. The following points may be responsible for the sugar recovery.

- Varieties

**Table 1: Trends in sugarcane area, production, productivity and sugar recovery of U.P. (2006 to 2016)**

Year	Sugarcane area (m. ha)	Sugarcane production (mt.)	Sugarcane productivity (t/ha)	Sugar production (mt)	Sugar recovery (%)
2006-07	2.247 (2.25)	133.95	58.20	8.48	9.47
2007-08	2.179 (2.18)	124.67	59.60	7.32	9.79
2008-09	2.084 (2.08)	109.05	57.20	4.06	8.94
2009-10	1.977 (1.98)	117.14	52.30	5.18	9.13
2010-11	2.125 (2.13)	120.55	59.30	5.89	9.14
2011-12	2.162 (2.16)	128.82	56.7	6.97	9.07
2012-13	2.112 (2.11)	132.43	59.60	7.49	9.18
2013-14	2.228 (2.23)	134.69	59.90	6.49	9.25
2014-15	2.141 (2.14)	133.06	60.50	7.10	9.54
2015-16	2.16 (2.18)	145.39	66.46	6.84	10.61
2016-17	2.193 (2.19)	133.70	72.37	8.75	10.61
All India (2015-16)	4.95	305.25	71.10	25.13	10.62

Source: Crop. Sugar, vol. 48 No. 4, December 2016

**Table 2 (a): Nutrient status of soil in U.P. (during 1953 - 54 to 2015 - 16)**

Characteristics	1953 - 54	2015 - 16
pH	7.6	7.2
Organic carbon (%)	0.61	0.31
Nitrogen (%)	0.053	0.023
Phosphorus (%)	0.120	0.061
Potassium (%)	0.720	0.450

**Table 2 (b) : Important physico – chemical properties of U.P. soil at present**

Characteristics	Range	Mean
pH	6.7-9.5	7.2
EC (dsm <sup>-1</sup> )	0.05- 1.0	0.28
Organic carbon (g kg <sup>-1</sup> )	1.5-6.5	3.10
Ca Co <sub>3</sub>	3.2-25.0	13.70
N (index)	0.96-2.90	1.60
P (index)	0.80-3.00	1.70
K (index)	1.00-2.89	1.86

- Management practices
- The manurial and nutrients status of soil
- Climate and post harvest management

Climate and post harvest management, Sugar synthesis and accumulation require bright sunny days and cooler nights. Minimum temperature is more important for sugar accumulation which should range between 14 - 7°C, In U.P., temperature falls below the required range and persist for longer duration which adversely affects the sugar accumulation. Longer duration of evergreen revolution encompassing natural resources and without affecting soil fertility environment adversely for increase crop production. There is urgent need to supply the nutrients through natural resources presently.

Biofertilizers have been proved to very useful nowadays for our agriculture as there have increased the productivity of different crops as well as saving the soil structure being polluted by the application of chemical fertilizers. About 79% free nitrogen is available in the environment (100 – 200 million tons). Some bacteria, blue green algae and azolla has tendency to fix the environmental nitrogen and make available to the plants while some bacteria / fungus can solubilize the fixed phosphorus and potash from the soil, release the plant growth substances which ultimately increase the crop yield upon their uptake from the soil. The alone or the mixture of these bio – agents is known as bio – fertilizers.

Among the organic decomposers *Trichoderma* sp. has been considered outstanding in decomposing organic matters viz., crop residues, pressmud cake etc. to organic fertilizers. *Trichoderma* has nine species among which *T. harzianum* and *T. viridae* are used important role in releasing antibiotic substances, growth promoting substances and crop ripening substances, decomposing materials and antioxidant. Additionally these excrete

hormones, which solubilize thus they act like bio – fertilizers. A study depicted that in the bio – organic cultivation with 1.0 kg of organodecomposer / ton PMC application during cane planting resulted good impact on cane crop and increased about 5-10 % cane yield. Similarly 10.0 kg decomposer / ha use in ratoon crop elevated ratoon yields significantly (Singh and Srivastava, 2007).

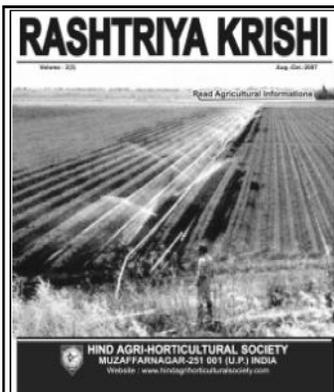
**Conclusion :** Because of climatic and edaphic conditions in U.P., sugarcane and sugar production need more special attention. Maintaining soil health, rising water table, mechanization in cultivation, Integrated Nutrient Management (INM) and Integrated Diseases Management (IDM), better ratoon management, intercropping with diversified farming and improved varieties and agronomic practices are of great importance for sustainable production. Despite, the fact that intercropping with green manuring and trench method of cane planting with wider row spacing are a profitable proposition and an efficient way of utilizing natural resources like sun, soil and that its technology has been almost perfected. Availability of inputs in market, arranging credit facilities to farmers, supply of varieties and seed of suitable crops and involvement of sugar factory personnel will certainly improve economic condition of farmers.

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