

Report of the Working Group on Sugarcane Productivity and Sugar Recovery in the Country

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GOVERNMENT OF INDIA
MINISTRY OF CONSUMER AFFAIRS, FOOD AND PUBLIC DISTRIBUTION
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Foreword

There would be very few industrial activities like sugar manufacturing which apart from its contribution to GDP, is source of substantial rural / semi-rural employment and can potentially contribute to renewable energy pool in a significant manner. The potential of the sugar sector, seen from this perspective is immense and there are many facets of this industry, not fully explored. The momentum is picking up globally, whereby the sugar plants are being seen as multi product industrial complexes which manufacture not only sugar but also industrial / potable alcohol, fuel ethanol, bioelectricity, bio-gases and bio-plastics as equally valuable activity. While, production of industrial / potable alcohol and electricity is now a well-established activity in the sugar mills in our country, the end use related to fuel ethanol is gradually picking up. In addition, the industry has to pick up the emerging value addition possibilities offered by press-mud / effluent based biogas (CNG) generation as well as bio-plastics production from alcohol. In fact, the long-term viability of the sugar complexes would be dependent upon the revenue streams from value added activities.

The whole manufacturing activity related to sugar and allied products is concomitant upon the availability of sugarcane in the required quantity and quality. Unfortunately, the same has been erratic/ below par whereby many sugar mills in the country have been working below capacity in the years of shortages and have been suffering losses in the years of surpluses. The sugarcane cultivators have been the ultimate sufferers in both situations, it being a matter of livelihood for them. The huge amount of capital and human already invested in the sector can be justifiably utilized only when abundant sugarcane with excellent sugar recovery levels is available. The recent efforts of Government of India to remove most of the regulatory controls in the sector would fully bear fruit only when we secure raw material supplies. With this intension in mind, I had asked department to work out the practical solutions for overcoming hindrances in attaining the desired levels of sugarcane productivity and sugar recovery. I am happy that the Working Group constituted for this exercise has come out with seemingly workable recommendations which I also expect will be implemented in right earnest.

(Prof. K. V. Thomas)

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Preface

Acting upon the recommendations of Dr. C. Rangarajan Committee, the Government has taken significant steps to remove regulatory controls on the sugar sector. This is expected to unbundle the unexploited potential of the sector and generate increased economic activity. At the same time, it was felt that substantial improvements are required on the sugarcane productivity and sugar recovery front, which have been, more or less, stagnant for the past many years, otherwise the sector will not be competitive internationally. The increased sugarcane productivity will also improve the overall income generation of the sugarcane cultivators. In this background the report of the Working Group is very timely.

The Working Group has made many useful recommendations. With appropriate dovetailing of the recommendations in the activities supported under the Sugarcane Development Fund, which this department administers, as well as the sugarcane support schemes of the Ministry of Agriculture, hopefully we would make significant improvements to bring the domestic sugarcane productivity and sugar recovery at par with the standards of the global leaders.

(Sudhir Kumar)

Summary of Recommendations



Summary of recommendations

1. Recommendations related to crop aspects

❖ **Credible Seed Programme**

Adoption of three-tier seed nursery programme with seed replacement at least once in 6 years and increasing use of tissue Culture for multiplying the basic genetic material for establishing breeder seed nurseries may be supported by government. *(Page 27-28)*

❖ **Institutionalized Extension Support**

Development of sugar mills as the pivots around which all extension support activities for their feeder areas occurs may be encouraged. *(Page. 29)*

❖ **Sustainable utilization of water and fertilizers**

Fertigation i.e. drip irrigation systems with inbuilt fertilizer application mechanisms as well as establishment of soil testing / advisory labs may be encouraged. *(Page. 29-30)*

❖ **Sustainable cultivation practices**

Adoption of sustainable cultivation practices during the entire life cycle of the crop including proper / recommended tillage practices, proper planting methods, proper spacing, intercropping, fallow management, water and fertilizer management, ratoon management as well as bio-integrated pest management strategies may be supported. *(Page. 30)*

❖ **Mechanization**

Equipments list for subsidy support in the schemes should be exhaustive and the test certificates of the designer Institute/SAU should be recognized by all states for the purpose of subsidy. In order to facilitate development of region specific cane harvesters the Department of Agriculture and Cooperation may look at the possibilities of revenue neutral machine development programmes in PPP mode through partnership of ICAR institutes / ISMA – NFCSF / International – National Machine Manufacturers. The Department of Food and Public Distribution may concentrate its support for the mechanization part to the proven machineries and at the same time may consider supporting incubators for development of locality specific harvesters. *(Page. 30-31)*

❖ **Special Scheme for drainage problems in Bihar**

State government can be sounded to conceive a sound landscape management project for which even international donor agencies / aid agencies could be roped in with the intermediation of the central government. *(Page. 31)*

2. Policy support

❖ To utilize **ethanol** as a major contributor to the energy security of the country and to gradually minimize dependence on petroleum sector imports. Country can also start preparing grounds for necessary amends in the automobile policies so as to promote the development of flexi fuel engines as well as delivery pumps, an area which would need full-fledged adoption, once the blending wall of 20-25% blend is attained, and an explorable option in this regard could be in the form of tax/excise duty based incentives. *(Page 32-34)*

❖ To reap natural advantages in specialty sugars. While the “**Fair Trade Sugar**” and “**Gur**” are the products which more or less exists in the country, and only effort needed is on the certification / branding / marketing part and is better taken up by the sugar industry's bodies, there is a sound case for initiating policy

interventions which can promote production / branding of **Organic Sugar**. *(Page. 34)*

- ❖ **Special Purpose Vehicles (SPVs)** could be floated to **strengthen the state level sugarcane research institutes**, which were lagging due to paucity of trained manpower, financial resources, etc. It can be encouraged by state government / research organization as well as the sugar mills and the sugarcane farmers becoming contributing and managing partners. *(Page. 34)*
- ❖ Appropriate changes in the **import policy / tariffs etc, may be made to promote Sugarbeet as a complementary sugar crop** as the domestic availability of the quality raw materials i.e. seeds, pesticides, etc. for Sugarbeet crop may be a concern in the beginning stages of domestic expansion of this crop. *(Page. 34-35)*
- ❖ To promote voluntary adoption of the sugarcane samplers / sucrose testing machines. *(Page. 35)*

3. Overcoming administrative impediments

- ❖ The DAC, in consultation with the state governments, need to devise an enabling mechanism so that the varieties released through **Central Variety Release Mechanism are allowed to be automatically/ speedily propagated in the states**. *(Page. 35)*
- ❖ The annual renewal of the cane areas by the office of the cane commissioners in sub-tropical part, especially UP and Uttarakhand is widely perceived to lead to lack of enthusiasm among sugar mills in nurturing the sugarcane crops in their command areas. Dr. C. Rangarajan Committee has also recommended **longer duration of cane area reservation**. The matter needs to be actively pursued with the state governments. *(Page. 35)*
- ❖ Permitting maturity based harvesting in sub-tropical states may also facilitate standing cane harvest by the sugar mills as practiced in the major part of tropical belt in India. These two interventions can drastically change the landscape of sugarcane cultivation and are the only long-term solutions to overcome the huge **gap in the cane cutting – crushing duration in sub-tropical India** and may be persued with the state governments. *(Page. 36)*
- ❖ Registration of bio-pesticides and manufacturing is treated on lines similar to chemical pesticides. The simplification of the certification procedures in regards to bio-pesticides will enable their speedier adoption and may be considered. *(Page. 36)*

4. Realigning SDF activities

Expansion of Grants- in-aid component of SDF

- ❖ Tissue Culture infrastructure in the research organizations may be funded through grants **to support establishment of breeder seed production facilities** which can be further propagated by the sugar mills through registered / identified seed growers. In the interregnum and in case the situation demands, the grants may also support alternate / traditional pathways of gene multiplication / breeder seed production by research organizations. *(Page. 45-46)*
- ❖ For promoting sugar mills as hubs for organizing the agricultural extension services through institutionalized arrangement for **technical consultancy, with the identified research organization** for each state, SDF cane development loans may be granted subject to a viable and long term MoU between the sugar mill and the identified organization, which should act as hand holding partner for

all crop development related activities. The expenses for this arrangement should be borne by SDF through grants-in-aid to the nominated organization. The nominated organization would also be made responsible for concurrent and long-term impact analysis of the activities. *(Page. 46)*

- ❖ Grants may also **be provided for promoting incubators for indigenous harvesters** utilizing combined initiative of research organizations, industry's representative bodies and local machinery makers. *(Page. 47)*
- ❖ **Pilot projects** envisaging production of a specified quantity of **organic sugar** in a mission mode in a specified time band may be supported through grants. *(Page. 46-47)*

Expansion and restructuring of Cane Development Loans

- ❖ Loans may be sanctioned only for state-wise identified, key constraints; in mission mode with clearly measurable targets and clear cut plans for final impact analysis; loan amount per project can be enhanced, so as to cover activities in a saturation mode; loan duration could be enhanced to at least five years *(Page. 40-41)*
- ❖ Loan may be sanctioned only for **appropriate combination of identified components** *(Page. 43-45)*
 - ❖ Variety / seed replacement
 - ❖ Mechanization
 - ❖ Fertigation
 - ❖ Sustainable cultivation practices
 - ❖ Institutionalized Extension support
 - ❖ Incentivization of seed growers
- ❖ **In order to institutionalize the involvement of research organizations** with the cane development activities, the loans may be granted only for projects with inbuilt consultancy / technical support / breeder seed supply or genetic material supply (for raising breeder seed nurseries) arrangements with the appropriate research institute / organization The loan proposals should also reflect the envisaged arrangements for seeking extension support as well as periodic Impact analysis arrangements through the concerned research organization. *(Page. 41-42)*

Re-prioritization in other components of SDF Loans

- ❖ Loans should be prioritized to **up-scale the units with ≤ 2500 TCD**. Support for up-gradation of < 2500 TCD plants should preferably be for the projects **envisaging simultaneous establishment of cogeneration plants**. While, the SDF loans may be prioritized for up-gradation of such small capacities, wherever financial funding norms permit such funding, the central and state governments need to work in tandem so as to find out practical ways for revival of the un-bankable sugar mills. *(Page. 38)*
- ❖ Loan should also be prioritized for projects targeting **establishment of cogeneration / distillery integrations in the existing sugar mills**. The **locational priorities of Oil Marketing Companies (OMCs)** while deciding SDF loans for distillery projects may be kept in mind. *(Page. 39-40)*

Chapter I | Background



Background

1. Socio-Economic Significance

The sugar industry, sustains the livelihood of 6 million agricultural and 0.5 million skilled and semi-skilled industrial worker families as well as generate significant employment in ancillary and allied activities. The area under sugarcane hovers around 5 million ha which is around 3% of the gross cultivable area in the country. In fact, sugar manufacturing is one of the largest agro based industry in the hinterlands of the country. The turnover of the sugarcane & sugar related economic activities is in the range of Rs. 80-85 thousand crores per annum, out of which around Rs. 55-60 thousand crores accrues to the sugarcane farmers of the country.

2. Significant part of global production and consumption

The Indian share in global sugar production has risen from 5% to 15% in the last five decades. In the same period India's share in global sugar consumption has gone up from 5% to 13%. Country is now the second largest sugar producer in the world and despite the largest consumption base in the world is self-sufficient and is also able to generate exportable surpluses. Country has produced sugar in the range of 24 – 26 mln MT the last 3 sugar seasons, has met the domestic sugar consumption requirements estimated to be in the range of 23 million MT for the ongoing 2012-13-sugar season and has exported surplus production.

The estimated Compounded Annual Growth Rate (CAGR) for domestic consumption of sugar is 3.5 %, which is more than the global average and is attributable not only to the lower initial base but also to the ever increasing disposable incomes (2.1% - contribution on this account is comparable to world standards of per capita consumption growth of sugar) as well as population growth (1.4% - contribution). As per estimates, the share of bulk consumers in the sugar consumption basket ranges from 60% - 65 %. And the rest of the consumption is by individual households. The per-capita consumption of sugar in the country is estimated at 18 kg./annum for 2011-12 sugar season. Another 5kg/capita per annum sweetener consumption in the country is by the way of Gur/ Khandsari products. The still lower consumption base of sugar in the country is indicative of huge opportunities for the domestic industry and as the country grows, the domestic sugar consumption may match the world standards (the world sugar per capita consumption is around 24kg annually and the per capita consumption in Europe and American Continents is around 35-40 kg/annum).

3. Emerging role as Renewable Energy Source

Gradually, the sugar industry is also emerging as a substantial source for meeting a part of the ever increasing energy needs of the country through the co-generation of electricity and the Ethanol, which are renewable/green sources of energy and these developments hold the potential of converting Sugar mills into huge Energy Complexes with passage of time. Though the contribution of these activities to the turnover of the industry at the moment is only around Rs. 10-12 thousand crore, over long term, the sugar industry has the potential to meet upto 20-25% of the total motor-fuel (Petrol) requirements of the country, and can therefore become a substantial partner in reducing

the foreign exchange outgo and attaining energy security, apart from meeting the traditional requirements of potable and alcohol based chemical industry.

4. Profile of Industry

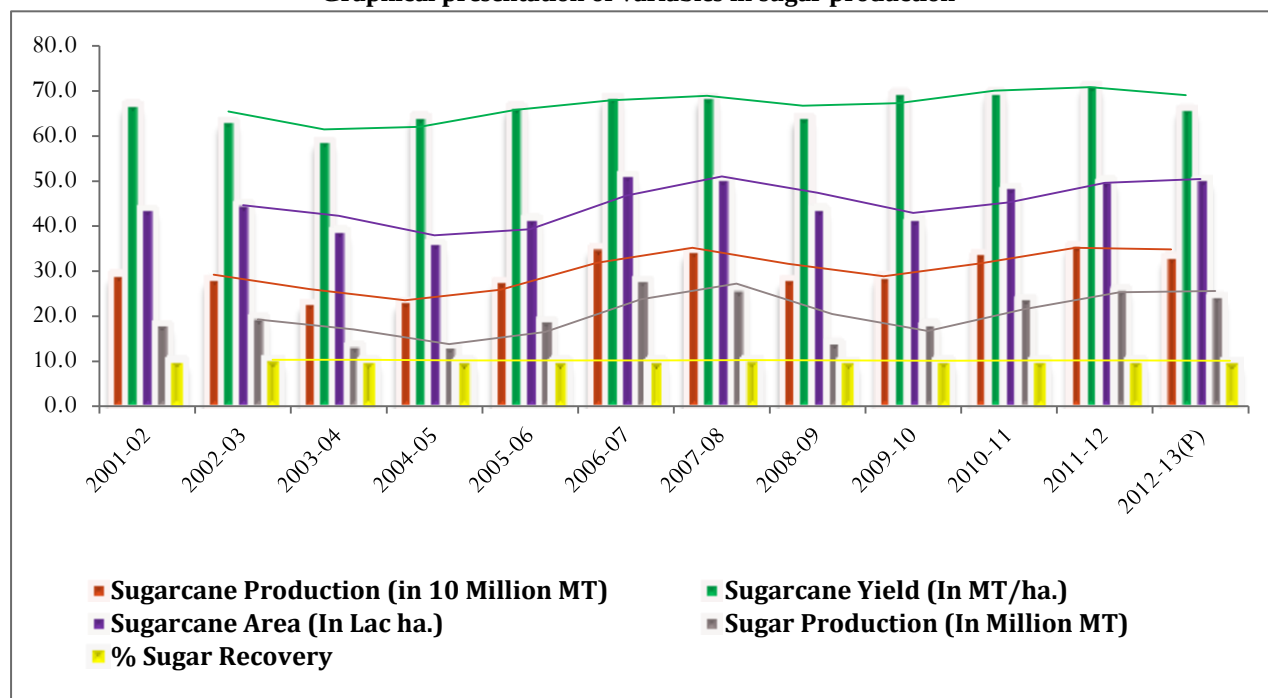
- (i) The sugar manufacturing activity in the country is widely spread out among 10 states/ UTs, out of which 5 states are in sub-tropical belt (Punjab, Haryana, Uttarakhand, Uttar Pradesh, Bihar) and the other 5 states are in tropical part of the country (Gujarat, Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu). The states of Chhattisgarh and Madhya Pradesh, in Central India as well as Odisha (Eastern India) and the Union Territory of Puducherry (Tropical India) also contribute to the domestic sugar production to some extent. There are units of every size, but mostly in 2500 TCD- 5000 TCD bracket, but increasingly, expanding and going even beyond 10000 TCD. Based on the existing levels of sugarcane availability and sugar recovery, the tropical and sub-tropical belts have the potential to produce around 16 million MT and 12 million MT of white sugar, respectively every sugar season.
- (ii) Two standalone sugar refineries have also been established in the country in the coastal belt of Gujarat and West Bengal which produce refined sugar from imported raw sugar and also from indigenously produced raw sugar. Though, these refineries are export oriented, the sugar produced therein has also scope of augmenting the white/refined sugar stocks in the country particularly during the years of low production and can radically improve the sugar security in the country. The daily sugar production capacity of these two refineries is around 5000 MT, which translates to production capacity of 1.5 million MT. In addition, raw sugar refining capacities have come up within the existing sugar mills also.
- (iii) The gradual liberalization of the sector and increasing linkages to the global sugar markets are bringing transformational changes in the Sugar sector whereby the efficiencies are taking place from the inefficient operators. As such, though there are 690 registered sugar mills, 93 sugar mills are on the verge of permanent closure and have not done any production during last five sugar seasons, leaving 597 number of operational sugar mills. Moreover, out of the operational mills, all the mills have not worked in all the years and the maximum number of sugar mills, which have worked in a single year, has been 529 (during 2011-12 sugar season). A further churn out can be expected corroborated by the fact that 136 new sugar mills are in various stages of establishment and can be expected to go to production stage in 2-4 years' time horizon. Most of the new projects are integrated with inbuilt planning for cogeneration and distillation facilities. The upcoming capacities are mostly in the tropical belt of Maharashtra and Karnataka. Annexure-I & Annexure-VI provide a glimpse of the manufacturing capacities of the Indian sugar industry.
- (iv) The industrial capacity is majorly under ownership of private sector units and co-operative sector, though there are a few public sector units owned by State Governments. In fact, the sugar industry has been in the vanguard of the establishment of co-operative movement in the states of Maharashtra and

Gujarat. While the total number of operational sugar mills in the cooperative sector (286) exceeds the number of operational sugar mills in the private sector (282), the size of the mills is in general bigger in the private sector. In the process, the crushing capacity wise split up between cooperative and private sector is loaded in the favour of private sector. Out of the operational per day cane crushing capacity of 22.24 Lac TCD, the private sector owns 13.74 Lac TCD, the cooperative sector owns 7.77 Lac TCD with the rest being with the public sector undertakings (29 sugar mills - 0.73 Lac TCD). Most of the upcoming projects are in the private sector. The sickness levels are also higher in the cooperative sector.

5. Persistent Problem Areas

- (i). The cyclicity of production has been the bane of Indian sugar sector. The peak of sugar production achieved in the country has been the figure of 28.2 million tonnes, during 2006-07, the graph has not been uni-directional and steady and there have been wide swings. Due to raw material shortage, sugar mills in Sub-tropical belt generally work for not more than 100-130 days. The working days in Tropical belt have been in the range of 140-180 days except Tamil Nadu where industry is able to get the working days stretched even upto 200-210. (Annexure –II, the working duration data)
- (ii). The industry, therefore, mostly has been working below capacity, a handicap which adds to the production costs, apart from raw material costing issues, and therefore, generally, out - placed in the world trade. In the process, in the years of surplus production, there are gluts leading to crash of domestic prices, as the higher cost structure generally makes Indian exports non-competitive and country finds difficult to push the surplus sugar out of country. In the year of shortages, the fixed costs affect the balance sheets of the industry. The payment to the farmers on account of sugarcane supplies, therefore, consistently gets affected leading to fluctuating cycles of planting and the infamous “sugar cycle” of India.
- (iii). Accentuating the poor economics of sugar production in the country has been the stagnant %age sugar recovery levels (Annexure- III, recovery figures). The %age sugar recovery from the crop has been far below standards achieved by major sugarcane based sugar producers with comparable agro-climate, like Brazil and Australia. The sugar recovery in different states has been hovering around 9.5% to 11.5%, with all India figures of around 10% while the potential is at least 11% in Sub-tropical part and 13% in the Tropical part of the country.
- (iv). The data given in the Annexure-IV provides a glimpse of the year-to-year sugar production trends and the contributing factors. The Annexure – V indicates the story, each major sugar producing state-wise. The trends have also been captured in the adjoining graph.

Graphical presentation of variables in sugar production



(v) The story gets further complicated by the drawl of significant part of sugarcane (15-20%) by the unorganized sector manufacturing Gur and Khandsari in the Country. As per estimations by various agencies, the share of Indian Gur/Khandsari production at about 6 million tonnes annually is 50-55 % of world production of similar products (10-11 million tonnes). About 60% of Indian production of Gur/Khandsari is in Uttar Pradesh, Maharashtra produces around 11% of domestic production with balance spread out among other sugarcane growing states. A reverse relation between Gur and Sugar production has been seen by the experience of last three decades. As such, the drawl of the sugarcane for alternate uses is more at the times of anticipated downswings in the sugar production.

(vi) In general, the farmers tend to shift to the alternate crops due to sectoral imbalances caused by sugar glut situations. In subsequent years, once due to downfall in sugar production the prices firm up, farmers tend to shift back to the sugarcane crop. The variations in the yield have been mainly climate afflicted, even though the sugarcane crop in major belts is 80-90 % irrigated, problems in adoption of scientific management practices.

6. Significant gaps in Potential and Achievement

(i). Country is far off-the-mark in realizing the full potential of the human and capital invested in the sector. While Brazil has become the largest producer of sugar in a short span of 3-4 decades and currently produces around 33 to 35 million tonnes of sugar annually, apart from huge quantities of ethanol as motor-fuel alternative and its sugar economy is majorly export oriented, Indian sugar despite having the cushion of huge domestic captive market has not been able to create a permanent niche in the international trade. Even the major neighborhood import markets –

Indonesia / Middle Asia / Africa have been majorly dominated by Brazilian/Thai sugar. Out of 48 million tonnes of Imports in South Asia / Middle Asia / Africa, India's export share stood at meager 27.70 % in the last 7 years against the Brazilian / Thai share of 70%.

- (ii) Country has not been able to tap the potential of sugar industry in meeting at least a part of the energy sector needs. In Brazil, around 50% of the motor fuel requirements are met by ethanol (mainly produced by sugar industry) and vehicles run on flexi-fuels (E20 – E25 / 100% anhydrous alcohol/ 100% petrol), saving the country valuable amount of foreign exchange outgo on import of Petro-products, whereas we have been grappling with the situation whereby even E5 blending programme is just gaining momentum.

7. Recent Positive developments on the Policy Front

In order to, harness the unexploited potential of the sector, the Government has recently acted on the major recommendations of Dr. C. Rangarajan Committee on sugar sector and has dispensed away with the major regulations related to the regulated release of sugar and imposition of levy on domestic production and these developments are expected to boost the bottom line of the industry in the long run. Similarly, the trade barriers have also been more or less removed and are expected to provide freedom to the industry on the export / import front.

8. Constitution of the Working Group

Realizing the fact that the enhancement in the sugarcane productivity and sugar recovery standards in the country hold the key for sustainability of the sugar sector and the amelioration of the sugarcane cultivators, the department had conducted a “Brain storming session on the issues concerning sugarcane productivity & sugar recovery in the country” under the chairmanship of Secretary (F&PD) on 8th January, 2013. Subsequently, to concretize the issues which came out during the session, it was decided by the department to constitute a Working group with representations from major research organizations in the country as well as the sugar industry apart from official representations from Ministry of Agriculture as well as this department and with the following mandate:

- To study/analyze factors restricting sugarcane productivity/sugar recovery in the country, in each, major sugarcane & sugar producing State/potential State.
- To come up with short term and long-term recommendations, with actionable plan, which are implementable in immediate future to improve the sugarcane productivity and sugar recovery in the country.
- To undertake periodic review of the progress achieved in implementation of the action plan and to suggest mid-course corrections, whenever required.
- To scan the implementable research findings (on annual basis) and to suggest the implementation strategies for major developments worth application/extension in the field.

Chapter II | Approach Adopted By the Working Group



Approach adopted by the Working Group

1. Starting with the premise that while the sector is replete with Literature / Reports / Recommendations / Research Findings with what needs to be done, and that the key bottleneck is the execution in a vast / diverse country like ours, the basic approach adopted by the Working Group centered on the following:

❑ **To zero down on 2-3 key impediments in each state requiring support / intermediation from Central Government and to suggest the practical solutions to overcome the identified key impediments**

While the constraints could be enormous, state / region specific and may need active involvement of numerous agencies, committee has tried to identify high impact activities, the constraints related to which, if tackled, can contribute to the major part of envisaged improvements

❑ **To build upon the existing resources / research findings and not try to reinvent the wheel**

Fortunately, the country is endowed with tremendous knowledge pool of scientific and technological advancements in the sector, and only needs suitable administrative / structural support mechanisms and facilitation so as to cover the last mile. As such, even for the sugarcane varieties, where the period for development of a new variety could be inordinately long, the group realized that the sensible approach would be to suggest suitable mechanisms for speedier adoption of the best possible varieties from the existing pool while leaving the field related to further development of varieties to the research, as a matter of continuously evolving science.

❑ **PPP possibilities to overcome lab to land hindrances**

While the scientific inputs are majorly generated by government research organizations, the extension of the same to the field needs active sharing of responsibilities by the industry, due to enormity of the job. As such, the group has tried to look at the possibilities of up-scaling the Public Private Partnership (PPP) prototypes, already operational in some form or other in some parts of the country.

❑ **Identification / Replication of Good Practices**

While, many of the practices could be state / region specific, guided by agro-climatic and cultural milieu of the state / region, the group thought it would be worthwhile to document the practices which could be of cross border interest / utility and are given in the “Enclosure” part of this report.

2. In the hindsight was also the fact that neither there is scope for expansion of area under sugarcane cultivation nor is it warranted for a resource intensive crop. As such, the guiding philosophy has to be to harness the full potential of the existing areas under sugarcane through incremental yields and better sugar recovery.

3. Also, kept in consideration was the concern that due to peculiar structure of Indian sugarcane supplies, there are limits to the cost cutting strategies; Indian sugar as a tradable commodity in international market may not be cost competitive especially in a falling / stagnant market situation and therefore any efforts aimed at raising the sugarcane

productivity and sugar recovery, which would inter-alia mean higher availability of raw material, should also look at the efficient utilization of sugarcane and sugar industry's resources through appropriate diversification strategies.

4. Committee also kept in view the systems, strategies and policy approaches in major sugar producing countries, especially cane-based sugar producing countries, as also the implications of the recent decisions of government of India to reduce regulation of the sector.

5. The working group conducted a series of meetings with the various stake- holders (Sugar Secretaries, Cane Commissioners, Agriculture Universities/ Research Organizations, Representatives from Industry and Farmers) of major sugar producing states, as per schedule tabulated below:

Date	Consultations with the State
22nd February, 2013	Bihar
3rd April, 2013	Uttarakhand
8th April, 2013	Uttar Pradesh
8th April, 2013	Punjab
12th April, 2013	Haryana
2nd May, 2013	Tamil Nadu
2nd May, 2013	Andhra Pradesh
3rd May, 2013	Karnataka
3rd May, 2013	Gujarat
3rd May, 2013	Maharashtra

6. In addition, there were several internal meetings of the working group. The group also scanned the existing literature/past deliberations / reports in the similar matter including the following:

- ☐ Report of the task force constituted to formulate development programme for sugar industry for the 9th five year plan (1997-1998 to 2001-2002)
- ☐ Report of the task force on sugar industry for the 10th five year plan (2002 to 2007)
- ☐ Report of the high powered committee on sugar industry (Mahajan Committee, April, 1998)
- ☐ Report of the committee on revitalization of sugar industry (Tuteja Committee, December, 2004)
- ☐ Report of the group of experts on sugar (Thorat Committee, April, 2009)
- ☐ Report of Core Group of Cane Commissioners to suggest measures for improving the productivity and availability of sugar cane in the country during 2009-2010 season (September, 2009)
- ☐ Seminar on Cyclic Nature of Sugar production held at VSI, Pune on 18th September, 2010
- ☐ Study instituted by CACP on " Final Report on Fluctuations in the Area, Coverage and Production as well as Issues in Yield Improvement in the Sugarcane Sector in the country" (March, 2011)
- ☐ CACP's recommendations on price policy for sugarcane for 2013-14 sugar season
- ☐ Swaminathan Report: National Commission on Farmers
- ☐ The Indian Sugar Industry Sector roadmap 2017 (June, 2007, KPMG's report)
- ☐ India as an agriculture and high value food powerhouse: A new vision for 2030 (April, 2013, Confederation of Indian Industry (CII) / McKinsey & Company's report)
- ☐ Economics of Sugarcane Production and Processing (Occasional Paper -54, 2010-NABARD)
- ☐ Vision 2030 (IISR, Lucknow) - <http://www.iisr.nic.in>
- ☐ Vision 2030 (SBI, Coimbatore) - <http://www.sugarcane.res.in>

7. The Working Group also gone through the present pattern of the major funding support to the sugarcane cultivators and sugar industry at GOI level, which is on the following lines:

7.1 The Department of Food and Public Distribution utilizes the funds generated under Sugar Development Fund (SDF) for development of the sector. The basic source of SDF is the cess on sugar produced in the country @ Rs. 24/- per quintal as per SDF Act, 1982 and SDF Rules, 1983. A major chunk of SDF is utilized to provide concessional loans for four broad activities in the sector namely- Cane development, Sugar plant modernization, development of bagasse based cogeneration facilities and development of integrated ethanol distillation plants. The fund is also utilized for institutionalizing subsidy schemes at the time of contingencies, mainly glut situations. There is also a provision in the SDF Rules, 1983 for supporting research aimed at promotion and development of any aspect of sugar industry through grants-in-aid. Till date around Rs. 6000 crore have been disbursed under concessional loan schemes for modernization / diversification/ cane development activity in the sector. In addition, funds to the tune of Rs. 3500 crore have been passed on to the industry under subsidy / subvention schemes at various points of time. The spend under grants-in-aid component for research has been miniscule and to the tune of Rs 27 crores only.

7.2 National Cooperative Development Corporation (NCDC) provides assistance to the sugar cooperatives for various development activities. Cumulatively, upto 31/03/2013, NCDC has disbursed an assistance of Rs. 7453.25 crores to the sugar cooperatives in the country

7.3 The Department of Agriculture and Cooperation has been supporting sugarcane crop through various grants-in-aid schemes implemented through state governments as indicated below:

- i) A general scheme for agriculture sector titled “Sustainable Development of Sugarcane Based Cropping System Areas (SUBACS)” which has been subsumed in the Macro Management Mode (MMM) scheme from October, 2000. The major interventions supported are - Macro Management Mode (MMM) from October, 2000
 - Multiplication of cane seed material
 - Demonstrations on crop production technologies
 - Distribution of farm implements
 - Trainings-State /Farmer’s level
 - Setting up of MHAT plant in sugar factories
 - Drip irrigation infrastructure
 - Setting up /strengthening of tissue Culture lab/ Bio-agent lab
 - Monitoring/inspection/visit/preparation of report/ POL etc. as contingency
 - Assistance for boring of tube well/pump sets
 - Distribution of Micronutrients
 - Distribution of planting material and soil treatment chemicals
 - Visit of farmers to the modal farms/institutes etc.

ii) It is further understood that 12th five year plan approach paper proposes subsuming the existing MMM in National Food Security Mission (NFSM) through Commercial Crop Based Cropping System with the following objectives:

- To utilize vacant inter-row space of Commercial Crops by growing oilseeds and pulse.
- To generate higher net return and cultivable land utilization index as compare to mono cropping.
- To increase the soil fertility status by adopting proper crop rotation with commercial crops.
- To maintain IPM strategies and reduce pest load through cropping system approach.
- To demonstrate latest technologies of crop utilization intercropping, seed production.
- To implement need based intervention of recent priorities in cotton, jute and sugarcane crop.

iii) Further under the flagship Rashtriya Krishi Vikas Yojana (RKVY), the Department supports the following major interventions:

- Demonstrations on crop production technologies
- Subsidy for breeder cane seed production
- Raising of foundation and certified cane seed nurseries.
- Cane seed transport subsidy
- Distribution of agriculture implements
- Trainings--State /Farmer's level
- Distribution of micro nutrients

8. In order to prevent any dilution of the inputs received during the course of discussions/ meetings from various agencies / stake holders; these have been reproduced, verbatim in the "Enclosure" part as a separate chapter titled "State wise major findings - views of Stake Holders for each state".

9. The committee also thought it worthwhile to document innovative developments in various parts of the country and these have been compiled in the "Enclosure" part as a separate chapter titled "Good Practices worth adoption – Pan India"

10. The operative parts of the report have been arranged on the following lines:

- ☐ An analysis of the Strengths / Weaknesses / Opportunities and Threats – "Chapter-III"
- ☐ Findings and Recommendations – "Chapter - IV"
- ☐ SDF – The Possible realignments – "Chapter - V"

Chapter III

SWOT Analysis of the Sector



SWOT Analysis of the Sector

An attempt has been made to study the Strengths, Weaknesses, Opportunities and Threats for the sector, which could be of guidance while coming to the prescription part.

Strengths of the Sector:

- ❑ **Huge domestic consumption base for sugar as well as for all by-products of sugar industry, imparting relative insularity from world markets**

The annual sugar consumption growing at a CAGR of 3.5% on the base of 23 million tonnes for 2012-13, the gap between world consumption standards and within country standards, the growing economy and the projected highest population base by 2030 means that the industry need not look outside country for sustenance. The domestic supply – demand scenario be it for Cogeneration, or Ethanol or Industrial Alcohol or Potable Alcohol or any other upcoming value adding stream, is expected to remain favourable for decades to come.

- ❑ **Manufacturing capacity, spread out across two distinct agro-climatic zones**

Providing buffer against climate vagaries, especially the climate change threats. Sugarcane cultivation not necessarily in contiguous holdings and also dispersed across two different agro-climatic, provides natural buffer against any natural calamities including pests.

- ❑ **Technical prowess in industrial processes**

Largely homegrown, huge industrial base in sugar machinery manufacture / support technologies and in fact making inroads in the international markets as a key supplier of sugar machinery.

- ❑ **Well established network of scientific support institutions**

- ❑ **Availability of gene base from world over and availability of suitable varieties, for each agro-climatic zone.**

- ❑ **Strong cane management systems**

The Cane Management, starting from survey of land at the beginning of the crop, production estimates, planning sugar cane harvesting schedule, harvesting, transporting to the sugar mills and subsequent payment to farmers, have evolved over period of time and are reasonably matured and delivering, of course with regional variations and nuances.

The industry is gradually taking recourse to increasing use of Information and Communications Technology (ICT) to facilitate continuous exchange of information regarding planting, supply schedules and cane payment, to bring efficiencies in the supply chain management as well as a valuable MIS too. In the cooperative setup milieu, addition to ICT interventions, the efforts are now gravitating towards mechanization of harvesting operations, with machines attuned to local needs, since standing cane is bought by sugar mills.

Weaknesses of the Sector:

❑ Stagnant levels of sugar recovery and sugarcane yield

The sugar recovery levels in the country are stuck around 10% (10.03 % recovery in 1950-1951 and 10.20 % in 2011-2012). The per annum growth rate of yield during 2000-2001 to 2011-12 has been abysmal 0.68%. The yield figures are in particular effected by low ratoon productivity which pulls down the overall average yields. This situation obviously, in view of the huge scientific base and technical prowess in the country, calls for deeper look on the implementation part of the available science and technologies.

❑ Huge gaps in the implementation part

The seemingly sound scientific precepts as well as easily doable administrative adjustments, sometime take inordinate time in execution. These are basically the problems centered around the lack of sound Extension support mechanisms.

❑ Small - scattered land holdings

The preponderance of small and marginal land holdings, in the range of 0.5-5 hectare, which cover at least 50% of total area under sugarcane, pose tremendous challenge in the extension aspects as well as in the mechanization part of the cultivation practices.

❑ High Production Costs

The stagnant yields (due to non-adoption of improved varieties and agronomic practices) and the lack of mechanization, as far as the agriculture side of sector is concerned and the preponderance of small sized stand - alone sugar mills, many of which are also not technologically upto-date as well as lack of value adding streams as far as the industrial side of the sector is concerned, make sugar production in India an extremely costly affair vis-à-vis other major sugarcane based sugar producing countries. The absence of linkage between sugarcane prices and sugar / by-product recoveries further compound the problem. In the process, while the Ex-mill cost of Indian sugar is in the range of Rs. 29-30 / kg., even in the most efficient state like Maharashtra, the per unit sugar production cost in Brazil is in the range of Rs. 24 / kg., in Thailand and Australia the same is in the range of 25-26/kg.

❑ Technical deficiencies in the sugar production setup

Out of the 597 operational sugar mills, 338 sugar mills are of the 2500 TCD and below capacities and are mostly stand-alone units without cogeneration and distillation facilities. This is a hugely embarrassing figure and could be at the root cause of techno-economic inefficiencies in the sector (Annexure-VI). A major chunk of sugar mills with capacity size $\leq$ 2500 TCD are in the cooperative sector. Moreover most of these sugar mills have the conventional double sulphitation processes instead of flexi-process which can facilitate sugar production as per domestic or international standards simultaneously.

❑ Idling Capacities

The recurrent shortage of raw material i.e. sugarcane has meant that the 70-90 % of the installed sugarcane crushing capacity has only worked during different years and there is huge idle capacity. The situation can become more grim, once the new

projects in pipeline also takeoff and in case there is no corresponding increase in the sugarcane availability.

Opportunities for the Sector:

❑ Huge scope for diversification into value added streams –

Cogeneration, ethanol, industrial and potable alcohol, animal feeds are some of the major by-products of sugarcane milling operations which can gradually convert sugar mills into economically vibrant Energy Complexes. The untapped cogeneration potential of the sugar industry is at least 50%, while for ethanol sky is the limit since the blending programme is just getting established in the country. There are upcoming applications providing possibilities of production of CNG, etc. from press mud, spent wash, effluents, etc on commercial scale.

❑ Huge untapped potential of the committed land resources-

Brazil produces around 500 – 550 million tonnes of sugarcane from 6.5-7.0 million hectare of land resources. We produce only 330-360 mln tonnes of sugarcane from the committed land resources of around 4.5 -5.0 million hectare. Our productivity is 68-70 tonnes per hectare while Brazilian average is 80 tonnes per hectare. Our sugar recovery is around 10% while the average in Brazil is around 13%. Without any further capital investment in the industrial capacities, the single step of making available sufficient sugarcane by twin strategy of yield enhancements and sugar recovery enhancement, the country can become the world leader in minimum possible time. The recent Vision paper prepared by Indian Institute for Sugarcane Research (Vision 2030) indicates possibilities of achieving an average productivity of 100-110 tonnes/ha. and average sugar recovery of 10.75 % to meet the anticipated 33 million tonnes of sugar requirements in 2030 A.D. As such, without any further horizontal expansion of the crop areas, the target is do-able.

❑ Huge operational capacities and encouraging number of upcoming capacities

An analysis of the milling capacities, which are operational, and the upcoming capacities (Annexure-I) reveal the following interesting facts:

- There are 597 operational sugar mills with installed milling capacity of 21 million tonnes of cane crushing on daily basis.
- There are 136 new sugar mills under erection, expected to add another 5 million tonnes of cane crushing capacity on day-to-day basis.
- In case improvements on raw material supply side are achieved,
 - Industry's cane crushing and sugar production, **minimally**, could be the range of 30 million tonnes in sugar terms every year taking into account the operational capacities and can go upto 37 million tonnes in sugar terms taking into account the operational as well as the upcoming capacities. This calculation assumes a minimum working duration of 150 days for sugar mills in the country, except for Karnataka and Tamil Nadu where it could be 180 days and sugar recovery levels of 10% in all part of the country except Maharashtra and Karnataka where 12% is easily achievable. The calculations are based on assumption that only 90% of the capacity works at any point of time. (Detailed projections in Annexure- VII).

- In Best Case Scenario, industry's production could touch 46 million MT in sugar terms taking into consideration only the operational capacities and the same could be upto 58 million MT by also taking into account the new capacities expected to become operational by 2017. This calculation assumes that the sugar mills can run for 180 days in sub-tropical part, in Andhra Pradesh, Gujarat, Central India and upto 210 days in Maharashtra and even upto 240 days in Karnataka, Tamil Nadu and Puducherry. The sugar recovery percentage, physiologically / technical achievable could be 11% in sub-tropical part, Central India and 13% in Maharashtra / Karnataka / Gujarat belt while Tamil Nadu, Andhra Pradesh may not go beyond 10%. The capacity utilization assumed is 90%. (Detailed projections in Annexure-VIII).

{The above analysis does not take into account the gains additionally possible by upgradation of the existing uneconomic size mills.}

❑ **Huge unexploited Domestic Ethanol Market**

India with the huge captive consumption base for not only sugar but also for alcohol based by-products of sugar industry paradoxically faces issues of sugar glut and idling industrial capacities, many a times in tandem, while the countries like Brazil with very minimal domestic consumption have nurtured huge sugar economies centered around the global sugar trade (by achieving lowest sugar production costs) and the utilization of Ethanol on a huge scale to meet domestic motor fuel requirements.

A huge opportunity lies in promoting the adoption of ethanol for meeting domestic fuel requirements. Two recent decisions by Government of India - to reduce regulation in the sugar sector and to give free hand to Oil Manufacturing Companies (OMCs) to procure mandatory 5% Ethanol blend requirements through tender process by market driven prices, portend bright future in the matter. Fortunately, in the last few years a number of integrated sugar plants have come up with process flexibilities of shift between sugar and ethanol. The standalone sugar mills also, gradually with Government support could be converted into integrated complexes.

❑ **Cogeneration of Electricity - huge unexplored potential**

The Economics and Technology of Electricity Cogeneration along with sugarcane milling has been sufficiently well established in the country, now. While India has been the pioneer in taking early lead in this technology, the progress has been tardy. The present installed capacity for generation of surplus electricity by sugar mills for grids is around 3800 MW against potential estimated to be in the range of 8800 MW in minimum case scenario and 10500 MW in best case scenario (Annexure-IX). The situation is obviously indicative of huge opportunities, since technology and market is reasonably well developed.

❑ **Emerging by-products**

The world has now started talking note of commercial possibilities in the realm of bio-plastics, cellulosic Ethanol, cellulosic gases (Syngas), bio-gases (CNG from

press mud as well as effluents) as side stream activities in the mills. The industry needs to take note of the emerging opportunities and devise strategies for gaining early mover advantage.

❑ **Niche Sugar Products**

The very structure of Indian sugar industry, wherein the individual sugarcane farmers are intrinsic part of sugar manufacturing chain, makes one wonder why the “**Fair Trade Sugar**” niche has not been explored by the industry in order to get value premiums in the export market.

The labour oriented structure of Indian sugarcane cultivation, makes it an easier breeding ground for developing value chains around “**Organic Sugar**” niche since the organic cultivation is a human resource intensive domain. There is also ample scope of branding and marketing of traditional “**Gur**” as a healthy sweeter alternative and is a niche not explored till date by any country in the world.

These niches if suitably explored can help sugar setor in getting foothold in the international trade and can overcome the costing inefficiencies of the sector.

Threats:

❑ **Domestic sugar production- consumption situation delicately poised**

Any failure to keep up the sugarcane supplies with the huge industrial capacities which have been setup/ are being setup in the country can lead to attrition can bleed the industry and can stagnate the sugar production. With burgeoning population and huge domestic requirements, any such failure to meet the domestic sugar requirements can create critical issues of food security.

❑ **Poor morale in the sector**

The sugarcane cultivators are generally a worried lot due to Cane Price Arrears, which occur with uninterrupted regularity every year. The sugar mill managements are worried due to losses in some years and less than adequate compensation on the capital and resources invested in other years. Lot of industrial capacity be it milling or distillation, is lying idle and is mostly because of raw material constraints. The situation, if not improved can boomerang and may precipitate an unwarranted crisis.

❑ **Completion from other remunerative crops**

The regular buildup of cane price arrears and the gradually increasing support to the other crops may lead to situation whereby the competing crops permanently take over the area presently under sugarcane. A manifestation of this trend is the increasing replacement of sugarcane crop by popular based agro-forestry models in Uttarakhand, whereby the sugar industry in the state is in perpetual dearth of sugarcane.

❑ **Climate change**

The unpredictabilities which might be unleashed by the climate change threats have greater scope in affecting the long rotation crops like sugarcane, as the tendency among farmers would be to shift to the short duration crops in times of weather uncertainties.

Chapter IV Findings & General recommendations



Findings & General recommendations

1. State-wise findings:

As the inputs received from various stakeholders would reveal (Enclosure-2), there could be numerous viewpoints about the problems and the gravity of each issue. The committee has tried to sieve through various viewpoints and has tried to summarize the major problem areas, as visualized by various stakeholders and these are listed in the decreasing order of priority:

Maharashtra / Gujarat

- ☐ Adoption of drip fertigation technology
- ☐ Seed availability and seed replacement programme with desirable varieties
- ☐ Mechanization support
- ☐ Soil testing and fertility improvement programme through INM
- ☐ Bio- integrated pest management
- ☐ Subsurface drainage system for ill drained soils

Andhra Pradesh / Karnataka

- ☐ Strengthening of State level research institutes
- ☐ Mechanization
- ☐ Adoption of drip fertigation technology
- ☐ Seed availability and seed replacement programme with the desirable varieties
- ☐ Institutional mechanism for extension/ advisory support for the Agronomy around the desirable varieties

Tamil Nadu

- ☐ Mechanization from planting to harvest
- ☐ Strengthening the quality seed supply network
- ☐ Adoption of drip fertigation technology
- ☐ Soil testing and fertility improvement programme through INM
- ☐ Demonstration of proven agronomic practices and training of extension personnel

Uttar Pradesh / Uttarakhand

- ☐ Seed availability and seed replacement programme with the recommended varieties
- ☐ Institutional mechanism for extension/ advisory support for the Agronomy around the recommended varieties
- ☐ Need for a relook at the Cane Supply System in the state, so as to reduce the time lag between harvesting and crushing
 - From average of 72 hours, at the moment to 24 hours, as achieved by Western India/ South Indian Sugar Mills
- ☐ Need for relook at the Cane Area Reservation System, so as to develop permanency of interest among sugar millers for area's development
 - Dr. C. Rangarajan Committee has also recommended to this effect

- ☐ De-notified / rejected varieties should be banned for cultivation

Punjab /Haryana

- ☐ Mechanization
- ☐ Seed availability and seed replacement programme with the desirable varieties
- ☐ Institutional mechanism for extension/ advisory support for the Agronomy around the desirable varieties
- ☐ Soil improvement program -Drainage system
- ☐ Development of high sugared early maturing varieties resistant to abiotic & biotic stresses.

Bihar

- ☐ Drainage system
- ☐ Development of varieties for flood affected & waterlogged area.
- ☐ Development of Agronomy for flood plains
- ☐ Institutional mechanism to overcome basic data discrepancies
- ☐ Strengthening of State level research institutes
 - Revival of SRI, Pusa in PPP Mode (VSI Pattern)
- ☐ Seed availability and seed replacement programme with the desirable varieties
- ☐ Institutional mechanism for extension/ advisory support for the Agronomy around the desirable varieties

2. **General recommendations on the key constraints requiring intervention:**

Going by the twin philosophy of identifying the high impact constraints needing Government of India's indulgence, the committee has filtered out the key constraint areas and has structured its recommendations in the following categories:

- a) Cropping aspects requiring consolidation / enhanced support
- b) Policy / Strategic interventions
- c) Simplification of Administrative constraints

(a). Cropping aspects requiring consolidation / enhanced support

As far as the strengthening of funding support for various existing initiatives of Government of India is concerned, the committee feels that the following areas related to the cultivation part of the value chain require enhanced Central Support / Intermediation.

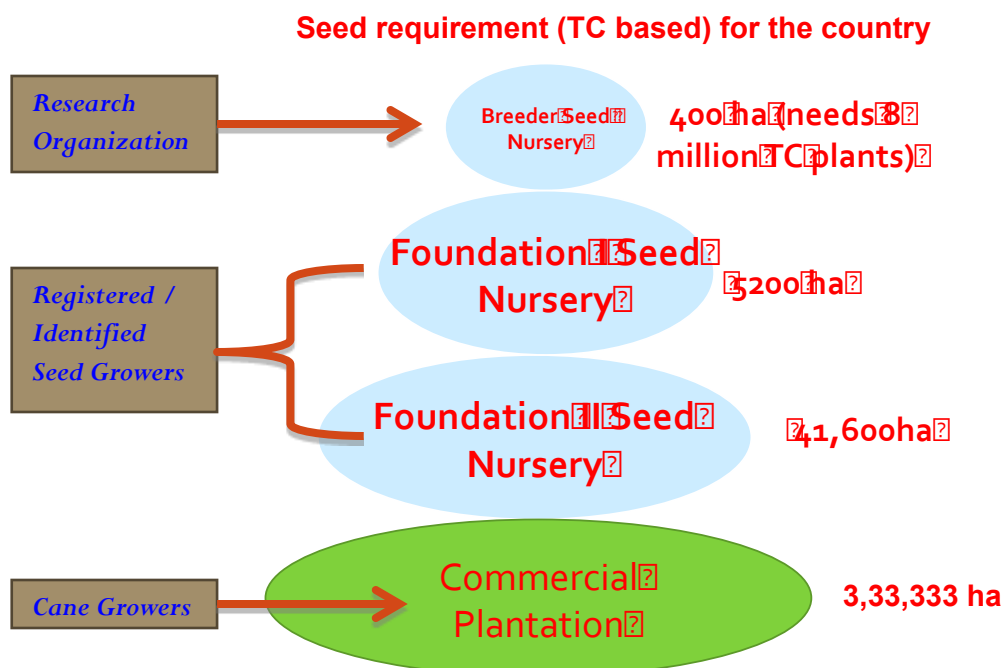
i) Credible seed programme

The basic backbone of the first green revolution in the country was the high yielding varieties of wheat and rice and seed availability of the same through extension support. The story needs to be replicated for sugarcane. Though the estimates vary, the yield enhancement through better variety seeds, with all other inputs remaining static could be at least 15%. Though reasonably good numbers of varieties of sugarcane are available with ICAR Institutes/ State Agriculture Universities, the problem has been the absence of concrete seed multiplication and seed replacement programmes. The scientists / breeders, the sugar mills and the sugarcane farmers who are the major stakeholders in the value chain, cite different reasons for the absence of credible seed programme.

While there could be various strategies like seed villages, seed farmers, captive seed farms of the sugar mills, use of bud-chip techniques, etc. to achieve the objective, the committee recommend adoption and up-scaling of the model adopted by the Bihar Government whereby the production of breeder seeds has been outsourced to the IISR, Lucknow with buy back arrangements with the sugar mills/ sugarcane farmers, as the backbone architecture for any seed replacement / multiplication strategy. While, government may support the seed programmes through Sugar Development Fund administered by the Department of Food and Public Distribution as well as through the subsidy/ Grants-in-Aid schemes of the Department of Agriculture and Cooperation, any scheme for financial support should involve the research organization who has been instrumental in development and release of a variety as the key partner, both as supplier of breeder seed / genetic material to raise breeder seed as well as technical consultant for further multiplications, down the value chain, along with sugar mills.

Over long term, the aim should be robust adoption of three-tier seed nursery programme with seed replacement at least once in 6 years and increasing use of tissue Culture for multiplying the basic genetic material for establishing breeder seed nurseries. The gradual shift from MHAT systems to

tissue Culture (meristem based) based systems for breeder seed nurseries is necessitated because of wide spread occurrence of Yellow Leaf Disease (YLD) in the country (Heat treatment cannot eliminate YLD virus) as well as by the sheer quantum of genetic material required for undertaking an ambitious varietal replacement programme. The subsequent multiplications i.e. foundation-I Seed Nursery and foundation-II Seed Nursery can happen through conventional seed set based techniques or bud-chip techniques as per state level preferences. As per estimations of SBI, Coimbatore, assuming 40% of sugarcane area in the country under plant crop and seed replacement to be done every 6 years, the annual requirements for a scientifically justifiable seed programme would be as indicated below:



In order to ensure strict quality control in tissue Culture production process, the breeder seed level programme should preferably be carried out either directly by identified central and state level research organizations or through a propagation chain in which the mother culture is supplied by the research organizations and the secondary / tertiary culture lab activities, seedling generation, as well as breeder seed nurseries activities are taken up by satellite establishments established by the sugar mills under supervision of research organizations. The foundation-I and foundation-II level seed multiplications should in any case will need to be organized by the sugar mills through identified seed farmers, seed villages, captive seed farms, etc.

ii) Institutionalized Extension Support

- Along with a lack of good quality seed material, the lack of consistent extension support to put into practice the agronomic recommendations has been the bane of Indian sugarcane cultivation. There is culture of over dependence and over expectation from Government Institutions, to organize every kind of extension support. In the process, we have situation of “Wasted Science”.
- While, there could be many reasons for the diluted extension support structure for sugarcane by the government machineries, including the greater thrust on staple food crops, horticulture crops, etc. the apathy of the Indian Sugar mills to this vital issue, important for their survival, is unexplainable. Here is the crop, which constitutes 60-70 % of the raw material costing of the industry and is the reason de-etire for the sugar industry. Such an umbilical linkage between a crop and the industry is nowhere else to be seen. While, government institutions are mandated and do the basic / applied researches with every aspect of sugarcane crop, as such, sugar mills have to act as a pivot around which all extension support activities for their feeder areas shall occur. The need of the hour is Self-reliance with research part handled by Government and extension part carried out by Sugar mills. There could be arrangements whereby the establishment of demonstration plots, publication of standard package of practices, audio-visual extension materials, etc. can be supported through various government schemes, but must be executed by the sugar mills.

iii) Sustainable utilization of water and fertilizers

Sugarcane is a highly resource intensive crop, especially in the water utilization context. In a situation where almost cent percent sugarcane crop in the country is irrigated to some extent or the other, and in the wake of growing recognition for conservative use of water, globally, the need is for the utilization of best available water utilization techniques/ technologies. The potential of drip irrigation systems which can save upto 50% water use in sugarcane crop needs to be harnessed in this context. Drip irrigation systems also aid in yield enhancement and sugar recovery by ensuring efficient delivery of water in the root zones. The recent droughts in tropical sugarcane growing belts have further enhanced the awareness among sugar millers as well as farmers for rapid adoption of drip irrigation systems.

The other aspect of resource intense sugarcane cultivation demanding attention is the excessive/ untimely use of Nitrogenous fertilizers and poor use of Phosphatic / Potassic fertilizers, a menace common for all agriculture crops in the country. In effect, whatever, is cheaply/ easily available is applied! There is poor adoption of organic manures / bio-fertilizers in the cultivation. The absence of conservation tillage practices also ensures extremely poor organic carbon levels in soils. Luckily, there

is awareness and many stakeholders cited absence of soil testing / advisory facilities as key constraint.

As such, any scheme entailing government support needs to target promotion of fertigation i.e. drip irrigation systems with inbuilt fertilizer application mechanisms. Similarly, the advisory support and expansion of fertilizer / soil testing labs need to be extensively supported, as this is not a highly capital intensive requirement and there are low cost soil testing models for setting satellite labs available in the country.

iv) Sustainable cultivation practices

While, an ideal strategy to improve farmer returns from sugarcane based cropping systems could be the promotion of inter-cropping in the initial stages of this long duration crop, somehow this has not picked up in great intensity in any part of the country. Similarly, the management of ratoons is extremely inadequate and is one management aspect if strengthened can give speedier results since additional labour / raw material inputs required would be extremely less vis-à-vis the expected remunerations through yield enhancements. In fact, the need of the hour is the promotion of sustainable cultivation practices during the entire life cycle of the crop which would inter-alia include proper / recommended tillage practices, proper planting methods, proper spacing, intercropping, fallow management, water and fertilizer management, ratoon management as well as adoption of bio-integrated pest management strategies.

v) Mechanization, the dire need

Mechanization will be able to lower down cost of cultivation, thereby, increasing profitability to cane growers. Timely operations further increase productivity. Farmers can have better ratoon crops if ratoon management equipments are used. Similarly, through Raised Bed Seeder-cum-Sugarcane planters, inter-row spaces can be used for drilling of pulse/oilseeds simultaneously. Use of sub-soilers not only increases 5-10% yield but also helps in improved rainwater percolation. Recently developed machines like culti-harrow and SS furrowers have potential of saving significant time and fuel in land preparation and furrow opening operations respectively. Cane trash burning is unhealthy, for which the use of Plant Residue Shredder (PRS) should be encouraged.

The shortage of labour, especially for harvesting operations, has been a common thread across all the states and surprisingly even in states like Bihar and UP. The situation drastically impacts the sugar recovery by extending the time lag between harvesting and cane crushing apart from accentuating the cultivation costs. However, the adoption of mechanical harvesting machines is closely linked to the proper planting density of the sugarcane crop. While, there are planters developed by various organizations, these have not picked up. The country specific small harvesters, which are suited to Indian conditions of fragmented land holdings, need to be developed. In fact, the situation warrants a

complete package whereby the machines are gradually adopted in the life cycle of sugarcane crop wherever feasible.

Adoption of sugarcane farming implements is hampered by limited number of manufacturers and availability of subsidy on limited equipments. Further, at times, the farmers are not able to take advantage of available subsidies because of the requirement of state level test reports for equipments. Solution is obvious in that the equipments list for subsidy support in the schemes should be exhaustive and the test certificate of the designer Institute/SAU should be recognized by all states for the purpose of subsidy.

Simultaneously, in order to facilitate development of region specific cane harvesters the Department of Agriculture and Cooperation may look at the possibilities of revenue neutral machine development programmes in PPP mode through partnership of ICAR institutes / ISMA – NFCSF / International – National Machine Manufacturers. The Department of Food and Public Distribution may concentrate its support for the mechanization part to the proven machineries and at the same time may consider supporting incubators for development of locality specific harvesters.

vi) Special Scheme for drainage problems in Bihar

This is a huge infrastructural constraint affecting not only sugarcane but entire agriculture of the state. State government can be sounded to conceive a sound landscape management project for which even international donor agencies / aid agencies could be roped in with the intermediation of the central government.

(b). Policy / Strategic interventions

A lot of capital investment goes into creation of sugar mills / complexes. Not only that, the sugar mills become the pivot around which sustains the livelihood of thousands of cane cultivators as well as workers employed in ancillary activities. The sugar mill complexes in nutshell are vibrant mini townships. The money invested in the projects is not only of the private entrepreneurs but also of the banking system of the country as well as soft loans from the Government. Once built, a sugar mill is expected to run easily for over 45-50 years. As such, the huge industrial capacity in sugar, which has been built up in the country, in the past few decades and the additional planned capacities are national resources and need to be utilized in the most efficient manner.

Due to very structure of Indian sugarcane and sugar industry, wherein the sugarcane constitutes around 70% of the raw material cost of the sugar, and is invariably grown in small – scattered small agricultural holdings, the production cost of Indian sugar can never match the economies of scale achieved by the major players in the international trade like Brazil and Australia etc., where the sugarcane farms are either owned/managed by the sugar mills themselves or the farmers holdings are

huge. This is true even for comparatively efficient sugar producing zones of the country in the tropical part.

So the big question is - what do we do with surplus sugar produced / likely to be produced? Do we allow the production capacity, which is in the vicinity of 28-30 million MT of sugar, by the most conservative estimates, to remain idle since domestic consumption is in the vicinity of 23.00 to 23.50 million MT, (at 2012-13 reference base). This has the implication not only with regard of idling of surplus capacities but also the inefficiencies it breeds in the costing of the sugar produced. Alternatively, why don't we try to consolidate on the proven value addition streams and at the same time try to access the sugar commodity markets with value added niche segments so that the costing inadequacies get covered? In this regard, committee's line of thinking is summarized below:

(i). Need to promote strategic combination of Sugar and Ethanol

Taking clues from the way the sugar industry has diversified in Brazil, it is high time that country starts planning for radical shifts in the sugar – alcohol production combinations, so that we produce what can be domestically consumed as far as sugar is concerned and start utilizing the surplus raw material for producing alcohol so as to meet at least a part of the domestic requirements of petrol, the requirements of industrial chemical industry and the requirements of potable alcohol industry. The scenario built up in Annexure – X provides tantalizing possibilities, which exist.

Taking into account only the operational milling capacities in the sugar industry, and based on two key assumptions (one, we start providing sufficient sugarcane for the operational cane crushing capacity and two, the milling capacity is fully integrated with optimum capacity distillation plants), the industry can either produce a combination of 30 million MT of sugar + 3000 million liters of alcohol or can shift to a product mix of 24 million MT of sugar + around 5900 million liters of Ethanol (2400 million liters as by-product and 3500 million liters as main product directly from juice). Further, taking into account the upcoming manufacturing capacities in the sector, which should be operational and running by 2016-17, industry can achieve a combination of 26 million MT of sugar + 10000 million litres of Alcohol, sufficient to take care of needs of every stake holder (even after accounting for the annual growth rates of concerned activity sectors).

The only catalysts required are the assured market from OMCs, the availability of raw material i.e. sugarcane and the distillation capacities. The underline is that the sugar industry could become a major player in saving valuable foreign exchange outgoes and in reduction of current account deficits, which have been of concern in the country. The major impediment to the blending programme of ethanol in the country has been the concerns regarding price parity of ethanol with petrol and apprehensions about its availability as well as the opposition from the domestic chemical industry.

The picture if seen in the larger perspective of established sugarcane processing capacities and the proven merits of renewable sources of energy,

the apprehensions of the chemical industry regarding anticipated shortages in the event of an expanded ethanol blending programme as well as the apprehensions of the petroleum industry regarding capabilities of the sugar industry to meet ethanol requirements for blending programme and at competitive rates are more or less unfounded. The perceived shortages happened only because it is a programme, which has just commenced, and in the absence of the permanent market for ethanol, the sugar industry has been struggling with the inventories of ethanol and in the process has not attempted to upscale the ethanol production. The proven capabilities of ethanol as an oxygenate promoting better burning of the Petrol components, upto 10% blend, makes the argument of 30-35 % offset on account of low calorific value of ethanol redundant. The price comparisons of imported petrol vs. ethanol as given in **Annexure-XI** indicate the possibilities of win-win situation for the country. Assuming the procurement cost of Rs. 39/liter for Ethanol, a neat saving of around Rs. 12,000 crores annually (at present exchange rates) can be anticipated on account of foreign exchange outgo (against the estimated spend of Rs. 660000 crores on import of raw petroleum by the Country - as per 2011-12 report of Ministry of Petroleum and Natural Gas on Basic Statistics on the sector) in case even 15% blend is achieved and the requirements are sourced from the domestic sugar industry. However, the transition of sugar industry from mainly a sugar producing entity to the economically more viable combination of sugar and ethanol also necessitates a markup on the ethanol prices. As indicated in Annexure -XI, there is scope for enhancement of ethanol prices by a margin of Rs. 5 to Rs. 7 per unit at the current petrol prices and more than that there is a sound case for premium pricing on ethanol due to its renewable / green status.

Another argument for giving support to ethanol blending programme can revolve around the agricultural employment which this activity creates / would create even if one assumes that the labour employment in sugar distilleries get neutralized by similar labour generation in petroleum refineries. The question of fuel vs. food debate is irrelevant since what we can target is the better sugarcane productivity and sugar recovery from existing land under sugarcane and its utilization through appropriate product mix, keeping in consideration the core strengths of the country and is not targeting horizontal expansion of the crop area.

The Brazilian vehicles run either on pure ethanol or on pure petrol or on blended petrol (with ethanol blend of 20-25%). The ethanol till date has been taken as a small subset of sugar mill activities in India and the government support has been limited to the extent of funding under SDF. Country can also start preparing grounds for necessary amends in the automobile policies so as to promote the development of flexi fuel engines as well as delivery pumps, an area which would need full-fledged adoption, once the blending wall of 20-25% blend is attained, and an explorable option in this regard could be in the form of tax/excise duty based incentives. In fact, the Ministry of Petroleum becomes a bigger stake holder

in the scenario projected for ethanol development programmes and shall coordinate with other Ministries. Government needs to think of suitable policy interventions to develop this source of renewable energy as a major contributor to the energy security of the country and to gradually minimize dependence on petroleum sector imports.

(ii) Development / Branding of products for Niche Markets

The most viable way for the Indian sugar to compete internationally, given its costing constraints is to concentrate on developing value added sugar / sugar products. There is huge unexplored international market, partially existent and partially ripe for expansion, for Organic Sugar / Fair Trade Sugar. Similarly, the “Gur” which is an Indian specialty though there are some similar products locally produced and consumed in some other countries, is one product whose nutritional benefits if properly branded and marketed can create a new product category for the international market. While the “**Fair Trade Sugar**” and “**Gur**” are the products which more or less exists in the country, and only effort needed is on the certification / branding / marketing part and is better taken up by the sugar industry’s bodies, there is a sound case for initiating policy interventions which can promote production / branding of Organic Sugar and some suggestions in this regard obtain in the succeeding chapter.

(iii) Strengthening of State Sugarcane Research Institutes

Many of the state level sugarcane research institutes suffer from paucity of trained manpower, financial resources, etc. Probably one viable mode to to strengthen / augment their activities could be through an institutional structure which could broadly be on the lines of VSI, Pune. Special purpose vehicles (SPV) could be floated in which the state government / research organization as well as the sugar mills and the sugarcane farmers become partners, the affairs of the institute are steered by a well-represented governing body and industry also financially contributes to the SPV. Central Government may consider issuing suitable advisory / guidelines to the states, in this regard.

(iv) Promotion of Sugarbeet / Sorghum as a complementary crops

One viable way to increase the working duration in the sugar mills is the adoption of Sugarbeet as well as Sorghum as the complementary crops. While there have been numerous hurdles, which are inevitable in any new endeavor, these crops, especially Sugarbeet distinctly present a viable alternative to complement sugarcane crop especially in the sub-tropical India. While the initiative on commercial adoption of these crops can be largely left to the sugar mills, government of India can consider appropriate policy environ to facilitate cheaper seed availability, pesticides availability, etc. Appropriate changes may be required with regards to import policy / tariffs etc. since the domestic availability of the quality raw materials for

Sugarbeet crop may be a concern in the initial stages of establishment of this crop in the country.

(v) Sugarcane Sampler

The world-over the technology for determining sugar percent in cane has been adopted to facilitate the cane payment. In India, the cane payment is on the basis of weight of the cane. The sugarcane samplers suited to Indian conditions needs to be developed and promoted on voluntary basis with appropriate policy support. Once the sugarcane growers become aware that they will receive the cane payment on the sugar recovery they will plant only those varieties which are good in sugar recovery.

(c) Simplification of Administrative constraints

i. Delays in state level release of varieties developed as part of Central Variety Release Mechanism (CVRM)

Somehow, the state level release of varieties developed through Central Variety Release Mechanism, which is quite a robust process and is based on data from multi location testing in respective zones and most of the times the State Agriculture Universities / institutes are the trial partners, has been facing bottlenecks due to state specific rules / regulations. The problem has been acute in the sub-tropical states. At the same time, the system is more or less in force in Southern States. The synergies between Central Government Research Institutes and State Agriculture Universities / State Level Research Institutes, need to be strengthened in this regard. The DAC, in consultation with the state governments, need to devise an enabling mechanism so that the varieties released through CVRM are allowed to be included in the list of state released varieties automatically for quick propagation.

ii. Longer duration of Cane Area Reservations

The annual renewal of the cane areas by the office of the cane commissioners in sub-tropical part, especially UP and Uttarakhand is widely perceived to lead to lack of enthusiasm among sugar mills in nurturing the sugarcane crops in their command areas. Dr. C. Rangarajan Committee has also recommended longer duration of cane area reservation. The matter needs to be actively pursued with the state governments.

iii. Facilitating maturity based harvesting as well as standing cane sale in sub-tropical India

While the UP state government views the current system of scheduling of sugarcane harvests as an equitable system, probably sound scientific – economic sense makes a case for a system which is based on harvesting the sugarcane at its peak maturity i.e. at the time when maximum accumulation

of Sucrose occurs in sugarcane. High Sucrose content in sugarcane sent for crushing shall lead to high sugar recovery which otherwise is much below the national average in UP from the last few years. Thus, assessing sugarcane quality by pre-harvest cane maturity survey and scheduling the cane harvesting on its basis is a scientific way by which sugar recovery can be improved in UP and other states of sub-tropical region.

The reform related to permitting maturity based harvesting can also facilitate standing cane harvest by the sugar mills as practiced in the major part of tropical belt in India. These two interventions can drastically change the landscape of sugarcane cultivation and are the only long-term solutions to overcome the huge gap in the cutting – crushing duration in sub-tropical India.

A viable course of action could be to leave the payment terms between the farmers and sugar mills, to be mutually decided, in case concrete mechanisms can be developed by the sugar mills to effect purchase of standing cane to be harvested and transported by them, without affecting the intermediary role of cane societies (in UP and Uttarakhand). This intervention is also closely linked with the possibility of speedier adoption of mechanical harvesting platforms. Given a freehand, the market forces may even evolve systems wherein the cane harvest manufacturers promote this as on-job activity, without aiming to sell the machines in the initial stages.

Permitting maturity based harvesting in place of presenting chit based system has been an oft-sounded demand of the entire UP sugar industry, deserves a well-reasoned consideration and the matter needs to be taken up by the Central Government with the state government.

iv. Simplification of registration process of bio-pesticides

At present registration of bio-pesticides and manufacturing is treated on lines similar to chemical pesticides. The simplification of the certification procedures in regards to bio-pesticides will enable their speedier adoption.

3. In nutshell, the way forward involves simultaneous efforts on rejuvenating the backend (raw material) supplies and consolidating the frontend (nurturing the new markets by channelizing the productive assets to produce the optimum product-mix). The last chapter of the report presents committee's views on SDF, in order to provide practical shape to the findings and recommendations narrated in this chapter.

Chapter V

Specific recommendations for realigning activities under SDF



Specific Recommendations for realigning activities under SDF

While the vision of the policy makers in having initiated steps long back (mid-80s onwards) to tackle critical areas of sugar sector through a dedicated cesspool is commendable, the following mid-course corrections can further be thought of:

1. Targeted Support under loan component of SDF for promoting Diversification / Modernization

As far as, the future direction of loans under SDF is concerned, the scenario projections in “Chapter – IV” would fairly well indicate that the thrust under SDF loans should be for promoting the establishment of distillation plants and cogeneration units in the existing standalone sugar manufacturing units as well as in supporting the up-gradation / expansion plans so that the minimum viable size is attained by each and every sugar miller in the course of time. The viable size in this regard is generally considered to be of 5000 TCD while the minimum possible need to be 2500 TCD. A whole microcosm exist in and around the existing sugar mills, livelihood of thousands of cultivators is involved and it would be fruitful to build upon the existing situation rather than building up an entirely new system. As such, the funding requirements of the existing and that too, the smaller mills with capacities lesser than 5000 TCD should override any proposals for the funding the green field sugar projects. This may also become an indirect dis-incentive to control the current spree of new sugar mill projects, which if not checked would lead to either huge idle capacities or else would lead to war of attrition in the existing scenario of raw material scarcity and un-economic sugar costs. Component wise, the possible changes in the SDF loan schemes could be:

i. Sugar mill modernization / up gradation:

Poor technical efficiencies due to small size / old plants lead to sugar loss during manufacturing operations. Such small mills, always fighting for survival, do not have where-withal for undertaking cane development activities with the farmers. As the tabular statement given below would indicate, there are abnormally high numbers of sugar mills with capacities below 2500 TCDs and require investments to the tune of Rs. 4000 crore so that the minimum viable size is achieved.

Capacity in TCD	Number of Operational Sugar Mills	Investment required for up gradation upto 2500 TCD (Rs. Crores)
< 1250	16	800
1250	59	1770
>1250 & <2500	55	1375
Total	130	3945

At least, 50% of the small capacity sugar mills are in Maharashtra, understandably in the Cooperative setup. Due to poor balance sheets, many such sugar mills find it difficult to attempt capacity up-gradation / modernization. While, the SDF loans can be prioritized for up-gradation of such small capacities, in the coming 2-3 years, wherever financial funding norms permit the funding, the central and state governments needs to work in tandem so as to find out practical ways for revival of the un-bankable sugar mills. Moreover, the support for up-gradation of < 2500 TCD plants should preferably be for the projects envisaging simultaneous establishment of cogeneration plants.

ii. **Promotion of integrated distilleries**

Out of the operational sugar mills in the country, only around 133 numbers of mills presently have the distilleries. These distilleries have a total capacity of about 2044 million litres per annum. In addition there are about 172 independent distilleries operating on procured molasses. Put together the total distillery capacity in the country is of the order of 3800 million litres (in terms of rectified spirit). The calculated distillery capacity is based on the assumption of 300 days operation in a year but the actual operation differs from unit to unit, based on raw material availability. In addition, taking into consideration the regulations of the environment sector as well as unit efficiencies, a practical figure would be around 220-240 working days for each distillery and with this assumption the existing distillation capacity in the country should be around 2900 million litres. It may also be worthwhile to reiterate that the actual distillation output in the country has been in the range of 2400-2500 million litres, mainly on account of raw material constraints i.e. molasses, in turn affected by sugarcane availability constraints.

The above situation demands a serious effort to establish the ethanol units as intrinsic part of sugar business complexes. In order to meet the requirements of producing ethanol on the scale which can at least meet 15% blending requirements + the standard requirements of potable liquor and chemical industry, the additional capacity creation to the tune of 1600 million litres would be required and would involve an investment of at least Rs. 10,000 crores. At the same time, capacity creation to absorb additional cane (and produce 10,000 million litres of Alcohol) through optimal Sugar: Alcohol mix would mean capital investment to the tune of Rs. 40,000 crores. Considering the enormity of the capital required, it would also be worthwhile to involve Ministry of Petroleum as a partner so that new avenues for speedier asset creation are found out. As far as SDF loans are concerned, a modified approach could be to target the establishment of ethanol plants in existing sugar mills in prioritized states / localities and preferably as per choice of OMCs, so that the locational mismatches between demand and availability are taken care of.

iii. **Promotion of Bagasse based cogeneration Units:**

Out of the operational sugar mills in the country, only around 210 numbers of mills presently have the cogeneration facilities. Technically, the surplus electricity generation, which is possible from the existing operational capacities of the industry and the funding requirements for the same is as indicated below:

Capacity in TCD	Number of Operational Sugar Mills	Sugar Mills having Co-generation	Operational Capacity (MW)	Potential Capacity Addition (MW)	Investment required (Rs. Crores)
Upto 2500	338	64	579	1918	9590
>2500 <5000	104	63	1160	656	3280
≥5000	155	83	2045	1635	8179
Total	597	210	3784	4209	21049

The analysis supports the case for increased support for the consolidation of existing resources by erection of cogeneration plants in sugar mills of every capacity, except probably the plants below 2500 TCD where the cost benefit ratio of the investment may not be favorable due to little exportable power possibilities. The department needs to synergize its efforts with the Ministry of Renewable Energy as well a Ministry of Power so that the capacities are upgraded / created in a time bound manner.

2. Possible structure of future Cane development loans under SDF

Since the basic purpose of constitution of the committee is to suggest yield enhancement strategies, a reworked model of the soft loan support under SDF, has been attempted by the committee and is given below:

i. The existing pattern of SDF Loans for Cane Development Schemes:

- ☐ The maximum cost of the schemes for cane development loan will be Rs.6 crore.
- ☐ Loan upto a maximum of 90% of the cost of the schemes will be admissible and the remaining 10% will be borne by the sugar factory from its own resources.
- ☐ The cane development scheme will normally be implemented in two years. Disbursement of the loan will also be in two installments.
- ☐ Provisions regarding rate of interest, repayment schedule of principal and interest, furnishing of security for SDF loans etc. will be as in terms of SDF Rules.
- ☐ Applications from the new/greenfield sugar factories for cane development loans will be considered, but actual disbursement will be made only after the sugar factory starts production of sugar.
- ☐ The existing practice of monitoring of the cane development projects, utilisation of the loans disbursed etc. by an agency appointed by the Central Government will continue in addition to the monitoring by the State Government as per SDF Rules.
- ☐ The applications for SDF sugar cane development loans may be given priority over other projects financed under SDF.
- ☐ Individual scheme wise cost of the project/admissibility of loan will be as given in the Annexure-XIII. Sugar factories can submit a single cane development scheme as well which may be costing upto Rs.6 crore subject to the prescribed cap on individual schemes.

The major problems with the existing pattern of funding are the following:

- ☐ The loan is given for plethora of activities, as per perceived requirements projected by the sugar mills. Since, a number of diverse activities are funded, there is lack of concerted efforts to improve the one or two prioritized problem areas and in effect there is dissipation of efforts.

- ❑ The varietal replacement is at times with seeds whose purity and genetic chain is untraceable.
- ❑ The monitoring part is basically aimed at ensuring spending of the money as per approved project and the long-term impact analysis does not feature in the scheme of things.
- ❑ The present pattern under SDF for cane development loan is limited up to Rs. 6.0 crores. Considering that the seed development, seed multiplication and seed replacement are of paramount importance and seed replacement programmes need expeditious expansion, this limit needs to be doubled.

ii. A reworked model for Cane Development loans could be on the basis of the following Principles:

- ❑ Loans may be granted only for state-wise identified, key constraints
- ❑ Loans should be in mission mode with clearly measurable targets and clear cut plans for final impact analysis
- ❑ Loan amount per project can be enhanced, so as to cover activities in a saturation mode
- ❑ Loan duration could be enhanced to at least five years
- ❑ The loans per project could be for one or more synergetic components out of five broad components, detailed below. The synergy of the components means, eg. the seed replacement component could also target adoption of improved agronomic practices and establishment of Demonstration Plots. Similarly, any project targeting water / fertilizer conservation issues, could target to establish Demonstration Plots as add-on activity.
- ❑ Sugar mills to be promoted as hubs for organizing the agricultural extension services through institutionalized arrangement for technical consultancies, with the identified research organization for each state. Loans to be granted subject to a viable and long term MoU between the sugar mill and the identified organization, which would act as hand holder for all crop development loans related activities. The expenses for this arrangement to be borne by SDF through grants-in-aid to the nominated organization. The nominated organization would also be responsible for concurrent and long-term impact analysis of the activities. The institutions for providing consultancy / technical support could be
 - PAU for Punjab
 - HAU for Haryana
 - SBI, RC, Karnal for Haryana, Punjab, Uttarakhand and Western and Central UP
 - UPCSR, Shahjahanpur for UP
 - NSI, Kanpur for UP
 - GB Pant University of Agriculture and Technology, Pantnagar for Uttarakhand

- IISR for UP/ Uttarakhand / Bihar
- RAU, Pusa for Bihar
- SBI, Coimbatore for Peninsular Zone
- TNAU, Coimbatore for TN
- ANGRAU, Hyderabad for AP
- DPKV, Akola, MPKV, Rahuri and VSI, Pune for Maharashtra
- JNKVV, Jabalpur for MP
- NAU, Navsari for Gujrat
- UAS, Dharwad & UAS, Bangalore for Karnataka
- ISMA
- NFCSF
- STAI

(iii) Components of the proposed cane development loans:

(a). Component for replacement of varieties, seed multiplication and seed Replacement:

As per broad estimation carried out by IISR, Lucknow, a concerted activity for raising breeder seeds on 10 hectare area can yield enough material to saturate the catchment, which could be around 10, 000 to 15,000 hectare, of one sugar mill in 4-5 years' time span for a 2500-3500 TCD sugar mill. This is based on the proven multiplication rate of 10 times in each link of the chain, down the line and at the average seed requirement of 6 tonnes/ha. . The rough costing sheet for the technical part is given at Annexure -XII and as can be seen would cost only about 2.5 crore over 4-5 years of the operation. IISR has already taken up such activity in consultancy mode with Bihar Government and is understandably also going to take up the similar activity with some UP Federation Sugar Mills. Taking a leaf from this model, the contours of SDF loans for this activity could be as follows:

- ☐ Loans should be granted only for projects with inbuilt consultancy / technical support / breeder seed supply or genetic material supply (for raising breeder seed nurseries) arrangements with the appropriate research institute / organization
- ☐ The project should also have extension support as well as periodic Impact analysis arrangements with the concerned research organization
- ☐ The consultants would be free to adopt traditional MHAT route or the tissue Culture route or any other geographically suitable strategy to make available quantity seed material for saturating the target catchment within the project duration. The sugar mill concerned will provide the land for the breeder seed activity.
- ☐ While the organization involved would undertake to provide either the breeder seed or the basic genetic material which could be in the form of –
 - Mother cultures for further propagation through tissue Culture / seed sets or bud sets for tissue Culture activities

or Seedlings raised through tissue Culture (In case tissue Culture route is adopted) (*Tissue culture plants and mother cultures should be virus indexed and also tested for genetic fidelity as per protocols at accredited labs.*)

- Seed sets or bud sets (in case traditional propagation route or bud chip method is adopted)

it would also oversee and coordinate with the sugar mill for establishment / running of tissue Culture labs, tissue Culture seedlings nurseries as well as breeder seed nurseries.

- ❑ The consulting organization would also provide technical support for the foundation-I and foundation-II seed propagation activities to be organized by sugar mills through identified/registered seed growers.
- ❑ There may be suitable incentivisation/ sale purchase strategies for foundation seeds to motivate the seed growers, which can be supported through subsidized SDF loans.
- ❑ Loan period to be suitably aligned with appropriate time period required for seed replacement in the full catchment of a sugar mill
- ❑ Infrastructure for tissue Culture / MHAT Treatment, etc. will also be funded under this component.
- ❑ The final nitty-gritties of the seed sale – purchase arrangements, including any incentives required, will be suitably devised by the sugar mills in consultation with the participating farmers and the consulting organization.

(b). Component for supporting increased adoption of mechanization

The SDF loans for promoting mechanization could be restricted to the following:

- ❑ For Demonstration and Adoption of indigenously developed machineries like
 - Planters
 - Settling trans-planter
 - Inter-culturing implements
 - Culti-Harrow
 - SS Furrower
 - Sub-soiler
 - Plant residue shredder
 - Trench Planter
 - Fertilizer and pesticide applicators
 - Ratoon management devices
 - Small harvesters
- ❑ Loans for imported harvesters, being costly and not well tested in Indian conditions could be restricted to maximum of two machines per project and could either be for the identified private entrepreneurs by the sugar mills or for the sugar mills themselves

- ❑ Incubators aimed at onsite development of locally useful equipment through farmer entrepreneurs
- ❑ Encouraging the establishment of service centers/private entrepreneurs for providing farm implements / machinery on hire-basis.
- ❑ Innovations / Activities aimed at reduction of post-harvest losses through:
 - Speedier crush time (24 Hrs. maximum from harvesting time)
 - Sifting of plant refuse / trash before transportation
 - Voluntary adoption of Sucrose testing gadgets (Sugarcane Sampler) in sugar mills

(c). Component for supporting Water and Fertilizer Conservation activities

❑ Implementation of drip fertigation

- Drip fertigation to be implemented in sugarcane farms which satisfy the suitability criteria for drip irrigation
- The installation cost after accounting for the Central and State Government subsidies to be borne by SDF
- Fertilizer recommendations for drip irrigation are to be made strictly based on the Soil Test Results
- Liquid fertilizers are very expensive at present. Liquid and water-soluble fertilizers and site-specific micronutrients to be distributed at full / partial subsidy by the sugar mills with financial support from SDF.
- The identified research organization for every state will consolidate the available information on fertigation to sugarcane and evolve fertigation schedule for concerned state.
- Preferably for the projects attempting to cover entire catchment area of the factory by improved irrigation systems

❑ Establishment of soil testing laboratories

- SDF loans can be considered for establishment of in-house/mobile soil testing facilities by sugar mills.
- The state-wise identified research organization will provide the technical support and consultancy for the establishment of soil testing laboratories in each factory's premises.
- The identified organization will also offer training to the soil testing personnel of the participating sugar mills, oversee the implementation of the soil testing programme and do impact analysis in consultancy mode
- Fertilizer recommendations, fertilizer and manure subsidies and free distribution of other soil inputs must be based on the soil test recommendations only

(d). Component for supporting Improved Agronomic Practices

- For projects envisaging adoption of the proven agronomic practices like wide row planting, scientific irrigation management, integrated nutrient management, intercropping, mechanized intercultural operations, trash mulching, fertilizer placement, pocket manuring, trash composting, chemical weed control, pest and disease management, harvest management, ratoon operations, saline and alkali soil management *etc.*, in-tandem
- For projects with arrangements sorted out with identified research organization to train the extension personnel of sugar mills and oversee its implementation and do the impact analysis in consultancy mode.

(e). Component for supporting extension activities:

Since, the major part of the activities also get covered by the visualized arrangements of active involvement of identified research organization for each state for crop loans components, the explicit support under SDF for extension could be restricted to the establishment of Demonstration plots in / around sugar mills, on the following lines:

- ☐ Plots aimed at practical demonstration of best package of practices / machineries for promising varieties.
- ☐ Dissemination of information through literature / audio - video materials / media
- ☐ Only for projects with inbuilt consultancy arrangements with the appropriate research institute / organization

3. Using SDF for consolidating infrastructure for key initiatives, through Grants

The provisions of SDF rules enable government to meet expenses for establishment / maintenance of institutions for training, extension and research programmes connected with development of sugar industry. The SDF rules also provide for payments of grants to the established institutions connected with sugar industry for carrying out research aimed at the promotion and development of any aspect of sugar industry. These enabling provisions may be used for expanding the support, preferably in mission mode, for supporting following activities, may be on pilot scale:

i. Supporting establishment of tissue Culture/ suitable seed multiplication setups in sugarcane / sugar research organizations

In order to, meet the huge requirements of basic seed material in the country, the only viable route, as indicated in earlier parts of the report is the tissue Culture. The organizations presently active in this field are SBI, Coimbatore and VSI, Pune. However, the existing setup in these two organizations cannot meet the needed requirements of the genetic material for even Tamil Nadu and Maharashtra, respectively, where these organizations are located. In addition tissue Culture propagation setups need to be developed ab-initio in other states.

The ideal setup could be the one in which the identified research organizations for each state undertake the responsibility at least upto the

stage of production and supply of mother cultures to the satellite tissue Culture centers, to be managed by the sugar mills. As per rough calculations, for meeting the requirements of an all India seed replacement programme on a 6 yearly cycle, the one-time investment required may not be more than Rs. 50 crores. The system can thereafter roll-on from the sale proceeds of the operations. The department can therefore consider inviting and funding the proposals from research organizations, each state wise, which are interested in taking up tissue Culture setups, to be exclusively devoted, for meeting the requirements of the concerned state for the cane seed material in a fixed timeframe. The state governments through their Cane Commissioner offices could be involved in the endeavor so as to ensure tie-ups / buy-back arrangements between the sugar mills and the research organizations.

In nutshell, while the grants in aid component supports creation of tissue Culture infrastructure in the research organizations, the loan component supports establishment of field facilities for further propagation by the sugar mills. However, in the interregnum and in case the situation demands, the grants may also support alternate / traditional pathways of gene multiplication / breeder seed production by research organizations.

ii. Supporting Consultancy arrangements of research organizations with the sugar mills for Cane development activities

In order to institutionalize the involvement of identified research organizations with the sugar mills for cane development activities, government may consider meeting the standard consultancy costs for the duration of the cane development loans through grants-in-aid component of SDF. The arrangements may be cost neutral or with minimal additional cost burden as the consulting organizations can be asked to take over the monitoring activity for the concerned loan and for which presently SDF makes separate payments to the nominated monitoring agencies. In fact, the mandate can be expanded and should go beyond the monitoring of the utilization of the loan money and should target the concurrent impact analysis of the loan during the project period and even few years afterwards.

iii. Supporting cultivation and manufacturing practices for production of “Organic Sugar”

There is a whole set of protocol of practices before requirements of international certification processes for Organic products are met with. The process requires complete abandonment of the use of chemical materials for prescribed number of years before the agriculture produce raised from a piece of agriculture land through organic cultivation practices qualifies for being certified organic. Obviously, this involves sacrifices during the development phase, which an individual farmer may not be in a position to afford. More than that, since the organically raised sugarcane would mean nothing if not accompanied by corresponding chain linkages in the industrial

processes so that there is final product, which can be certified as “Organic Sugar”.

In this context, SDF can start supporting, **pilot projects** envisaging production of a specified quantity of organic sugar in a mission mode in a specified time band. This would obviously involve the identification of the farmers, the extent of land involved, the slight modification of industrial processes, the steps for meeting the certification requirements as well as an indication of possible long-term supply arrangements. Initially the activity could be restricted to a few prototypes in each major sugar producing state and in case the momentum picks-up, this can become a component to be supported on a large scale, probably through the soft loan system.

iv. Supporting development of region / state specific cane harvesters

The extremely variable size of land holdings, the entirely different crop harvest arrangement in sub-tropical and tropical part, the largely manual systems of planting and the difficulties of adoption of large harvesters developed for other markets are some of the factors which call for **promoting incubators** for developing indigenous harvesters by combined efforts of research organizations, industry’s representative bodies and local machinery makers. SDF can be utilized for extending grants for instituting such machinery development incubator projects through multi party arrangements, wherein some costs are borne by Government and more than the costs, the Government brings all interested parties onboard in joint initiatives.

Annexures

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Annexure XI	Price Build up Comparison @ Rs 59 per USD as on 24th June'13 for imported Petrol and domestic Ethanol
Annexure XII	Budget requirement for raising 10 ha of Breeder's Seed of improved sugarcane varieties in Sugar Mills Proposal from Indian Institute of Sugarcane Research, Lucknow
Annexure XIII	Existing funding pattern of crop development loans under SDF
Annexure XIV	The order constituting the Working Group



Annexure – I

Sugar manufacturing base in the country

S. No.	State	Installed**		Operational ***		Closed****		Upcoming*****	
		Capacity*	No. of Sugar mills	Capacity*	No. of Sugar mills	Capacity*	No. of Sugar mills	Capacity*	No. of Sugar mills
Major sugar producing states									
Sub-tropical belt									
1	Bihar	67079	28	47990.00	11	19089.00	17	3500.00	1
2	Haryana	50850.00	16	50850.00	16	0.00	0	7000.00	2
3	Punjab	62600.00	24	48350.00	17	14250.00	7	3500.00	1
4	Uttarakhand	44500.00	10	44500.00	10	0.00	0	0.00	0
5	Uttar Pradesh	830591.00	158	803453.00	137	27138.00	21	3500.00	1
Sub Total		1055620.00	236	995143.00	191	60477.00	45	17500.00	5
Tropical Belt									
6	Andhra Pradesh	137604.00	44	130822.00	39	6782.00	5	7000.00	2
7	Gujarat	78750.00	25	72500.00	21	6250.00	4	0.00	0
8	Maharashtra	589072.00	222	563759.00	207	25313.00	15	290500.00	83
9	Karnataka	252055.00	71	243550.00	65	8505.00	6	136500.00	39
10	Tamil Nadu	164050.00	46	160300.00	44	3750.00	2	7000.00	2
Sub Total		1221531.00	408	1170931.00	376	50600.00	32	441000.00	126
Potential states									
11	Chhattisgarh	7500.00	3	7500.00	3	0.00	0	0.00	0
12	Odisha	14200.00	8	11250.00	6	2950.00	2	0.00	0
13	Madhya Pradesh	35025.00	19	29200.00	14	5825.00	5	17500.00	5
Sub Total		56725.00	30	47950.00	23	8775.00	7	17500.00	5
Minor Players									
14	Puducherry	3250.00	2	3250.00	2	0.00	0	0.00	0
Sub Total		3250.00	2	3250.00	2	0.00	0	0.00	0
Industry closed / On the verge of closure									
15	Goa	1250.00	1	1250.00	1	0.00	0	0.00	0
16	Assam	3313.00	3	0.00	0	3313.00	3	0.00	0
17	Dadra Nagar & Haveli	1250.00	1	1250.00	1	0.00	0	0.00	0
18	Kerala	1516.00	2	0.00	0	1516.00	2	0.00	0
19	Nagaland	1000.00	1	0.00	0	1000.00	1	0.00	0
20	Rajasthan	3750.00	3	1000.00	1	2750.00	2	0.00	0
21	West Bengal	4400.00	3	3800.00	2	600.00	1	0.00	0
Sub Total		16479.00	14	7300.00	5	9179.00	9	0.00	0
Grand Total		2353605.00	690	2224574.00	597	129031.00	93	476000.00	136

* As per Directorate of Sugar and Sugar Technologist Association of India (STAI) in terms of Tonnes Cane crush per Day

** Registered capacity.

*** Sugar Mills which have worked at least once in the last five sugar seasons.

**** Sugar Mills, which have not worked even once in the last five sugar seasons.

***** New Sugar mills under erection @ average of 3500 TCD capacity and expected to be operational by 2016-17 sugar season.

Record of Working days of Sugar Mills in the Country

Sl No	State	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12 (P)	2012-13(P)*
Major sugar producing states													
Sub-tropical belt													
1	Bihar	116	125	81	82	126	145	93	61	67	97	98	104
2	Haryana	162	144	125	96	100	162	150	65	59	109	147	
3	Punjab	147	139	90	64	78	118	136	67	55	77	100	96
4	Uttarakhand	138	151	116	110	120	156	117	76	87	96	111	94
5	Uttar Pradesh	149	158	114	133	124	151	120	73	88	104	125	108
Tropical Belt													
6	Andhra Pradesh	119	130	104	96	124	173	127	75	66	103	115	96
7	Gujarat	152	172	151	108	150	202	191	125	147	163	139	187
8	Maharashtra	127	123	77	70	107	175	162	91	145	162	149	139
9	Karnataka	145	158	107	103	152	180	168	96	137	158	155	120
10	Tamil Nadu	194	173	111	59	234	265	201	165	144	168	202	145
Potential states													
11	Chhattisgarh	-	31	94	58	80	149	190	69	36	49	76	
12	Odisha	55	85	86	59	64	84	75	46	43	71	91	
13	Madhya Pradesh	64	69	79	59	77	135	122	43	55	84	77	
Minor Players													
14	Puducherry	139	121	131	117	238	235	176	113	88	160	206	
Industry closed / On the verge of closure													
15	Goa	60	99	85	69	99	141	108	78	73	107	90	
16	Assam	-	-	-	-	-	-	-	-	-	-	-	
17	Kerala	65	26	-	-	-	-	-	-	-	-	-	
18	Nagaland	-	-	-	-	-	-	-	-	-	-	-	
19	Rajasthan	61	28	111	62	90	90	103	51	75	60	39	
20	West Bengal	35	91	81	58	63	93	56	22	47	63	53	
	All India	140	141	99	96	126	173	148	88	111	134	140	121

P- Provisional

* Duration for the sugar season 2012-13 is worked out on the basis of crushing capacity as submitted by Cane Commissioners in estimates of sugar production

Annexure-III

Record of State wise % Sugar Recovery

State	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12(P)*	2012-13*(P)
Major sugar producing states													
Sub-tropical belt													
Bihar	9.11	8.82	9.05	9.33	9.58	9.48	8.67	9.20	9.30	9.49	9.30	9.28	8.76
Haryana	9.80	9.95	10.13	10.47	10.16	9.78	9.74	9.90	9.05	9.37	9.02	9.14	9.68
Punjab	9.70	9.45	9.72	9.72	9.79	9.19	9.54	9.30	9.33	8.59	8.80	9.24	9.04
Uttarakhand	-	9.42	9.47	9.75	9.63	9.42	9.54	9.80	9.20	9.19	9.34	9.14	9.04
Uttar Pradesh	9.71	9.53	9.54	9.82	9.79	9.49	9.49	9.30	8.91	9.13	9.15	9.09	9.10
Tropical Belt													
Andhra Pradesh	10.36	10.01	10.15	10.32	10.65	10.05	9.69	10.10	9.88	9.28	9.77	9.81	9.62
Gujarat	10.42	10.79	10.58	10.93	10.76	10.82	10.68	10.90	9.50	10.52	9.99	10.61	10.66
Maharashtra	11.63	11.60	11.68	10.93	11.39	11.66	11.39	11.80	11.52	11.51	11.30	11.67	11.30
Karnataka	10.75	10.72	10.80	10.21	10.11	10.83	10.69	10.10	10.30	10.67	10.92	11.16	10.44
Tamil nadu	9.64	9.61	9.87	9.92	9.64	9.24	9.31	9.30	9.56	8.94	9.10	9.34	8.99
Potential states													
Puducherry	8.18	8.46	9.56	9.80	9.72	7.62	8.31	8.90	8.90	8.30	8.70	8.86	8.48
Minor Players													
Chhattisgarh	-	-	9.15	9.90	10.20	9.70	7.62	9.00	9.00	7.82	8.72	8.21	9.48
Odisha	9.61	9.05	9.79	9.25	9.40	8.96	9.74	9.50	9.50	8.84	8.70	8.81	8.53
Madhya Pradesh	9.18	9.91	9.90	10.15	9.80	9.76	10.11	10.60	10.60	9.40	9.67	9.69	9.75
Industry closed / On the verge of closure													
Goa	9.52	8.96	9.25	8.89	8.51	9.28	9.57	10.10	10.10	8.17	8.66	9.02	8.89
Assam	7.75	-	-	-	-	-	-	-	-				
Kerala	8.09	8.26	7.04	-	-	-	-	-	-				
Nagaland	-	-	-	-	-	-	-	-	-				
Rajasthan	8.76	9.45	8.43	9.53	7.63	6.85	9.04	7.10	7.10	7.79	7.73	7.66	7.69
West Bengal	7.09	8.32	8.44	8.45	8.11	8.45	8.32	7.00	7.00	7.05	7.18	8.10	8.29
All india	10.48	10.27	10.38	10.22	10.17	10.22	10.16	10.30	10.05	10.20	10.17	10.27	9.99

(P) - Provisional

* Based on on-line Proforma-II

Trend of year-to-year sugar production and the associated factors

Sugar Season	Sugar Production (In Million MT)@	Sugarcane Area (In Million ha.)#	Sugarcane Production (in Million MT)#	Sugarcane Yield (In MT/ha.)#	% Sugar Recovery@
2001-02	18.50	4.41	297.21	67.37	10.27
2002-03	20.13	4.52	287.38	63.58	10.38
2003-04	13.96	3.94	233.86	59.38	10.22
2004-05	13.66	3.66	237.09	64.75	10.17
2005-06	19.32	4.20	281.17	66.92	10.22
2006-07	28.20	5.15	355.52	69.02	10.16
2007-08	26.30	5.06	348.19	68.88	10.30
2008-09	14.68	4.42	285.03	64.55	10.05
2009-10	18.80	4.17	292.30	70.02	10.20
2010-11	24.35	4.88	342.38	70.09	10.17
2011-12	26.34	5.04	361.04	71.67	10.27
2012-13(P)	24.80	5.06	336.15	66.47	9.99

@- Directorate of Sugar

#- DAC's estimates

(P)- Provisional

**Historical trend of sugarcane cultivation and sugar production in major states
(Sub-Tropical Belt)**

Sugar season	Area (000 Hect.)	Sugarcane Production ('000 Tons)	Yield (Metric Tons /Hect.)	Recovery %	Sugar Production upto 31.05.13 Prov. (Fig. in lakh tones)	Area (000 Hect.)	Sugarcane Production ('000 Tons)	Yield (Metric Tons /Hect.)	Recovery %	Sugar Production upto 31.05.13 Prov.(Fig. in lakh tones)
	Uttar Pradesh					Haryana				
2001-02	2035	117982	57.98	9.53	52.59	161	9270	57.58	9.95	6.24
2002-03	2149	120948	56.28	9.54	58.74	189	10650	56.35	10.13	5.99
2003-04	2030.1	112754	55.54	9.82	46.08	160	9280	58	10.47	5.86
2004-05	1954.7	118715.6	60.73	9.79	51.52	130	8060	62	10.16	3.98
2005-06	2155.8	125469.9	58.2	9.49	55.64	127	8180	64.41	9.78	3.88
2006-07	2246.5	133949.4	59.63	9.49	83.52	140	9580	68.43	9.74	6.77
2007-08	2179	124665.3	57.21	9.3	73.2	140	8860	63.29	9.9	5.99
2008-09	2084	109048	52.33	8.91	41.53	90	5130	57	9.05	2.29
2009-10	1977	117140	59.25	9.13	51.67	74	5335	72.09	9.37	2.48
2010-11	2125	120545	56.73	9.15	57.58	85	6042	71.08	9.02	3.93
2011-12	2162	128819	59.58	9.09	69.58	95	6959	73.25	9.14	4.91
2012-13	2212	130508	59	8.98	74.66	107	7490	70	9.45	5.07

Sugar season	Uttarakhand					Punjab				
	Area (000 Hect.)	Sugarcane Production ('000 Tons)	Yield (Metric Tons /Hect.)	Recovery %	Sugar Production upto 31.05.13 Prov. (Fig. in lakh tones)	Area (000 Hect.)	Sugarcane Production ('000 Tons)	Yield (Metric Tons /Hect.)	Recovery %	Sugar Production upto 31.05.13 Prov.(Fig. in lakh tones)
2001-02	125.9	7555.3	60.01	9.42	4.44	142	9250	65.14	9.45	5.93
2002-03	134.4	7331.7	54.55	9.47	4.59	154	9290	60.32	9.72	5.11
2003-04	128	7651	59.77	9.75	3.93	123	6620	53.82	9.72	3.88
2004-05	107	6441	60.2	9.63	3.36	86	5170	60.12	9.79	3.37
2005-06	101	6134	60.73	9.42	4.14	84	4860	57.86	9.19	3.88
2006-07	121	6100	50.41	9.54	5.28	99	6020	60.81	9.54	5.5
2007-08	124	7686	61.98	9.8	4.01	110	6690	60.82	9.3	5.34
2008-09	107	5590	52.24	9.2	2.23	81	4670	57.65	9.33	2.43
2009-10	96	5842	60.85	9.19	2.91	60	3700	61.67	8.59	1.81
2010-11	106.7	6497.6	60.9	9.34	3.05	70	4170	59.57	8.8	3.03
2011-12	108	6311	58.44	9.14	3.31	80	5653	70.66	9.24	3.88
2012-13	110	6718	61.07	8.89	3.37	83	5602	67.49	8.99	4.31

Sugar season	Bihar				
	Area (000 Hect.)	Sugarcane Production ('000 Tons)	Yield (Metric Tons /Hect.)	Recovery %	Sugar Production upto 31.05.13 Prov. (Fig. in lakh tones)
2001-02	113.4	5211.1	45.95	8.82	3.39
2002-03	107.3	4520.5	42.13	9.05	4.21
2003-04	103.6	4285.9	41.37	9.33	2.77
2004-05	104.2	4111.7	39.46	9.58	2.7
2005-06	101.3	4337.9	42.82	9.48	4.19
2006-07	129.6	5955.5	45.95	8.67	4.83
2007-08	108.6	3854.9	35.5	9.2	3.36
2008-09	111.9	4959.9	44.32	9.3	2.22
2009-10	115.9	5032.6	43.42	9.49	2.6
2010-11	248	12763.6	51.47	9.3	3.87
2011-12	218.3	11288.6	51.71	9.28	4.51
2012-13	252.6	13084.7	51.8	8.76	5.08

**Historical trend of sugarcane cultivation and sugar production in major states
(Tropical Belt)**

Sugar season	Area (000 Hect.)	Sugarcane Production ('000 Tons)	Yield (Metric Tons/Hect.)	Recovery %	Sugar Production upto 31.05.13 Prov. (Fig. in lakh tones)	Area (000 Hect.)	Sugarcane Production ('000 Tons)	Yield (Metric Tons/Hect.)	Recovery %	Sugar Production upto 31.05.13 Prov. (Fig. in lakh tones)
	Maharashtra					Tamil Nadu				
2001-02	578	45140	78.1	11.6	55.88	321	32620	101.62	9.61	18.39
2002-03	573	42617	74.38	11.68	61.64	261.4	24165.4	92.45	9.87	17.04
2003-04	443	25668	57.94	10.93	31.99	192.1	17656	91.91	9.92	11.9
2004-05	324	20475	63.19	11.39	23.03	232	23396	100.84	9.64	14.75
2005-06	501	38853	77.55	11.66	52.64	335.4	35106.5	104.67	9.24	21.38
2006-07	1049	78568	74.9	11.39	90.13	391.2	41124	105.12	9.31	24.21
2007-08	1093	88437	80.91	11.8	90.75	354.2	38071	107.48	9.3	21.41
2008-09	768	60648	78.97	11.52	46	308.9	32804.4	106.2	9.56	15.95
2009-10	756	64159	84.87	11.51	70.36	293.2	29745.6	101.45	8.94	12.69
2010-11	965	81895.7	84.87	11.3	90.65	316	34251.8	108.39	9.1	18.42
2011-12	1022	86733.1	84.87	11.67	89.96	346.4	38575.7	111.38	9.34	23.79
2012-13	937	60490.5	64.56	11.25	79.87	392.9	39682.3	101	9.04	15.86

	Karnataka					Andhra Pradesh				
2001-02	407	33016.6	81.12	10.72	15.5	218	18082	82.94	10.01	10.48
2002-03	382.7	32485.3	84.88	10.8	17.98	232	15387.2	66.18	10.15	11.88
2003-04	243.3	16015.4	65.83	10.21	11.57	209	15070	72.11	10.32	8.81
2004-05	178	14276	80.2	10.11	11.32	210	15739	74.95	10.65	12.03
2005-06	219	18267	83.41	10.83	20.09	230	17656	76.77	10.05	12.76
2006-07	326	28669.7	87.94	10.69	25.42	264	21692	82.17	9.69	19.24
2007-08	306	26240	85.75	10.1	28.39	247	20296	82.17	10.1	13.35
2008-09	281	23328	83.02	10.3	16.75	196	15380	78.47	9.88	5.92
2009-10	337	30443	90.34	10.67	25.12	158	11708	74.1	9.28	5.1
2010-11	423	39657	93.75	10.92	36.44	192	14964	77.94	9.77	10.05
2011-12	430	38808	90.25	11.16	38.66	204	16686	81.79	9.81	11.35
2012-13	417	35059	84.07	10.44	33.3	196	16105.3	82.17	9.68	9.91

	Gujarat				
2001-02	175.8	12464.6	70.9	10.79	10.56
2002-03	202.9	14071.3	69.35	10.58	12.38
2003-04	176.4	12669.1	71.82	10.93	10.77
2004-05	196.7	14570	74.07	10.76	8.32
2005-06	197	14580	74.01	10.82	12.44
2006-07	214	15630	73.04	10.68	13.9
2007-08	211	15190	71.99	10.9	13.66
2008-09	221	15510	70.18	9.5	10.22
2009-10	154	12400	80.52	10.52	11.91
2010-11	190	13760	72.42	9.99	12.7
2011-12	202	12750	63.12	10.61	10.02
2012-13	185	13300	71.89	10.63	11.27

Capacity profile of the operational sugar mills

S. No.	State	In terms of Tonnes Crush per Day (TCD)								Total
		< 1250	1250	>1250 - <2500	2500	>2500 - <5000	5000	>5000 - <10000	>10000	
Major sugar producing states										
Sub-tropical belt										
1	Bihar	1	0	2	1	1	4	1	1	11
2	Haryana	0	1	6	5	1	2	0	1	16
3	Punjab	1	3	2	6	2	2	1	0	17
4	Uttaranchal	0	0	1	3	3	0	2	1	10
5	Uttar Pradesh	3	7	6	17	23	10	51	20	137
										0
Tropical Belt										0
6	Andhra Pradesh	1	4	5	9	11	4	5	0	39
7	Gujarat	2	1	1	8	3	4	1	1	21
8	Maharashtra	5	29	21	101	31	10	10	0	207
9	Karnataka	1	4	4	27	13	5	8	3	65
10	Tamil Nadu	0	2	1	17	16	2	6	0	44
Potential states										
11	Chhattisgarh	0	0	0	3	0	0	0	0	3
12	Orissa	0	3	0	3	0	0	0	0	6
13	Madhya Pradesh	1	2	3	8	0	0	0	0	14
Minor Players										
14	Pondicherry	0	1	1	0	0	0	0	0	2
Industry closed / On the verge of closure										
15	Goa	0	1	0	0	0	0	0	0	1
16	Dadra Nagar & Haveli	0	1	0	0	0	0	0	0	1
17	Rajasthan	1	0	0	0	0	0	0	0	1
18	West Bengal	0	0	2	0	0	0	0	0	2
State Wise Total										0
		16	59	55	208	104	43	85	27	597
Sector Wise Total										
Private		8	7	15	76	55	24	71	26	282
Cooperative		3	51	35	122	43	18	13	1	286
Public		5	1	5	10	6	1	1	0	29
Grand Total		16	59	55	208	104	43	85	27	597

Potential of the Industry – Minimum Achievable in a sugar season

S. No.	State	No. of working days	Sugar recovery	Cane crushing (MT)		Sugar Production (MT)	
				On basis of Operational and upcoming mills at 90% of capacity utilization*	On basis of operational mills at 90% of capacity utilization**	On basis of Operational and upcoming mills at 90% of capacity utilization*	On basis of Operational mills at 90% of capacity utilization**
Major sugar producing states							
Sub-tropical belt							
1	Bihar	150	10%	6951150.00	6478650	625603.5	583078.5
2	Haryana	150	10%	7809750.00	6864750	702877.5	617827.5
3	Punjab	150	10%	6999750.00	6527250	629977.5	587452.5
4	Uttarakhand	150	10%	6007500.00	6007500	540675.0	540675.0
5	Uttar Pradesh	150	10%	108938655.00	108466155	9804479.0	9761954.0
Sub Total				136706805.0	134344305.0	12303612.5	12090987.5
Tropical Belt							
6	Andhra Pradesh	150	10%	18605970.00	17660970	1674537.3	1589487.3
7	Gujarat	150	11%	9787500.00	9787500	968962.5	968962.5
8	Maharashtra	150	12%	115324965.00	76107465	12455096.2	8219606.2
9	Karnataka	180	12%	61568100.00	39455100	6649354.8	4261150.8
10	Tamil Nadu	180	10%	27102600.00	25968600	2439234.0	2337174.0
Sub Total				232389135.0	168979635.0	24187184.8	17376380.8
Potential states							
11	Chhattisgarh	150	10%	1012500.00	1012500	91125.0	91125.0
12	Odisha	150	10%	1518750.00	1518750	136687.5	136687.5
13	Madhya Pradesh	150	10%	6304500.00	3942000	567405.0	354780.0
Sub Total				8835750.0	6473250.0	795217.5	582592.5
Minor Players							
14	Puducherry	150	10%	438750.00	438750	39487.5	39487.5
Sub Total				438750.0	438750.0	39487.5	39487.5
Industry closed / On the verge of closure							
15	Goa	Not Considered					
16	Assam						
17	Dadra Nagar & Haveli						
18	Kerala						
19	Nagaland						
20	Rajasthan						
21	West Bengal						
Sub Total							
Grand Total				378370440.0	310235940.0	37325502.3	30089448.3

Cross-reference – Annexure I

* By 2016-17 sugar season and assuming additional sugarcane availability for the upcoming capacities

**Already once achieved during 2006-07 and only dependent on sugarcane availability

Potential of the Industry - Best Case Scenario in a sugar season

S. No.	State	Working days	Sugar recovery (%)	Cane crushing (MT)		Sugar Production (MT)	
		Climatically possible		On basis of Operational and upcoming mills at 90% of capacity utilization*	On basis of operational mills at 90% of capacity utilization**	On basis of Operational and upcoming mills at 90% of capacity utilization*	On basis of Operational mills at 90% of capacity utilization**
Major sugar producing states							
Sub-tropical belt							
1	Bihar	180	11%	8341380	7774380	917551.8	855181.8
2	Haryana	180	11%	9371700	8237700	1030887.0	906147.0
3	Punjab	180	11%	8399700	7832700	923967.0	861597.0
4	Uttarakhand	180	11%	7209000	7209000	792990.0	792990.0
5	Uttar Pradesh	180	11%	130726386	130159386	14379902.5	14317532.5
Sub Total				164048166	161213166	18045298.3	17733448.3
Tropical Belt							
6	Andhra Pradesh	180	10%	22327164	21193164	2232716.4	2119316.4
7	Gujarat	180	13%	11745000	11745000	1526850.0	1526850.0
8	Maharashtra	210	13%	161454951	106550451	20989143.6	13851558.6
9	Karnataka	240	13%	82090800	52606800	10671804.0	6838884.0
10	Tamil Nadu	240	10%	36136800	34624800	3613680.0	3462480.0
Sub Total				313754715	226720215	39034194.0	27799089.0
Potential states							
11	Chhattisgarh	180	11%	1215000	1215000	133650.0	133650.0
12	Odisha	180	11%	1822500	1822500	200475.0	200475.0
13	Madhya Pradesh	180	11%	7565400	4730400	832194.0	520344.0
Sub Total				10602900	7767900	1166319.0	854469.0
Minor Players							
14	Puducherry	240	10%	702000	702000	70200.0	70200.0
Sub Total				702000	702000	70200.0	70200.0
Industry closed / On the verge of closure							
15	Goa	Not considered					
16	Assam						
17	Dadra Nagar & Haveli						
18	Kerala						
19	Nagaland						
20	Rajasthan						
21	West Bengal						
Sub Total							
Grand Total				489107781.00	396403281.00	58316011.3	46457206.3

Cross reference – Annexure – I

* By 2016-17 sugar season

** By 2016-17 sugar season assuming improvement in the sugarcane availability in the intervening years.

Scope for surplus power generation in the sugar industry *

Minimum sugarcane crushing possible on basis of Operational and upcoming mills at 90% of capacity utilization (MT)	Minimum sugarcane crushing possible on basis of operational mills at 90% of capacity utilization (MT)	Surplus Power Generation Potential for the Grid (MW)	
		On basis of Operational and Upcoming mills at 90% of capacity utilization**	On basis of Operational mills at 90% of capacity utilization **
378370440.0	310235940.0	10500	8800

* On basis of minimum achievable cane crushing potential – Annexure VI

** On basis of standard technical norms

Scope for radical shifts in Sugar: Alcohol combinations in the country*

Minimum sugarcane crushing possible on basis of Operational and upcoming mills at 90% of capacity utilization (MT)	Minimum sugarcane crushing possible on basis of operational mills at 90% of capacity utilization (MT)	Traditional Combination of Sugar Production (MT) as main product and Alcohol as by-product from C molasses **		Possible Combination of Sugar Production (MT) as main product, restricted to domestic requirements and Alcohol both as by-product from C molasses as well as main product from spare sugarcane juice**	
		On basis of Operational and Upcoming mills at 90% of capacity utilization***	On basis of Operational mills at 90% of capacity utilization ****	On basis of Operational and Upcoming mills at 90% of capacity utilization***	On basis of Operational mills at 90% of capacity utilization****
378370440.0	310235940.0	37 Million MT Sugar + 3700 million Litre of Alcohol by 2016-17 sugar season	30 Million MT of sugar + 3000 million Litre of Alcohol in 2013-14 sugar season	26 Million MT of sugar + 10000 Million Litre of Alcohol by 2016-17 sugar season	24 Million MT of Sugar + 5900 Million Litre of Alcohol in 2013-14 sugar season

* On basis of minimum achievable cane crushing potential – Annexure VI

** On basis of standard technical norms

Annexure XI

Price Comparison @ Rs 59 per USD as on 24th June'13 for imported Petrol and domestic Ethanol

Sr. No	Particulars	Unit	Petrol	Ethanol NDC	Remarks
1	FOB Gasoline Price at Arab Gulf	\$/bbl	111.79	-	Calculated
2	Add: Ocean Freight from AG to Indian Ports	\$/bbl	2.06	-	Assumed for Petrol as taken for Diesel
3	C&F (Cost & Freight) Gasoline Price	\$/bbl	113.85	-	Taken from IOCL website as on 16th June'13
	C&F (Cost & Freight) Gasoline Price	Rs/Lit	41.98	-	At Rs 59 per USD
4	Import Charges	Rs/Lit	0.40	-	Assumed for Petrol as taken for Diesel
5	Basic Customs Duty @ 2.575% (2.50% + 3% Education cess)	Rs/Lit	1.11	-	Assumed for Petrol as taken for Diesel
6	Import Parity Price (at 29.5° C) (Sum of 3 to 5)	Rs/Lit	43.49	-	
7	Export Parity Price (at 29.5° C)	Rs/Lit	42.31	-	Calculated
8	Trade Parity Price (80% of (6)+20% of (7))	Rs/Lit	43.26	-	
9	Refinery Transfer Price (RTP) (Price Paid by the Oil Marketing Companies to Refineries)	Rs/Lit	43.26	39.00	Calculated
10	Add: Excise Duty & Cess @ 12.36%	Rs/Lit	-	4.82	
11	Add: Freight	Rs/Lit	-	2.76	Freight may vary from Depot to Depot
12	Add: Premium recovered for BS-IV Grade over BS-III Grade	Rs/Lit	-	-	
13	Add: Inland Freight, Delivery Charges etc.	Rs/Lit	0.95	-	Assumed for Petrol as taken for Diesel
14	Add: Marketing Cost of OMCs	Rs/Lit	0.69	0.69	Calculated
15	Add: Marketing Margin of OMCs	Rs/Lit	0.67	0.67	Calculated
16	Total Desired Price (Sum of 9 to 15)-Before Excise Duty, VAT and Dealer Commission	Rs/Lit	45.57	-	Calculated
17	Less: Under-recovery to Oil Marketing Companies for BS III Diesel	Rs/Lit	-	-	
18	Price Charged to Dealers (17-18)- Excluding Excise Duty & VAT	Rs/Lit	45.57	-	Calculated
19	Add: Specific Excise Duty @ ` 3.56/Litre ( ` 3.46/Litre+ 3% Education cess)- Diesel	Rs/Lit	-	-	
20	Add: Specific Excise Duty & Cess @ Rs 9.48 per Lit- Petrol	Rs/Lit	9.48	-	
22	Sub-Total	Rs/Lit	55.05	47.94	Difference b/w Petrol & Ethanol- Rs 7.11 per Lit
21	Add: Dealer Commission	Rs/Lit	1.79	1.79	It may vary from state to state
23	Add: VAT	Rs/Lit	11.37	11.37	Tax remains same as ethanol will be sold as petrol
24	Add: Cess & Service Tax- Ethanol	Rs/Lit	1.01	1.01	As per invoice taken from HPCL petrol pump
25	Retail Selling Price at Delhi - Rounded off (Sum of 18 to 24)	Rs/Lit	69.21	62.11	

Note:

For Ethanol VAT set off is applicable in most of the states

For interstate movement of Ethanol, 2% CST will be applicable

1 USD = Rs 59

Petrol Price Build up referred from IOCL website

Selling price of petrol will vary in each state, as VAT applicable is different for each state. For ex- Vat applicable in Mumbai is 25% whereas in Delhi it is 20%

Annexure XII

**Budget requirement for raising 10 ha of Breeder's Seed of improved sugarcane varieties in Sugar Mills
Proposal from Indian Institute of Sugarcane Research, Lucknow**

(Rs. in lakhs)

S. No.	Item	First year	Second year	Third year	Fourth year	Total
1.	MHAT unit (1 No.)	3.5	-	-	-	3.5
2.	Planter (2 Nos)	4.0	-	-	-	4.0
3.	Ratoon management device (2 Nos)	2.0	-	-	-	2.0
4.	Man power (Skilled and unskilled)	10.0	11.0	12.1	13.3	46.4
5.	Operational expenses including travel	10.0	11.0	12.1	13.3	46.4
6.	Expenses for crop raising	10.0	11.0	12.1	13.3	46.4
7.	Watch and ward of seed production field	7.0	7.7	8.5	9.3	32.5
8.	Intellectual fee for breeder seed production	5.0	6.0	7.0	8.0	20.0
9.	Institutional charges	5.5	4.6	5.0	5.5	20.6
Total		57.0	50.3	54.8	59.7	221.8

- First cycle of breeder seed in 10 ha (approx. 600 tons) will be produced by IISR at sugar mill farm subject to normal weather condition
- Subsequent multiplication of quality seed will be carried out by sugar mill staff under the supervision of IISR staff.
- Transportation cost of implements/machinery from IISR or manufacturers to be born by the mills.
- The lifting, transport and distribution of Seed Cane from the site will be the sole responsibility of Sugar mill.

Contact: director@iisr.org

Existing funding pattern of crop development loans under SDF

Sl. No.	Scheme name	Financial limit
1.	Setting up of Heat treatment plant	2.50 lakh
2.	Rearing of Seed Nurseries a) Foundation seed through Conventional sugarcane setts.	First Year @ Rs. 30,000/- per ha. subject to a maximum of 5 ha. Second Year @ Rs. 30,000/- per ha. with multiplication factor of 8 for Northern States and of 10 for Southern States.
	b) Rearing of Seed Nurseries from Tissue culture plantlets.	First year @ Rs. 80,000/- per ha. subject to a maximum of 2 Ha. Second year Rs.80,000/- per ha. with multiplication factor of 40. Seed shall be procured from Govt. recognized institutions, VSI, Pune, SBI, Coimbatore, Universities and their affiliates.
	c) Certified seed	@ 26000/- per ha
3.	Incentives to cultivators to switch over to improved varieties of sugarcane	@ Rs. 20,000/- per ha.
4.	Integrated Pest and Disease management including the cost of equipments, pesticides and bio pesticides.	i) Equipments like sprayers, dusters Rs. 7500 Rs. 2500 per hectare for bio-pesticides only. Cost of Traditional pesticides not to be included.
5.	Irrigation schemes – (Drip, Raingun sprinkler, tube wells/bore wells, lift irrigation schemes, distribution pipelines, digging / deepening of old wells, K.T. weirs, Farm ponds and Check dams).	Drip irrigation ii) Raingun sprinkler @ 60,000 per ha. iii) Tube wells/Bore wells @ actuals. Subject to a maximum of Rs. 1 lakh for new tube-wells/Bore-wells and a maximum of Rs. 50,000 for deepening of existing tube wells/Bore-wells. a) Cost of KT weirs etc not to be included. b) Micro irrigation measures like drip irrigation, sprinklers and rain guns will be compulsory for water scarce areas, with a focus to minimize drawdown of water table.
6.	Ratoon management	@ 10,000/- per ha
7.	Improvement of problematic soils through surface/sub surface drainage and chemical amendments	Identification of salt affected soils through Remote sensing Chemical amendments @ Rs. 10,000/- per ha. Each
8.	Field Demonstrations and Extension Mechanism	Demonstration on plant crop, ratoon crop; cost of LCD Projector, Computer with software and accessories, Audio visual aids (TV, CD player, multimedia kit) @ Rs. 30,000/- per ha. subject to a max. of 5 Ha. for factories with cane area less than 10000 Ha. and 10 Ha. for factories with cane area more than 10000 hec.

The order constituting the Working Group

File No.DCS/S-1/2013
Government of India
Ministry of Consumer Affairs, Food & Public Distribution
Department of Food & Public Distribution
Directorate of Sugar

Krishi Bhavan, New Delhi
Dated, 1st February, 2013

OFFICE MEMORANDUM

Subject: - Constitution of working group to study the issues concerning sugarcane productivity & sugar recovery in the country.

In order to harness the full potential of the sugarcane as a commercial crop and the sugar industry as a green industry, capable of ameliorating the socio-economic condition of a part of Indian farming community as well as capable of catering to ever growing needs of energy sector in the country, it has been decided to constitute a Working Group to look at the various factors, which have kept sugarcane productivity as well as sugar recovery in the country, stagnant. The composition and terms of reference of the working group is as under:

1. Composition

- | | | |
|--------|---|-------------------|
| (i) | Joint Secretary (S&SA)
Department of Food & PD | - Chairman |
| (ii) | Joint Secretary (Crops) or his representative,
not below the level of Director
(D/o Agri. & Cooperation),
Krishi Bhawan, New Delhi | - Co-Chairman |
| (iii) | Chief Director (Sugar), Directorate of Sugar | -Member Secretary |
| (iv) | Director (SDF)
Department of Food & PD | - Member |
| (v) | Director, Sugarcane Breeding Institute,
Coimbatore, Tamil Nadu | - Member |
| (vi) | Director,
Indian Institute of Sugarcane Research,
Lucknow, Uttar Pradesh | - Member |
| (vii) | Assistant Director General (Commercial Crops),
ICAR, Hqrs, New Delhi | - Member |
| (viii) | President,
Sugar Technologists' Association of India,
New Delhi | - Member |
| (ix) | President/Director General,
Indian Sugar Mills Association of India,
New Delhi | - Member |
| (x) | President/Managing Director,
National Federation of Co-operative Sugar Factories,
New Delhi. | - Member |

2. Terms of Reference

- (i) To study/analyse factors restricting sugarcane productivity/sugar recovery in the country, in each major sugarcane & sugar producing State/potential State.
- (ii) To come up with short term and long term recommendations, with actionable plan, which are implementable in immediate future to improve the sugarcane productivity and sugar recovery in the country.
- (iii) To undertake periodic review of the progress achieved in implementation of the action plan and to suggest mid-course corrections, whenever required.
- (iv) To scan the implementable research findings (on annual basis) and to suggest the implementation strategies for major developments worth application/extension in the field.

The State specific recommendations/solutions, would become the basis for future Cane Development Loans for the concerned States and, therefore, the activities to be funded under Cane Development Loans, for each State, might be re-aligned so as to overcome the identified State Level impediments. The Working Group will be serviced by Directorate of Sugar, Department of Food & PD, which will make suitable arrangements/take necessary approval to facilitate participation of non-official members, in case need arises for the meetings/boarding & lodging in Delhi as well as out of Delhi. The Working Group will submit its first report within a period of three months with State specific recommendations/solutions.


 (Rajan Sehgal)
 Chief Director (Sugar)
 Tele No. 23393760
 Email: cdsugar.fpd@nic.in

To
All Members of Working Group.

Copy forwarded for information to:

1. Private Secretary to Hon'ble Minister for Consumer Affairs, Food & Public Distribution.
2. Private Secretary to Hon'ble Minister for Agriculture.
3. PPS to Secretary, Department of Food & PD.
4. PPS to Secretary of Department of Agriculture & Cooperation.
5. PPS to Secretary, Department of Agricultural Research & Education.
6. PPS to Joint Secretary (S&SA).
7. PPS to CD (Sugar).
8. Under Secretary (Admin), Directorate of Sugar, Krishi Bhawan, New Delhi.
9. Deputy Secretary (Finance), Department of Food & Public Distribution.

Copy to- NIC – for uploading in Department's/Directorate's Website.

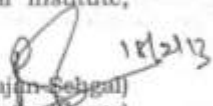
No. DCS/S-1/2013
Government of India
Ministry of Consumer Affairs, Food & Public Distribution
Department of Food & Public Distribution
Directorate of Sugar

Krishi Bhawan, New Delhi,
Dated: 10th February, 2013

OFFICE MEMORANDUM

Subject: Constitution of working group to study the issues concerning sugarcane productivity & sugar recovery in the country

In continuation of the O.M. of even no. dated 01.02.2013, the Competent Authority has decided to include Director General, Vasantdada Sugar Institute, Pune as a Member of the Working Group.


(Rajan Sehgal)
Chief Director (Sugar)
Tel. 011-23383760

To

Director General, Vasantdada Sugar Institute, Pune.

Copy forwarded for information to:

- 1) All Members of Working Group.
- 2) Private Secretary to Hon'ble Minister for Consumer Affairs, Food & Public Distribution.
- 3) Private Secretary to Hon'ble Minister for Agriculture.
- 4) PPS to Secretary, Department of Food & PD.
- 5) PPS to Secretary of Department of Agriculture & Cooperation.
- 6) PPS to Secretary, Department of Agricultural Research & Education.
- 7) PPS to Joint Secretary (S&SA).
- 8) PPS to CD (Sugar).
- 9) Under Secretary (Admin), Directorate of Sugar, Krishi Bhawan, New Delhi.
- 10) Deputy Secretary (Finance), Department of Food & Public Distribution.

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Enclosures



Enclosures

1. Good Practices worth adoption – Pan India



Good Practices worth adoption – Pan India

In order not to dilute the spirit / gist of various inputs received from the agencies leading exemplary practices in different parts of the country, while the following briefly indicates such practices, the details can be found in “Enclosure” part of this report.

1. **Case study of Shri Datta Co-operative Sugar Factory**
 - ❑ Achieving 150 tonnes per acre sugarcane productivity
2. **Standing Cane Harvest and Transportation in Maharashtra, Gujarat, North Karnataka**
 - ❑ Major factor reducing post-harvest losses, crushing within 24 Hrs. and good sugar recoveries
 - ❑ Amenable for rapid adoption of Mechanical Harvesting options
 - Case study of Vikas Sahakari Sakhar Karkhana Ltd.
3. **Bihar model for production and supply of breeder seeds**
 - ❑ With budgetary support of state government and participation of sugar mills, tapping technical know-how of Indian Institute of Sugarcane Research (IISR), Lucknow
4. **ICT interface**
 - ❑ Case study of Sugar Information System in UP
 - ❑ Cane Management Systems in the individual sugar mill groups
 - ❑ Being increasingly used by sugar mills as a MIS tool and for planning, timely raw material supply and payment operations
 - Case study of Murugappa Group
5. **Sustainable sugarcane initiative (ICRISAT)**
 - ❑ Promotion of best planting / agronomic practices in AP / TN
6. **System of Sugarcane Intensification (SSI) through Public – Private Participation (PPP) in the State of Andhra Pradesh**
 - ❑ An effort aimed at aggregation of individual farm holdings, to be managed as single units by agriculture graduates / post graduates
7. **VSI an institution promoted largely by the Cooperative Sector sugar mills in Maharashtra**
 - ❑ Sense of ownership
 - ❑ Strong linkage between research and field
 - ❑ Strong in application part of scientific findings
8. **New Machines on the anvil**
9. **Sugarcane information portal**
 - ❑ CaneInfo – by SBI, Coimbatore

1. Achieving 150 Tons per acre sugar cane productivity

Shri Datta Co-operative Sugar Factory at Shirol, District Kolhapur had started innovative and ambitious programme to achieve 150 per acre sugar cane productivity. They involved around 550 member farmers in this scheme. They started implement activities to increase the sugar cane productivity by 20 to 30 % over average existing productivity of 36 ton per acre. They selected 14 ideal farmers those getting around 100 ton per hector sugar cane productivity. The productivity campaign was planned under the guidance of Mr.S.R.Patil , Chairman & M.L.A. of Shirol constituency. There is limited scope for increasing area under sugar cane so the initiative to increase the sugar cane productivity from existing area had been planned this will be rolled model.

❑ The beginning

Shri Datta Co-operative Sugar Factory started in 1969. At that time the productivity of sugar cane was 20 to 25 ton per acre. Keeping the view to enhance this low productivity Sugar factory had established separate cane development department in 1986-87. They started using improved schemes and technology for this purpose. They have modern soil testing laboratory including the facility to test micro nutrient status of soil. Micro nutrient testing is done by Japanese made instrument. One agriculture assistant is appointed for supervising and implementing the scheme for 300 acre area. Total area of initiative s about 30000 acre. Farmers are guided from tillage to harvesting and assisted with production technology, seed, green manuring crop seeds, organic, bio, and chemical fertilizers, pesticides, weedicides, foliar spray fertilizers etc. Financial support was made available through SDF, Loan and factories own fund etc. The crop management technique used member farmers resulted in increasing the productivity up to 40-45 ton per ha. Planning was started to make sustainable sugar cane availability from the area of operation of the mill. The journey started from 250 TCD & reached to 7000 TCD in 2001. Today factories running with 7800 TCD.

❑ Programme Planning

The efforts were being done to achieve 100 ton per acre productivity by the sugar mill. In each village demonstration plots were taken. Farmers from adjoining area visited these demonstration plots. They started adopting the technology used in demonstration plots which helped him increasing the productivity of these farmers. The factory management thought to increase the productivity of sugar cane farmers having average productivity 70 ton per acre to 100 ton per acre. Accordingly they started planning productivity enhancement programme. With the help of factories human resources 550 farmers selected. The programme started in 2010. Farmers & officers were given training in April 2010.

One farmer from each village was selected in implementing the programme. Varieties selected were Co-86032 & Phule-265. The soils having ability to give high wind were tested for nutrient content. Where organic carbon content is less the efforts are made to maintain the level from 0.75 to 1 % by using organic manures and fertilizers.

Successful farmers of this programme

14 farmers achieved sugar cane productivity up to and above 100 ton per acre. The list is as follows & was given the productivity target of 150 per ton acre.

Sl. No.	Name of the farmer	Village	Productivity ton per acre
1	Malkari Terdale	Mankapur	121.89
2	Sahabuddin Sutar	Shirdhone	111.26
3	Raghunath Patil	Chandur	110.40
4	Laxman Pasare	Kardaga	108.83
5	Kallappa Rajmane	Jainapur	108.83
6	Ajit Narasgodawar	Shedbal	107.27
7	Pradip Patil	Sadlaga	106.89
8	Ashrefalli Patel	Aurawad	106.88
9	Rajkumar Paraj	Danaoli	105.56
10	Raghunath Mahtre	Nandini	104.66
11	Manoher Gawde	Aurawad	103.56
12	Liyakat Dabirpatel	Kanwad	102.53
13	Shatgonda Patil	Sahapur	101.49
14	Sanjay Kole	Aurawad	100.49

One Lakh prize for 150 ton per acre productivity.

To encourage more & more farmers to participate in productivity campaign sugar mill has announced prizes. The farmers getting more than 125 ton per acre sugar cane production are given Rs.100000 prize. Those farmers getting 120-125 ton per acre sugar cane productivity are given Rs.80000 prize. Similarly 115-120 ton per acre Rs.70000, 110-115 Rs.60000 & 105-110 Rs.50000 prizes are given to the farmers.

Significance of programme:

- Opportunity is given to the farmers having productivity more than 70 ton per acre.
- 550 member farmer's participation.
- Area coverage up to 750 acre.
- 14 farmer's productivity above 100 ton per acre.
- Highest productivity of Mr. Malkari Terdale i.e. 120 ton per acre.
- Financial provision Rs.20 crore per year.
- Utilization of S.D.F. fund.
- Efforts to increase under area drip.
- Average increase in productivity up to 20-30%.
- Advanced laboratory service with Chlorophyll testing facility.
- Special prizes to the farmers getting above 100 ton per acre production.
- Sustainable sugar cane availability for crushing from area of operation.

2. Standing Cane Harvest and transportation

In Maharashtra sugar cane harvesting and transportation is done by the sugar mills since the starting of first cooperative sugar mill in Maharashtra in 1951. The cost of harvesting and transportation is subtracted from the cane payment to the farmers. The process broadly involves:

- Registration of sugarcane cultivation – The registration of member farmers of sugar factory with area under cultivation, variety planted, date of planting is done as and when planting is done in the planting seasons. Non- member farmers are also registered for gate cane.
- On the basis of registration of cane plantation Harvesting schedule is being prepared by the sugar factories.
- Appointment of cane harvesting machinery through transport cooperative society/trust or private labour contractor by paying them some advance money approximately Rs 32 per ton of cane to be cut.
- Scheduling of harvesting programme on the basis of date of plantation, variety, and maturity of sugarcane.
- Harvesting and Transport charges are fixed by committee appointed by sugar mill, labour union and transport contractor.

Advantages:

- Fresh and matured cane is available to sugar factory in sufficient quantity as per the crushing capacity of the plant.
- As cane is crushed within 24 hour of harvesting of the cane which results in good recovery as compared to other state.
- Uniform harvesting and transport charges throughout State.
- **Suitable for rapid adoption of Mechanical Harvesters in the State**
The harvesting and transportation arrangements in the state facilitate speedier adoption of Mechanical Harvesters. State Government has also dovetailed the funding support under RKVY for harvesters. Though the cost of mechanical harvesting is slightly higher than manual labor, and at present 2% cane is harvested by machine harvester, the target is Mechanical harvesting up to 10% in near future. Till date there are 152 harvesters used in the state. Average capacity of harvester is 8 to 10 ton per day. Some sugar mills have carried out further innovative strategies to develop private entrepreneurship for harvesters and a case study of **Vikas Sahakari Sakhar Karkhana Ltd.** is worth documentation and is reproduced in the succeeding pages.

Case study: Innovative strategy to develop private entrepreneurship for Sugarcane Harvesters

VIKAS SAHAKARI SAKHAR KARKHANA LTD.

1. Ours is a leading sugar factory in **Latur** district of Maharashtra State. We have introduced mechanical harvesting in our factory area, we have purchased Five Nos. of New Holland Make 4000 series Sugarcane Harvesters in 2011-12 Sugar season & are in use from last 2 years.
2. Actual cane crushing is for about six months in a year and sugarcane harvester can be used only for sugarcane crop. After closure of the sugar season, the sugarcane harvesters are kept idle. Hence return on investment and interest component is matter of concerned.

For sugar cane harvesting by mechanical harvester following are the prerequisite.

- a) Wide row plantation minimum 1200mm (4 ft) wide.
- b) Lengthwise plantation to minimize machine turnings to avoid fuel wastage during turning.
- c) Cane field free from stone & other hard materials to avoid blade damage.
- d) Adequate large holdings to minimize shifting of machine.
- e) Motorable approach road upto field.
- f) Suitable harvesting programme for minimum shifting of machines.
- g) Live electricity wires crossing fields at sufficient height.
- h) Low soil moisture content at the time of harvest.

Economics of mechanical harvesting shall depend on existence of above prerequisites.

Entire sugar cane plantation by cane growers is area of operation is wide row plantation i.e. 1200 to 1500mm (4'-5') wide. In order to comply with other prerequisite separate harvesting programme for mechanical harvester is prepared based on availability of above conditions to the possible extent.

3. Scheme for purchase of mechanical sugar cane harvester is implemented by our factory. The main features are as under.
 - a) Machine shall be owned by an individual member.
 - b) Means of finance: 10% by owner, 15% interest free loan by sugar mill, 75% bank loan.
 - c) Subsidy is credited to loan account.
 - d) Interest on loan is born by sugar mill.
 - e) Machine owner enters with long term agreement with sugar mill for cane harvesting.

4. Mechanical Harvester- Operational Data for 2011-12 & 2012-13 Season

Sr. No.	Season	Avg. Harvesting MT/Day	Avg. fuel Consumption Ltr/MT.	Cost of Harvesting Rs/MT.	Harvesting Rate for manual harvesting Rs/MT.
1	2011-12	76.726	2.366	337.00	244.38
2	2012-13	60.690	2.250	438.00	244.38
Average		68.708	2.30	387.00	244.38

Advantages and disadvantages of mechanical harvesting

Advantages:

1. Harvesting at ground level, manual harvesting is above ground.
2. Increase in Yield. (Due to bottom inter-node cutting.)
3. No need of stubble shaving. (Saving in stubble shaving cost.)
4. Increase in yield of Ratoon crop due to automatic stubble sharing.
5. Shredding & spreading of trash on soil, increases C: N ratio
6. Minimization of water evaporation losses.(Due to Mulching)
7. Increase in sugar recovery (Due to high sugared bottom inter node crushing.)

Disadvantage:

1. More trash & green sheath as compared to manual harvesting
2. Heavy losses in sugar cane pol, if it is not crushed within 6 to 8 Hours of harvesting.
3. Chopped/Billeted cane increases cost of transportation & no. of transporting vehicles and needs special in unloading system.
4. Soil compaction due to heavy weight of Cane harvesters, leads to hard pan.
5. To overcome the present situation & very high cost of machine, it is necessary to decrease the rate of interest & or increase the subsidy amount (percentage). Therefore we request for
 - a) 100 % finance from sugar development fund.
 - b) Provide min 50% capital subsidy.

Above support shall be required for initial phase of 5 years. Once the practices are established economics of mechanical harvesters shall be self-supported

(S.D.Bokhare)
Managing Director
Vikas sahakari sakhar karkhana Ltd.,
Vaishalinagar Nivli, Tq & Dist. Latur.

3. Bihar model for production and supply of breeder seeds
Memorandum of Understanding
THIS MEMORANDUM OF UNDERSTANDING made the
AMONG

The Government of Bihar (hereinafter referred as "the State Government") as represented by **The Principal Secretary, Department of Sugarcane Industries, Government of Bihar OF THE FIRST PART**

AND

Indian Institute of Sugarcane Research, a body established under Indian Council of Agricultural Research, Department of Agricultural Research and Education, Government of India having its Head Office at Raibareli Road, P.O-Dilkusha, Lucknow-2260002 herein referred as represented by The Director, IISR, Lucknow **OF THE SECOND PART.**

Preamble

1. Whereas it has been proposed by the Government of Bihar to provide breeder seed of Sugarcane to the Sugar Mills of Bihar for its multiplication on their farms.
2. Whereas Government of Bihar has issued sanction order I /budget- YO-618/20 12-Swi 121 dated 16.10.2012 for the scheme framed for the above-mentioned purpose.
3. The operation period of scheme will be financial year 2012-13 and it will be extended for next four financial years i.e. up to 2016-17.
4. The required land for production of breeder seed is 50 hectares out of which 10 hectares land will be provided by the said institute on its farm at Motipur (Bihar) and rest 40 hectares of land will be acquired by the institute at Harinagar Sugar Mills farm on lease basis.
5. Out of 50 hectares land 25 hectares of land will be utilized every year for planting of sugarcane under breeder seed production program and 25 hectares will be kept under green manuring for maintaining its fertility under alternate year breeder seed production.
6. In first year, Sugarcane Department will provide fund for development of basic infrastructure and facilities for crop raising including irrigation facility at both the sides of seed production by consulting project investigators. RJO)'tl second year onwards Department of Sugarcane Industries will provide recurring expenditure for production of breeder seed and maintenance of infrastructure.
7. The quantity of breeder seed produced on 25 hectares will be around 12500 quintal every year, subjected to normal crop/ weather conditions.
8. The breeder seed produced under above project will be distributed among the sugar mills on advice of Department of Sugarcane Industries, Bihar on payment basis.
9. The cost of seed produced will be collected by the Principal Investigator, IISR, Luknow and the amount so collected will be deposited in state treasury every year.
10. The Department of Sugarcane Industries, Bihar will be the owner of all infrastructure created during the course of implementation of the scheme. After closure of scheme entire non- movable infrastructural facilities created at Motipur will be property of IISR, Lucknow.

11. The fund provided by the State Government for the project will be utilized by the Principal Investigator of the project i.e. Nodal Officer, IISR Regional Centre, Motipur of IISR, Regional centre, Motipur, Distt- Muzaffarpur and technical supervision and execution will be responsibility of Centre Principal Investigator i.e., Scientist Incharge, of IISR, Regional centre, Motipur, Distt- Muzaffarpur as per institute norms with the due approval of the Director, IISR, Lucknow.
12. The Director, IISR, Lucknow is authorized to reallocate the funds within different heads as per the need and necessity of work. Further, the unspent balance will be carried forward for its utilization in the next financial year.
13. Outcome of breeder seed production will be from the month of October, 2013. The varieties of breeder seed production will be as per suggestion of State Government.
14. The nucleus seed required for production of breeder seed will be managed by the Institute itself.
15. If required, The Department of Sugarcane Industries may nominate an Officer for constitution of local purchase committee on the request of institute.
16. Centre Principal Investigator i.e., Scientist Incharge, IISR Regional Centre, Motipur will be wholly responsible for any misuse of infrastructure provided by the State Government.
17. Recurring expenditure includes cost of cultivation including land lease rent, security of crops etc., IISR, Lucknow institutional charges, intellectual fees as per ICAR guidelines, travel expenses of scientist etc.
18. The funds received under the scheme will be utilized as per ICAR/Government of India rules.

NOW THEREFORE IT IS AGREED BY AND AMONG THE PARTIES THAT IISR WILL ACT AS THE AGENCY FOR CHANNELISING THE BREEDER SEED PRODUCTION PROGRAM FOR WHICH COST OF PROGRAM PAYABLE BY GOVERNMENT OF BIHAR AND IT IS FURTHER AGREED THAT-

1. The total amount required for breeder seed production in first year has been worked out by the said Institute.
2. The fund will be placed in advance by the State Government for breeder seed production.
3. Post disbursement security/verification/audit inspection of the amount utilized by the IISR would be done by the State Government, if considered necessary by them.
4. Finance and Accounts Officer, IISR, Lucknow will submit Utilization Certificate in prescribed format to the Department of Sugarcane Industries, Bihar.

NOW THEREFORE IT IS FURTHER AGREED BY AND AMONG THE PARTIES AS FOLLOWS:

On execution of the present MOU by the two parties-

1. State Government shall place fund with IISR in advance after working out of the estimate provided by the Institute for fund requirement.
1. As the payment of recurring expenditure for next four financial year i.e. 2013-14 to 2016-17, State Government will make necessary provision for the requisite amount in the subsequent years, and shall be made available in advance.
2. Any Issue which is not covered here above or on which further interpretation/clarification is required will be decided by mutual consultation.

In witness thereof, the parties have signed this Memorandum of Understanding on the day, month and year first above mentioned.

Financial Summary

Programme on Quality Sugarcane seed Production at IISR Regional Centre, Motipur and Harinagar Sugar Factory farm, (Bihar)

A	Basic infrastructure required with approximate cost for the development of proposed Sugarcane Breeder Seed Production Site at Harinagar, Motipur Muzaffarpur, Bihar to be provided by cane department, Government of Bihar Rs. 96.60 Lakh
B	Annual Requirement for raising breeder seed crop at Harinagar and Regional Centre, Motipur farms: Rs. 72.50 Lakh
C	Annual Requirement of IISR, Lucknow for technical guidance in raising breeder seed crop at Harinagar and Regional Centre, Motipur sites for first year: Rs. 16.00 Lakh

4. ICT interface

Sugarcane Information System in UP



Sis Sugar cane Information System

The Indian Farmer

TECHNOLOGY

- ▶ Low Literacy
- ▶ Unaware about best price
- ▶ Exploited by middlemen



Sis Sugar cane Information System

Objectives

TECHNOLOGY

- ▶ Strengthen supply chain
- ▶ Disseminate timely information
- ▶ Eliminate middlemen
- ▶ Agro-Marketing through IT



Sis Sugarcane Information System

Cane Management Activities and Farmers Interaction

Activity	Frequency
Survey Of Field	02
Calendar Of Supply Tickets	01
Start Of Sugar Mill/ Centers	02
Supply Tickets	12
Weighing Of Sugarcane	12
Payment Of Sugarcane	12
Developmental Activities	12
Total	53
Total Interactions-53x3	159 Million

Sis Sugarcane Information System

Challenges

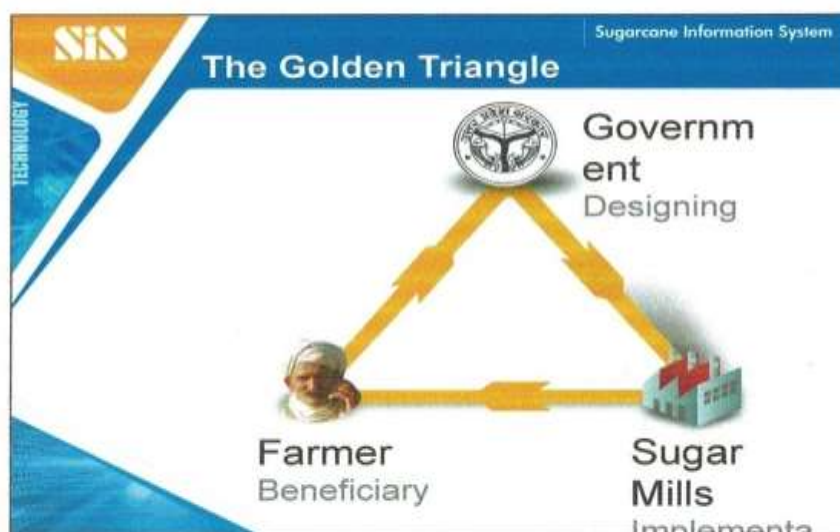
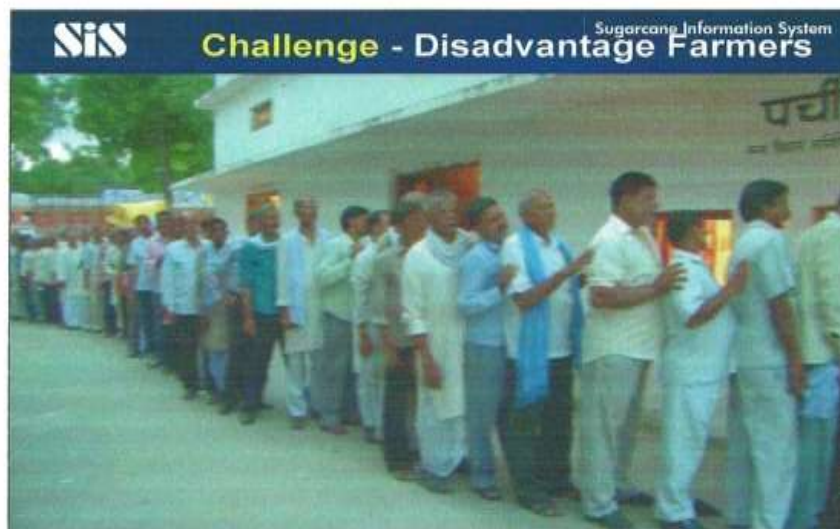
Farmers

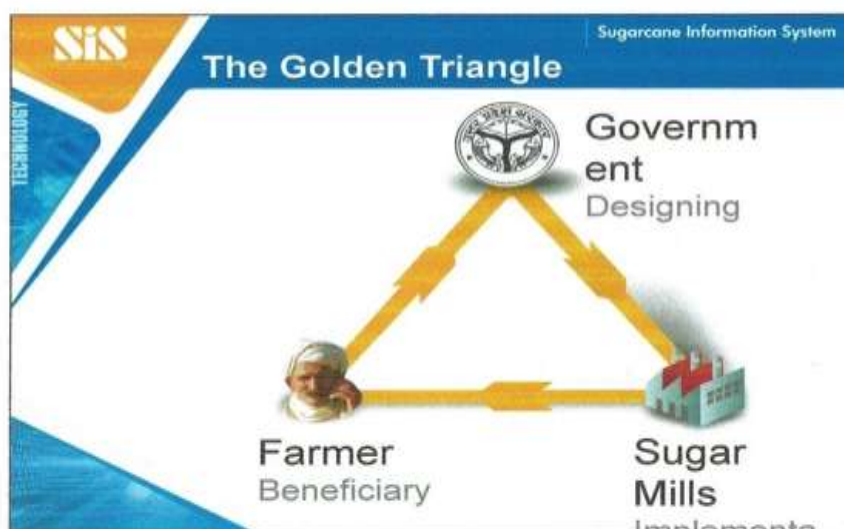
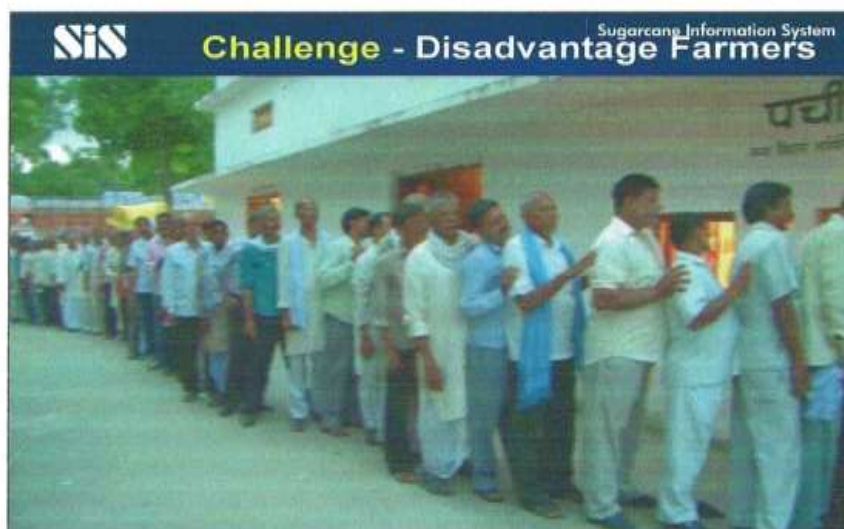
- Lack Of Transparency- Cane Mafia
- Staggered Purchase- 12 times- 6 Months
- Wasteful Visits- 20 trips- \$4 per trip
- Low Income due to less area and supply of sugarcane- \$120 per hectare
- Less weight due to staleness – 5% per day

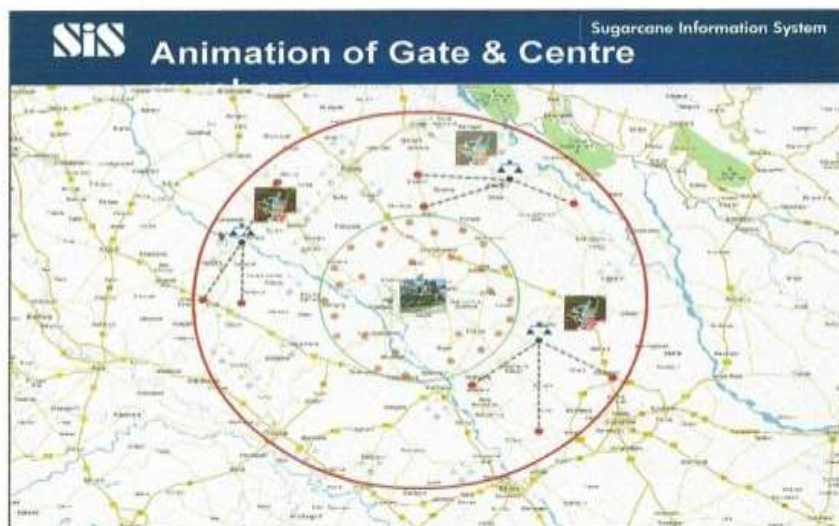
Sugar Mills

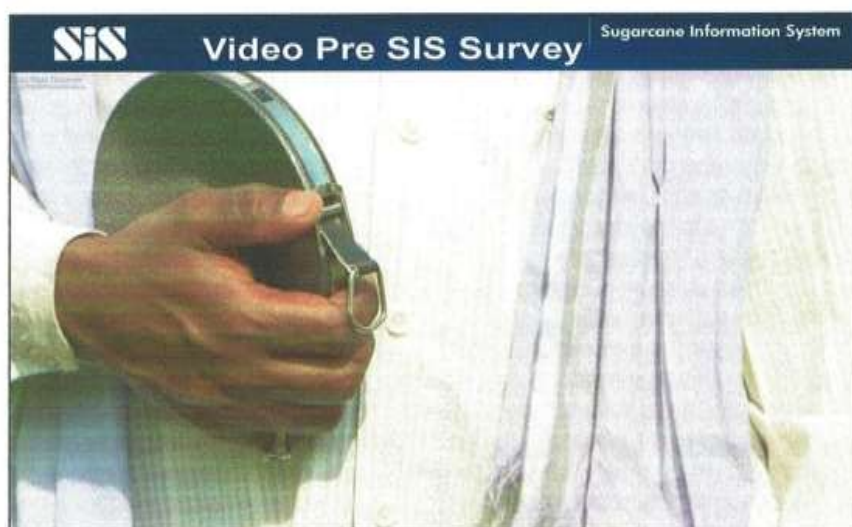
- Less Sugar recovery due to stale sugarcane
- Lower Capacity Utilization
- Unnecessary data entry





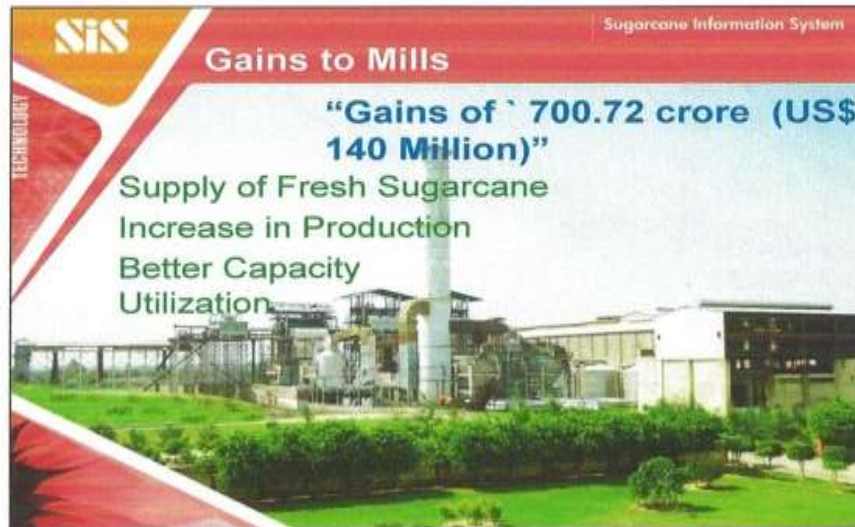






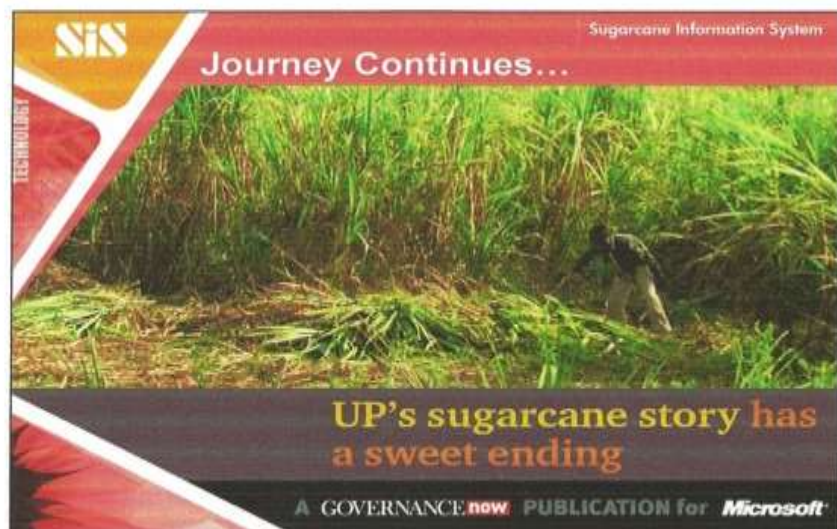












CMS - Case study of Murugappa Group

"CANE MANAGEMENT SYSTEM (CMS)"

Concept:

To Integrate the management of crop development process and provide benefits to management and suppliers in providing better yield, sustained operational support with the adoption of modern technology, providing transparent information and MIS system.

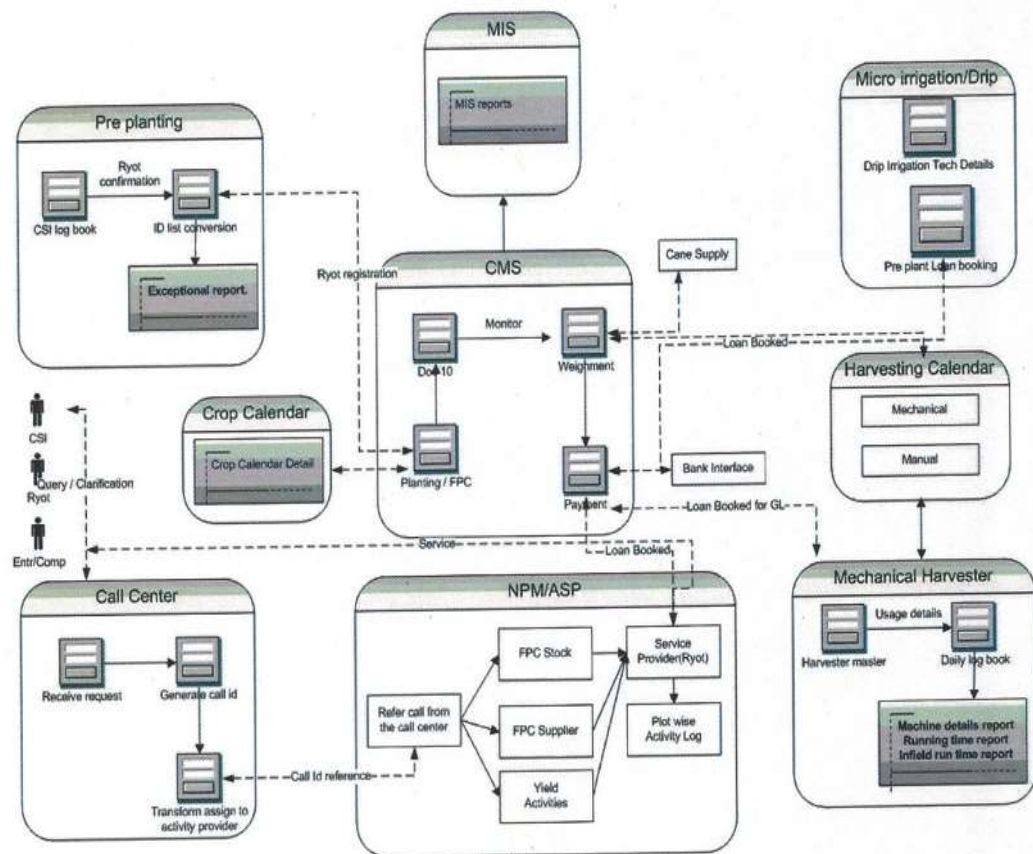
What is CMS?

- SCM solution for Cane Procurement
- Individual Farmer Account Management
- Crop Monitoring Practices
- Services offered to farmers
- Farm Advisory Service, Crop economics, Crop Rotation
- Organize fertilizers, Pesticides and Bio control agents
- Organize loan, insurances, cutting labor advance
- Assist in monitoring groundwater and irrigation facilities
- A mechanism for providing feedback to R&D

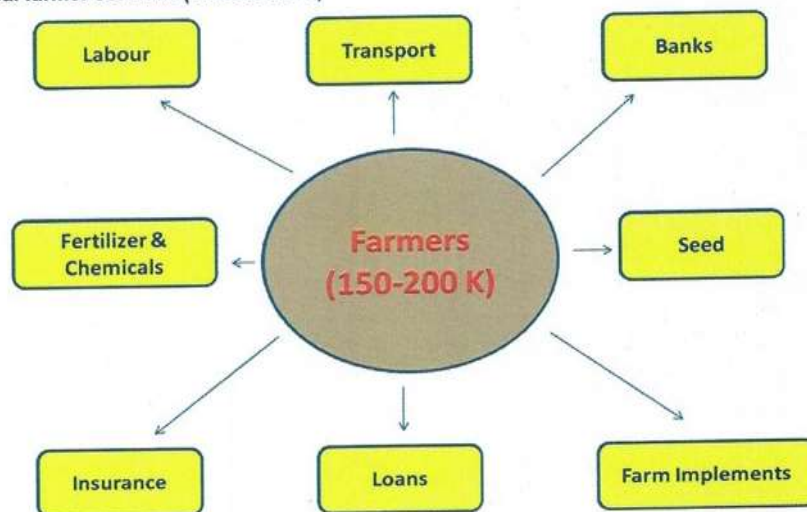
The 'Cane Management' – is not just a product, but a process involving procedures and systems in place to deliver quality, comfort, and profitability to every agency involved from the grower to the company. The information flow is one of the vital processes in the operations for smooth, efficient and informative.

The major entities in these cane operations are the Growers, Cane Inspectors, Factory, Harvester, Transporters, Insurance Company and Bank. "Cane Management System" – as a whole takes care of various operations and functions around the entities.

Over view of Cane system:

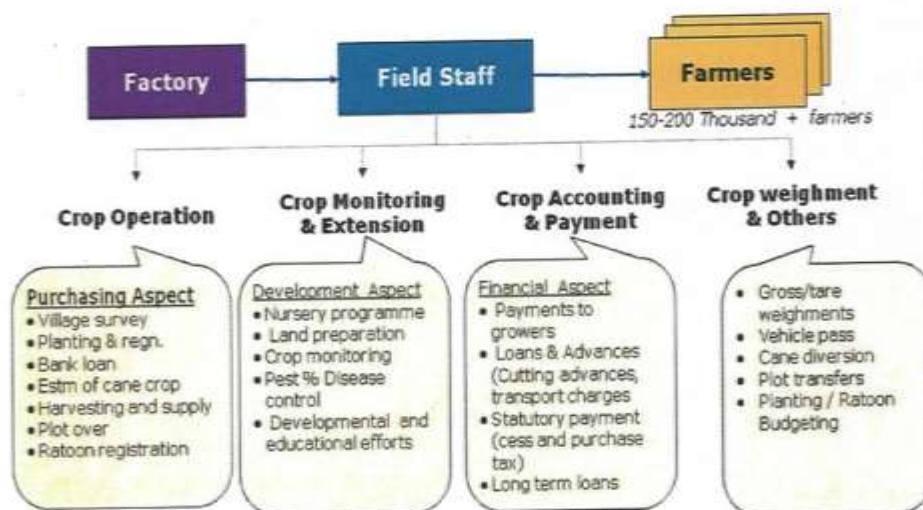


Typical farmer services (Transactions)



WebCMS (Web enabled Cane Management System)

A system to provide the link between the company and cane growers - performing the critical role of purchasing sugarcane and development of cane growers



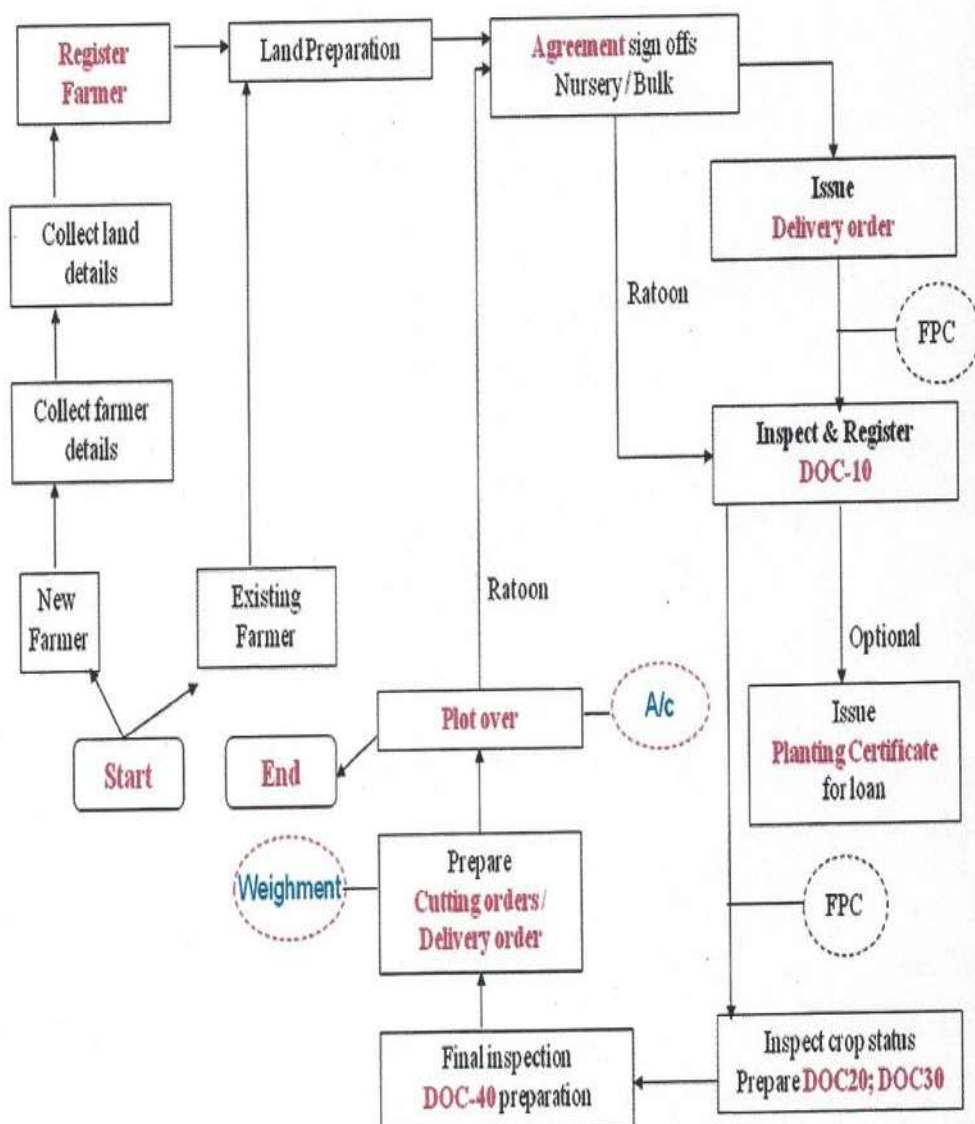
The use of the Cane Management System has streamlined procurement operations (10 – 15 Thousand transactions / day)

WebCMS – Capabilities & Benefits

- WebCMS - An end to end solution enabling improved decision making and planning.
- Data available in real-time (on-line) for better resource management and better information dissemination
- Increased manpower (field staff) productivity
- Field staff – able to spare quality time on technical work
- Retrieval of historic data made easy from the data-base
- Travel time of farmers, field staff, transporters, cane cutting labor to the factory is significantly reduced
- Integration with Third party vendors.
- Long and short term budget , estimation and planning.
- Instantaneous SMS email alerts.
- Comparative view of operations data at a glance.
- Interfaces with
 - Weighbridge equipments

- Hand held devices
- Bar codes
- ERP / Accounting systems
- Secure and user friendly to users for data extraction and analysis
- Speedy Cane payment processes
- Supports local language (Vernacular) for farmer / transporter / cane cutting labor.

Conceptual Solution



Technology Advantages

Relevance and merits of 'Web Technology' to Cane Management System

In cane management – the role of CSI and Growers and the information captured at these two entities are highly important. As CSIs are always in the field, providing them the application at their location or nearest becomes very important, which can be easily achieved through web technology.

Widely accepted Technology: In this rapid technology advancement, the "Web Technology" is the one mostly accepted and proven technology, which will last for several years from now. Various design tools are available and plenty of advancements are happening within the framework of 'Web Technology'.

Portability: With any future technical advancement within framework of 'Web Technology' can be easily adapted. Portability becomes easy with minimum effort.

Ease of Maintenance: With widely accepted technology the resources available to maintain the application are plenty. Moreover as the application is running in a centralized location, the maintenance becomes easy.

Dissemination of data: In web technology, with properly managed security, the transformation of data from one agency to another becomes very efficient and effective.

Access extendibility: Cane management system involves various agencies like growers, bank, transporters, Insurance company, etc. In any process or operation, where various agencies are involved, the technology should have the capability to extend the access to the agencies. In 'Web Technology', the possibility of extending the application and providing access to others is always available.

Operational Practices

The entire cane operation is broadly grouped under the following modules. Each of the modules would contain various data capture forms and query pages.

a) Farmers Management

As the 'cane' is the main raw material in this Sugar business, the farmers who grow cane are the most important entity in this entire operation. This module involves operations like registration of farmers, their profile and land, identifying the area for planting cane, past history and registration of plots for each season and varieties.

b) History of the Land

For better performance and yield the cane need to be cultivated in cycles. To arrive at the cycle and estimate the amount of cane, which can be cultivated, etc. the "**History of the Land**" is highly important data. This needs to be captured in efficient way and various analyses needs to be done using the land history. This module covers the entire history of the land and its profile.

c) Other Agency Management

Other than Ryots, there are various agencies involved in the cane operations. The Transporters, Harvester, Bank, Insurance Company and Fuel bunks are maintained through this module.

d) Cane Registration

CSI will meet all farmers in village. Provide Information to farmers for benefits of cane plantation, collection of farmers & plot details during the meeting. All the farmer/plot information will be captured in the CSI daily log. Based on the farmer details CSI will plan for field visit. All visits made to field are captured CSI log book. CSI has to get confirmation from farmer for cane planting. At the time of confirmation a new ID list entry will be generated. After ID list created new ryot number will be generated. During the DO generation a new plot number is assigned to the ryot and become a register ryot. Existing ryot after plot over automatically new ID list will be created.

e) Planting operations

This module involves most of the operations of Cane Sub-Inspector (CSI). On registration of plot for the season, the issue of setts, fertilizers and pesticides are covered in this module. The planting certificate is issued to Riots and insurance for the same is done in this module.

f) Monitoring cane growth and related operations

Continuous monitoring of the cane and its growth are very important in cane operations. These operations also carried out by CSIs and Extension Officers handle any critical issues in crop (like pest or damage, etc.).

During this monitoring operation various parameters are measured and recorded. The templates called Doc10, Doc20 and Doc30 are generated during this monitoring process and analyzed. This includes harvest maturity survey and brix test results. This data are very important to arrive at estimated yield.

Crop calendar is a process where the operations are carried during pre planting stage for plant and Ratoon. Based on this calendar various operations are carried out for the plot and loan will be booked for the corresponding plots.

g) Harvesting operations

This module involves various operations involved in harvesting the cane and transports the same to factory for crushing. Based on the growth and variety, the cutting priority is generated and the cutting orders are provided to the growers. Pass number is allotted to vehicles to carry the cane and trip sheets are maintained to track the cane transportation. Registration of ratoons are included as part of this harvesting operation module.

h) Procurement at factory

This module involves the receipt of sugar cane at factory yard, its weighment and recording the quantity received. This data is compared with cutting order and the variances are analyzed. The payment is based on the quantity received at factory.

i) Payment process

This module involves the processing of payments to cane growers, transporters, and cutting labour gang. This process takes care of deducting all the advances and loan recovery. Statements of account to various agencies are prepared in this module.

Payment process for cane diverted to/from other factories is carried out through this module. Advance payments like cutting advance are also managed through this module.

j) Loan disbursement

Banks provide loans to Ryots against the Planting certificate issued by the factory. This loan amount is recovered from the final payment and the remaining is payable to the Ryots.

Fertilizer loan and chemical loans are provided to the growers. In these loans instead of money, the required fertilizer and chemicals are supplied. The values for these supplies are deducted from the final payment to growers.

Apart from this special loan like Drought Loan, Flood Loan, Plugging advance and cane development loan is maintained and the recovery is tracked through this loan module.

k) Insurance operations

The growers in co-ordination with CSI – inform the Insurance Company, in case of crop failure or affected crops, etc. The company forwards the claim form and the settlement amount is credited to growers account. The entire process of this insurance claim, rejections and settlement are captured in this module.

l) Cane diversions

Diversion of cane between the factories are recorded and the payment / receipt for these diversions are made by consolidating the diversions. Transfer of crop from one grower to another is also tracked and maintained in this module.

m) Cane Weighment

Cane weighment Module is a windows-based application having modules to capture the Gate Entry & Gross / Tare for the Cane from the Plot. At the Weigh Bridge the Vehicle is weighed for the Gross Weight first. Ryot details to verify the correctness. There are two options

- a). Self -- In this case, the no provision to Enter Harvesting and Transport details
- b). Contract -- The entry of Harvesting Gang/Mini Contractor details and the Transporting Vehicle details are allowed. Provision is also given for fuel token entry. After unloading the cane, the vehicle is weighed again to capture the Tare Weight. In the Tare Weight Capturing Screen, the operator enters the Cutting Permit Number.

n) Master maintenance

This module covers maintenance of various masters in this 'Cane Management' like Season, Variety, Village, Division, Fertilizer, Chemicals and application users. Only authorized person can maintain these masters through this module.

o) Security systems

This module covers creation of application user and user group. User groups are created and access to various options in the system granted / revoked through this module. Users are attached to the user

group and users would inherit the access privilege of the user group. System administrator can grant / revoke the access rights of the users through this module.

p) Export Consolidated data

This module covers the consolidation of data and transfer of data to central server for query / report purpose. This will be through a scheduled task and the system administrator can define the schedule.

q) Query / Report application

This is a stand-alone web based module – will be hosted in an Intranet Server. The consolidated data from various factories will be uploaded into this module.

This module is mainly for senior executives stationed at corporate office to query and view reports. A web administrator will maintain the access to the users.

Technical specifications

Each factory has few of its cane offices (Divisional Office) around its covering area and these cane offices are linked with Factory. Few processes and operations related to Growers happen at cane offices and procurements and payment process happen at Factory location.

Web based CMS application is hosted in the Factory Intranet Server. This will be connected to the Cane Offices through available network. The cane offices or the system that use the Web based CMS, need to have only the Internet Explorer of Windows.

From the factory, the incremental consolidated data (e.g. summary of procurements, payments, etc.), would be exported daily (or) for every shift – to the central server.

The application is developed using – Microsoft technology comprising of IIS 6.0. HTML, DHTML, XML, ASP.Net and VB / Java scripts is used for developing the application front end. The Operating System is Windows Advanced Server 2008. XML is the protocol for all data transfers.

The database is SQL Server 2008. Any processes within the database will be handled through database objects like Stored Procedures, Triggers, etc. All the reports and queries are developed using Crystal Reports 10.0. The application will be hosted in Windows Advanced Server 2008.

The user's PC would need connectivity to the Intranet Server. Internet Explorer 8.0 or later will be required to run the application.

All the user machines, within the factory would be connected to the Intranet Server through the LAN.

User's machines located outside the factory and within the command area of each Factory need to connect to the Intranet Server through WAN connectivity.

5. Sustainable Sugarcane Initiative

Sustainable Sugarcane Initiative

Introduction

Water is increasingly becoming a major limiting factor for agriculture, especially where irrigated crops and dry land agriculture are intermixed. Often in the same watershed, both irrigated crops such as rice and sugarcane exist with dry land crops such as sorghum and millets. In such circumstances, the impact of irrigated crops on dry land agriculture is significant, particularly in semi-arid regions, where irrigation is primarily based on ground water exploitation, leading to decline in soil moisture and seriously reducing the productivity. Further, the erratic trends in rainfall add to the growing complexity of the water issues. Thus, we need to explore every possible approach to reduce the water input to all crops, particularly those which excessively depend on scarce resources. Any water reduction to thirsty crops such as sugarcane will have a positive impact on the dry land agriculture in the same region. To improve productivity and protect the ecosystem, an integrated approach to agriculture involving all stakeholders is essential in tackling pressing issues such as the decline in productivity, ground water table, soil moisture and the uncertainty of monsoons, all of which are interlinked. On one hand, watershed management can improve the water resources in basins, but on the other hand, until and unless that water is used more productively, the investments will not yield results.

Farmers cultivating sugarcane are facing multiple problems. Water is one of the major constraints and it is affecting the productivity and profitability of sugarcane growers and millers. The problem is going to further deteriorate due to variability of rainfall influenced by climate change. So, unless sugarcane farmers are provided with options of high yields with much less water, India will find it difficult to meet its growing demand for sugar.

Sugarcane is an important crop in India. There are 35 million farmers growing sugarcane and another 50 million depend on employment generated by the 571 sugar factories and other related industries using sugar. In Uttar Pradesh, Maharashtra and Tamil Nadu, sugarcane plays a major role in the state economy.

During the last 10 years, sugarcane production in India has been fluctuating between 233 million tonnes and 355 million tonnes. Similarly, the productivity at the farm level is as low as 40 t/ha. With such low yields and fluctuations in production, and India having the second

largest area under sugarcane cultivation in the world next to Brazil, the industry is in for big trouble.

The problem is going to further deteriorate due to variability of rainfall influenced by climate change. So, unless sugarcane farmers are provided with options of high yields with much less water, India will find it difficult to meet its growing demand for sugar. Under such situation development of new technology involves less input to produce more will be the viable option.

Sugarcane in India is grown in two distinct agro-climatic regions – the Tropical (largely comprising Maharashtra, Karnataka, Gujarat and Tamil Nadu) and the Sub-tropical (Uttar Pradesh, Punjab, Haryana and Bihar).

Among the states, Uttar Pradesh occupies half (2.25 m.ha) of the total area followed by Maharashtra (1.04 m.ha). Though UP dominates in production with 134 MT followed by Maharashtra with 79 MT, in terms of productivity, Tamil Nadu leads with 105 t/ha followed by Karnataka (88 t/ha) and Andhra Pradesh (82 t/ha).

Yet despite its long tradition and large area in India, in terms of productivity, sugarcane yields are unimpressive, especially where the crop is irrigated. The average productivity of sugarcane is low with certain regions reporting yields as low as 40 t/ha only. Not only is the cane yield low, the sugar yield - typically at less than 10% of cane weight - is also less than satisfactory given that yields of 14% of cane weight at the time of cutting (and sometimes much higher) are possible. The Australian sugar industry for instance is regularly typified by sugar yields of around 14%, while yields of up to 25 tonnes of sugar per hectare have been reported in Hawaii! Sugarcane cultivation and the sugar industry in India are facing serious challenges due to various internal and external factors.

The reasons for such low productivity are:

- The improved varieties released by research organizations perform well in the initial years but lose their vigour and decline in yield in due course.
- Water availability is unpredictable. The concern is not only the quantity of water required, but also the lack of proper water management practices. Due to this, water is either wasted or sometimes not available at the right time.

- Unpredictable climatic aberrations, improper cultivation practices, negligence in plant protection measures, imbalanced nutrient management and other practices like mono cropping often result in low productivity, fetching low price in the market.

In addition, it is also very important to consider the enormous amount of water that goes into the sugarcane production. Approximately 25,000 kg of water is needed to produce 10 kg of sugarcane. But, the water table is depleting every year. Costs of production, moreover, are increasing not just for the small farmers but for the large industrial players as well. In future, these challenges will become even more complex with climate change inducing direct and indirect effects on crops, water, pests and diseases, and volatility in the international market.

A recent FAO report predicts sharp shortfall of sugar production in India in the year 2009. On one hand, there is the opportunity in terms of growing demand for sugar and other bi-products of sugarcane, and on the other hand, there is the decline in production and productivity due to various reasons. The rising cost of farm chemicals, along with the increasing social and environmental costs of water use by the agricultural sector and the pollution accruing to modern, input intensive production practices have begun to raise serious questions in the minds of policy makers, planners and farmers alike. Any problem affecting the sugar sector is a widespread problem, affecting a significant number of households and ecosystems. The desirability of a widely replicable solution is therefore equally obvious.

This question is already being addressed in the rice sector, with the System of Rice Intensification (popularly known as SRI). SRI is an integrated approach that greatly reduces irrigation water requirements while producing a range of benefits including higher yields, better quality rice, less chaff and resistance to lodging.

The Sustainable Sugarcane Initiative (SSI) is yet another practical approach to sugarcane production which is based on the principles of 'more with less' in agriculture like System of Rice Intensification (SRI). SSI improves the productivity of water, land and labour, all at the same time, while reducing the overall pressure on water resources.



Sustainable Sugarcane Initiative (SSI)

Sustainable Sugarcane Initiative is a method of sugarcane production which involves using less seeds, less water and optimum utilization of fertilizers and land to achieve more yields. Driven by farmers, SSI is an alternate to conventional seed, water and space intensive Sugarcane cultivation.



The major principles that govern SSI can be stated as below:

- Raising nursery using single budded chips
- Transplanting young seedlings (25-35 days old)
- Maintaining wide spacing (5X2 feet) in the main field
- Providing sufficient moisture through water saving efficient irrigation technologies viz., skip furrow, alternate furrow and subsurface drip irrigation



- Practicing intercropping with effective utilization of land

Water management

- Produce more per mm of water and all other inputs
- Raise cane crop even under marginal lands
- Raise crop in problem soils and water
- Minimum tillage



- Create micro catchments for water harvesting
- Multi-ratooning
- Produce higher cane yield with less water

Fertigation schedule for sugarcane

RDF - 275:63:115 NPK kg/ha Once in 10 days

Stage (Day After Planting)	(kg/ha)		
	N	P	K
0-30	39.4	0	0
31-60	48.6	26.25	9
61-90	51.4	20.50	13.5
91-120	55.2	16.25	14.6
121-180	57.8	0	40.5
181-210	10.5	0	35.0
Total	275.0	63.0	115.0

Overall benefits

- In conventional method, cost of setts occupies the major part of cost of cultivation
- By practicing SSI, this seed cost can be reduced up to 75%
- Reduction in the plant mortality rate
- Increases in the length and weight of each cane
- It is easy to transport the young seedlings for longer distance
- Intercultural operations can be carried out easily due to wider spacing

Opportunities offered by SSI

- ❖ Addresses the issue of late planting by raising seedlings and their transplantation later on which actually advances the entire process.
- ❖ Addresses the issue of narrow spacing as the technology is based on successful

exploitation of sunlight and air by following wider spacing in the main field.

- ❖ Addresses the problem of improper method of irrigation, namely, flooding.
- ❖ Significant reduction in seed requirement, as only the bud is used as seed material.

Comparison between Conventional and SSI methods of Sugarcane Cultivation

Particulars	Conventional method	SSI method
Seeds/Setts	48,000 buds (16,000 three budded setts)	5000 single budded chips (5,000 buds per acre)
Nursery preparation	No	Yes
Planting	Direct planting of setts in the main field	Transplanting of 25-35 days old young seedlings raised from bud chips
Spacing	1.5 to 2.5 ft between rows	5 ft between rows
Water requirement	More (flooding of field)	Less (maintenance of moisture in the furrows and adoption of drip irrigation)
Mortality rate among plants	High	Low
No. of tillers per plant	Less (10-15)	More (15-20)
Accessibility to air and sunlight	Low	High
Scope for intercrop	Less	More

Scope of SSI in Tamil Nadu

Tamil Nadu, being the number one state in sugarcane productivity (more than 100 t/ha), has a great potential in SSI. The following are some of the reasons to foresee the great impact of SSI in Tamil Nadu sugarcane sector.

- ❖ Farmers are very much innovative, eager to take up any new technologies with great enthusiasm and support.
- ❖ SSI will be a suitable option to solve the present problems of increasing seed cost,

labour cost and other soil fertility and productivity related issues.

- ❖ Due to wider spacing, intercultural operation becomes easy, thus reducing the drudgery among women labourers.
- ❖ The wider spacing suggested in SSI are ideal in case of introducing Mechanical harvester, an effort already in practice in some of the Mills areas in Tamil Nadu.

Conclusion

SSI involves use of less seeds, less water and optimum land utilization to achieve more yields. It is governed by some principles like using single budded chips, raising nursery, wider spacing, sufficient irrigation and intercropping. By practicing these measures, the following benefits can be realized:

- Better germination percentage
- High number of millable canes
- Reduction in the duration of crop to some extent
- Increased water use efficiency
- Improvement in accessibility to nutrients with optimum use of fertilizers
- More accessibility to air and sunlight
- Reduction in cost of cultivation and
- Extra income from intercrops

On the whole, by practicing SSI farmers can very well increase their productivity by reducing the use of inputs like fertilizers and saving the vital resources like water simultaneously. Hence, it is very much possible for sugarcane farmers to reap greater economical benefits by maintaining ecological sustainability.

6. System of Sugar cane Intensification (SSI) through Public-Private Participation (PPP) in the State of Andhra Pradesh

V Nagi Reddy IAS, Dr M Vijay Kumar, K V Prabhakar Reddy, PPanduranga Reddy

Sugar cane is the second most important agro-industrial crop of the country, next only to cotton. This crop is the only raw material for the nearly 659 sugar mills producing about 25 to 26 million MT of sugar annually apart from being the predominant source of potable alcohol, industrial alcohol and of late the fuel-ethanol. Cultivated in 5.09 m. ha, it provides dependable source of livelihood to about 70 lakh farmers and employment to lakhs of people both on-farm and off-farm.

General Constraints in Sugarcane Production

The reasons for low cane productivity over two decades are several, mainly attributable to

- i. Non-adoption of high yielding varieties suitable to the localities.
- ii. Dearth of good quality seed. Non-implementation of seed village scheme.
- iii. Non availability of working labor at critical times and its inefficiency and high costs.
- iv. Inefficient irrigation management
- v. Non-adoption of improved cultivation practices
- vi. Non-adoption of appropriate tools and machinery to the farmers on account of their cost and unavailability in the country.
- vii. Abysmal management of Ratoon crop leading to poor yields of cane and sugar.
- viii. Use of imbalanced fertilizer doses. Lack of replenishment of organic reserves to the cultivated land over decades and increased application of synthetic fertilizers leading to degeneration of soils.
- ix. Increased intensity of pest infestation viz., Borers scale insect, mealy bug, white fly, pyrilla etc., and
- x. Buildup of systemic new emerging diseases like smut, mosaic, grassy shoot, YLS etc.,
- xi. Degeneration of sugarcane cultivars due to prolonged exposure to insanitary and adverse environments.

Noticing a persistent declining trend in the cultivation of a crop of such economic imminence, Government of Andhra Pradesh have launched a multipronged initiative by involving the State Department of Agriculture (DA), the State Agricultural University (ANGRAU), the Sugar Factories (SF) and Farmer Entrepreneurs called the **System of Sugar cane Intensification (SSI)** during the year 2010-11. The centres established under the initiative are called the **SSI Promotion centres (SSI PC)**.

Rationale of SSI PCs:

The sugar industry in India, finds itself in a complex web of problems leading to declining profitability to the cane growers as well as the sugar industry. The reasons for the same are to be traced and suitably addressed to give a boost to this sector. Unlike many western countries, sugarcane is the only source of sugar in our country and therefore, any mismatch between demand and supply of sugar in the country assume significance at the national level often inviting sudden interventions from the national Government leading, at times to irreparable and long term damage to the industry.

At the state level, the area under sugarcane cultivation has come down from 2.0 lakh ha to 1.60 lakh ha over the last 10 years on account of emergence of more competitive crops like cotton, soybean, vegetables; globalization of sugar trade leading to plateauing and relative fall in sugar prices; receding water tables constraining irrigation coverage; scarcity and abrupt increase in labour costs etc. These challenges can be met only through application of modern science and technology to sugarcane cultivation; mechanization; aggregation of the farmers in to viable size groups and the consequential aggressive capital infusion. Cane development wings of the relatively small and medium SFs in the country are not able to meet these challenges effectively leading to the conceptualization of the SSI PCs in the state. It is believed that an accountable and profit oriented private entrepreneur would serve as an ideal fit in the fragmented sugarcane processing industry to derive multiple benefits in a sustainable and decentralized pattern.

Benefits of the SSI PCs:

1. Direct responsibility for promotion of the SSI in about 400 ha of land, and thereby to setup highly visible demonstrations of improved package of practices.
2. Helping farmers to adopt latest science and technology in sugar cane cultivation.
3. Provision of modern machinery to the farmers on hire basis.
4. Mitigating labour scarcity and costs.
5. Improving Irrigation efficiency through adoption of drip irrigation systems.
6. Improving fertilizer efficiency through timely and optimum fertigation methods.
7. Ensuring potentially highest yield to the farmers.
8. Reduction in the cost cultivation.
9. Provision of end to end solutions to the farmers.
10. Increasing the annual crushing capacity and efficiency for SFs in the zones.
11. Increasing the sugar recovery for the SFs.

Essentials of the SSI PCs:

1. Inviting SSI PC proposals and their appraisal by the DA.
2. An MOU between the DA, the SF and the entrepreneur to set up the SSI PC.
3. Financial closure of the SSI PCs.
4. Bridging viability gap funding through Government subsidies.

Structure and components of SSI PCs:

1. The Entrepreneur/Promoter.
2. Skilled workers.

3. Nursery equipped with polyhouse or shade net (netlon)
4. Machinery consisting of:
 - i. Heavy duty tractors
 - ii. Mini tractors
 - iii. Budchip machine
 - iv. Cultivation equipment consisting of ploughs, cultivators, ridgers, rotovators, sprayers
 - v. Sugarcane planter
 - vi. Sugarcane harvester
 - vii. Infield tractors
 - viii. Transport vehicles
 - ix. Machinery shed and workshop

Initially centres will be allocated by the DA to defined areas consisting of groups of mandals. These centres will then be trusted to Sugar factories or willing farmer entrepreneurs or their organizations in the form of co-operatives, primary producers companies (PPCs), or associations through two stage competitive bidding in a transparent manner. In the first stage eligible bidders will be selected based on their financial strength, experience and the range of services they offer to the farmers. In the second stage the financial bids will be evaluated based on the subsidy sought.

Out of the total unit cost of Rs.244.00 lakhs the Subsidy was limited to 25% or Rs. 33.00 lakhs, whichever is less.

The SSI PC designed by the DA consisted of the following components:

S No	Equipment	Quantity (No)	Unit cost (Rs lakhs)	Total cost (Rs lakhs)
1	Heavy duty tractors	2	24.00	48.00
2	Sugarcane planter	2	6.00	12.00
3	Ploughs, rotovators, cultivators, ridgers etc	10	1.00	10.00
4	Laser guided leveller	1	3.50	3.50
5	Power weeders	2	3.0	6.00
6	Sugarcane harvester	1	150.00	150.00
7	In-field tractors	2	6.00	12.00
8	Workshop, tools	1	2.50	2.50
	Total			244.00

Methodology of SSI PCs:

1. Enlisting of farmers and execution of agreement between the SSI PC and the farmers

The SSI PC holder needs to enlist farmers in area of at least 400 ha based on the accepted conditions of minimum services to be provided and their tariff levels. The relation will sustain on the basis of mutual benefit to all the stakeholders ie the farmer, the SF and the SSI PC holder himself.

2. Selection of cultivars and production of healthy planting material

This is one of the major aspect that has direct bearing on the yield of sugarcane not only in the plant crop but also in the succeeding ratoons. While selecting a variety for planting, due attention ought to be paid to know details such as yield potential of the variety, resistance to diseases like red rot, grassy shoot and 'whip smut', its tolerance to withstand water stress etc. nonetheless a thorough seed treatment has to be given before planting the same with appropriate chemicals.

A number of varieties like Co 6907, 83 R 23, Co 7219, 83 A 30, 87 A 298, 86 V96, 92 V297, Co 7805, 85 R 186, Coc 671, Co 62175 etc., have been tried in peninsular zone. The most predominant and popular variety Co 86032 is being cultivated over 90% of the area (38.747 ha). However, this variety while being moderately resistant to smut, is susceptible for lodging.

3. Preparation of soil and manuring

Sugarcane is a heavy feeder, Nutrient removal by sugarcane for every tonne of cane produced 0.56 to 1.20 kg of N, 0.38 to 0.82 kg of P_2O_5 , 1.00 to 2.50 kg of K, 0.25 to 0.60 kg of Ca, 0.20 to 0.35 kg of Mg, 0.02 to 0.20 kg of Na, 2.00 to 2.70 kg of SO_4 with some quantity in each of the micronutrients. Since the crop remains in the field for a period of a year, it requires sufficient nutrition at various stages of its growth. The cane quality and yield is decided on the time, method of application and quantity of fertilizer applied. Fertilizers are expensive inputs and judicious use of this input becomes imperative. Sugarcane requires 250 kg N, 100 kg P_2O_5 , and 120 kg K_2O /ha under local conditions. However, the exact quantities of fertilizers to be applied to a particular field are decided on the basis of soil test report. Feeding of nutrient through the drip for improve crop yields and fertilizer use efficiency.

4. Establishment of drip irrigation systems

This is the most important aspect of sugarcane growing next to fertilization. The utility of water will be enhanced if the soil is rich in organic content. Water is a valuable resource and its use should be made in a most appropriate manner. Moisture conservation methods like addition of adequate quantities of organic manure to soil, trash mulching of top soil @ 15 ton/ha helps in conserving soil moisture.

Sugarcane requires 120 to 140 inches of water which is equivalent to 12,500 to 14,000 tonnes, including the rain water.

The following techniques would help in economizing frequent use of water:

- i. Addition of organic manure @ 50 cartload/ha.
- ii. Spreading sugarcane trash as soil mulch @ 15 t/ha.
- iii. Giving irrigations through alternate furrows.
- iv. Installing water saving modern irrigation systems such as drip or sprinkler.

Drip irrigation in sugarcane is a relatively new innovative technology that can conserve water, energy and increase yields thereby net profits. Thus, drip irrigation may help to solve three of the most important problems of irrigated sugarcane - water scarcity, rising pumping (energy) costs and depressed farm profits.

Sub-surface drip irrigation system is gaining popularity among sugarcane growers owing to its superiority in conserving water, energy and by removing obstructions to intercultural operations. It also saves significantly the labour requirement in folding and relaying the systems at harvest time. Evaporation loss in this technology is less than in conventional drip system and only one weeding is sufficient. Cane yield is expected to increase by 30%.

5. Transplantation of seedlings and establishment of the stand

Bud chip system is an improved method of single bud involves the instrument having hemi spherical chipping knife, [used to chip out the buds from sugarcane](#), required only 2000 kgs of seed material for planting in one hectare of area. The remaining portion of sugarcane is normally used for juice extraction or in production of jaggery or sugar. The chipped out buds are placed on trays using cocopeat or saw dust as a media, Growing chip buds in nursery needed series of treatments, covering of trays in the initial days with poly film to create humidity for sprouting the buds, later sprouted buds need shade for a couple of weeks, after attaining two or three leaf stage, it requires hardening treatment for the establishment of seedlings in the main field. Healthy seedlings will be transferred and transplanted at shallow depth to boost high number of tillers with negligible mortality and with increased malleable canes. The malleable canes will project high yield by feeding moisture and nutrients on to the target spot through drip irrigation with reduced input cost.

BUD CHIP SEEDLING TRANSPLANTER

The machine consists of a pair of saddle wheel and water dispensing system. It was imported from Italy, runs parallel with 45 HP tractors. During movement, it drops the sugarcane seedlings in specified spacing with some amount of water to avoid initial shock and for quick establishment at main field. The studies conducted at Agricultural Research Station, Basanthpur of Medak District, indicating that the machine transplanted plot has having less mortality of sugarcane seedlings and high number of tillers compared to conventional method, these tillers which will in turn develop into more number of productive malleable canes, featuring that dropping at uniform depth, proper crown covering of clump on level at fine soil tilt conditions.

6. Intercultural and weed management

Intercultural operation done in between the interspaces which includes weeding, hoeing, mulching and finally earthing-up. Due to unavailability of bullock drawn intercultural implements locally, shortage of labour, lack of knowledge on herbicide usage

etc., no farmer generally does adequate intercultural operations. Due to this, the plant roots growth is confined to superficial layers, cannot draw sufficient moisture and nutrients, sometimes may leads to lodge the entire crop and weeds cause 60-70 percent losses both in quality as well as quantity of cane produced.

Intercultural operations i.e loosening of soils between the rows has carried for improving physical condition of soil for healthy root growth (respiration) after completion of tillering stage. Earlier, all these operations were usually done with help of bullock drawn implements, which were low cost high utility implements which ensures adequate hoeing, breaking of clods either sides of ridges, digging the inter row spaces for cutting secondary and tertiary roots and followed by mild earthing up with ridger. Now a days, farmers were not giving much emphasis on soil health, due to shortage of farm animals and labour availability, increased cost of expenditure on hiring implements for such operation. In recent years, the many machines were in operation from 4 HP rotary tillers, power tillers to 35 HP tractor drawn rotavator will pulverize the soil, improve root respiration there by increase crop yield by 30-40% from the existing condition. All the machinery having its own merits and demerits with manufacturing companies. Intercultural operation by mini tractors will operate insitu cultivation, minimize weed growth and also create congenial atmosphere and promote microbial colony at rhizosphere of soil. Earthing up is an important operation to stop development of non-productive tillers and also protects from heavy gale winds of lodging of cane. This implement consists of a pair of ridger breaks the old ridge and lifts the soil to strengthen the stubbles.

The experiment was conducted at Agricultural Research Station, Basanthpur-Mamidigi of ANGRAU in Medak district to study the productive efficiency of different genotypes of sugarcane under SSI method in comparison with conventional method. The System of sugarcane Intensification (SSI) improving the crop yields and net returns by reducing the cost of cultivation involves zero labour or minimum labour

The trial was conducted to study the growth, quality and yield under System of sugarcane Intensification (SSI) technology using 12 different genotypes for higher yield and quality parameters. The results reveals that Co 86032 had recorded higher cane yield (155.4 t/ha) and quality (20.02%) compared to conventional method (124 t/ha and 19.96%) respectively. The average stool weight (20.79 kg), leaf area (4.79cm²), cane height (3.3 mt), cane girth (2.92 cm), single cane wt (1.61kg) recorded to be highest under SSI method compared to conventional system. Indicating that the operations under SSI, creating congenial environment by improving soil physical condition allowing the root systems to develop for highly branched superficial roots, downward-oriented buttress roots and deeply penetrating agglomerations of vertical roots known as rope roots. This will give rise to making the crop to expose its full expression of genotype at particular atmosphere

7. Integrated pest management

Dip the setts/ buds in 1.2% solution of broad spectrum systemic fungicide. Carbendazim (50g Bavistin in 100 litres water) for 20-30 minutes before planting. Or Propiconazole 200 gm in 100 lit of water for 30 min and 200 ml Malathion. The SSI PC

maintains surveillance continuously and ensures timely prophylactic and control measures in an integrated manner.

8. Harvesting and delivery of the cane to factory

Harvesting of sugarcane on time at proper stage, i.e. peak maturity is necessary to realize maximum weight of canes and subsequently maximum sugar with least possible field losses under the given growing environment. Harvesting either under-aged or over-aged can with improper method of harvesting leads to loss in cane yield, sugar recovery, poor juice quality and problems in milling due to extraneous matter. Therefore, mechanized harvesting of sugarcane will ensure harvesting at proper stage and overcomes the problem of labour scarcity. In addition the machine will boost the agricultural mechanization in the State's sugarcane business through increased output. Subsequent operations of land preparation are quicker and more efficient when compared to manual methodologies. The time between harvesting and sowing minimized with higher yields for farmers, better productivity and quality in terms of the canes collected and savings in terms of equipment, fuel and labour dedicated to these operations.

9. Ratoon management

Around 65-70% area of sugarcane is under ratoon. Ratooning offers many advantages in the economy of cultivation. Since, it saves the cost on procurement and preparation of setts, land preparation etc. Though, it is a fact that ratoon yields more than the plant crop, Due to improper management due to compaction of field during harvesting of cane by trampling, movement of carts or harvesting and transport vehicles or neglected ratoons have resulted in poor yields and low cane quality, which has directly projecting in the overall production and recovery of the nation.

The productivity and quality of ratooncrops are very poor, Since most of the ratoons are neglected or subjected to poor management. The productivity of ratoon can be upgraded to the level of plant crop or even better provided with good management practices by growers.

- a) Running sub-soiler/Chisel plough: continued use of heavy machinery/ harvester can create hardpan or compacted soil. These may hinder root growth and infiltration of water and nutrients. Sub soiler / Chisel plough is a special type of single or double arm plough which breaks the compacted sub soil, it also aimed at restoring the lost soil properties and involves loosening compacted soil layers below the ploughing depth, without inverting them.
- b) Disc Off barrower: Earlier bullock drawn plough used to cut lateral roots at both the sides of ridge. Now, off barrowing implement will cut the shoulder on either side of ridge to specified depth, it will improve and develop new roots and ultimately the growth of the crop.

- c) Stubble shaver: when sugarcane was harvested manually by labour, there were leftover lengthy infected canes or stubbles, which will reduce the production potential of emerging tillers. It requires shaving of stubbles at ground level. Earlier, such operations were used to carry manually by labour. Since, labour component is inefficient and expensive resource. It need to operate by implements for efficient boosting of tillers.

Progress so far:

Four SSI PCs have been set up in the state so far, out of which while three units are run by the SFs directly the fourth one is operated by an entrepreneur. All put together an area of about 1000 ha is brought under the SSI in the state.

S No	SF	No of units	Area harvested (ha) during 2012-13
1	Trident Sugars, Madhunagar, Zahirabad	1	200
2	Krishnaveni Sugars, Gadwal	2	400
3	Gayathri Sugars, Maghi	1	400

Conclusion

The integrated cultivation model involving all the important players with the private entrepreneur is helping in aggregating the small and marginal farmers on one hand and upgrading the cultivation standards rapidly leading to increased yield to the farmer, higher sugar recovery to the SF, profitable enterprise to the SSI PC holder. However there is lukewarm response from entrepreneurs as seen by only one such case out of the 8 units grounded in the state till now. With increased ease and profitability the farmers are tending to increase area under sugar cane. The mechanized system in sugarcane (SSI) i.e bud chip transplanter, accessories of Mini tractor and harvester is an ultimate solution for millers and sugarcane farmers for improving productivity of plant crop as well as ratoon with reduced cultivation cost, minimum labour and high farm income.

Costly machinery at times requiring imports or large scale fabrications/adaptations, multiple taxes including customs, vat and transport, lack of service facilities and their costs, limitations on state subsidies are some of the constraints. Inadequate co-ordination amongst stakeholders, fragmented holdings and inadequate subsidies are working as a big drag on the enthusiasm of the SSI PC holders.

Way forward:

1. The DA needs to revise the components of SSI PC and their costs based on the experience gained and also the actual prices.
2. Subsidy level needs to be raised from 25% to 50% of the total unit cost (Annexure I) and it needs to be released without imposing any limits.
3. GOI needs to play a direct and leading role. Granting of 50% subsidy by GOI to at least one unit in the zones of each of the 659 SFs in the country would need an amount of Rs 472 cr. This amount can be granted over the remaining period of 4 years of the XII FYP.
4. A project may be granted to one of the IITs to fabricate appropriate machinery for sugarcane cultivation in the country.

Annexure I

The SSI PC as per latest design and prices

S No	Equipment	Quantity (No)	Unit cost (Rs lakhs)	Total cost (Rs lakhs)
1	Heavy duty tractors	2	24.00	48.00
2	Sugarcane planter	2	6.00	12.00
3	Ploughs, rotovators, cultivators, ridgers etc	10	1.00	10.00
4	Laser guided leveller	1	3.50	3.50
5	Mini tractors	2	3.0	6.00
6	Sugarcane harvester	1	150.00	150.00
7	In-field tractors	2	12.00	24.00
8	Workshop, tools	1	2.50	2.50
9	Shadenet and polyhouse	1	30	30
	Total			286.00

S No	Equipment	Quantity (No)	Unit cost (Rs lakhs)	Total cost (Rs lakhs)
1	Heavy duty tractors	2	24.00	48.00
2	Sugarcane planter	2	6.00	12.00
3	Ploughs, Rotovators, cultivators, Ridgers, Tractor mounted Sprayers, 2-wheel traile, r etc	10	6.00	60.00
4	Laser guided leveller	1	3.50	3.50
5	Power weeders	2	3.0	6.00
6	Sugarcane harvester	1	150.00	150.00
7	In-field tractors	2	9.00	18.00
8	Workshop on wheels with tools	1	11.00	11.00
9	Shadenet & Poly house	2	15,00	30,00
	Total			308.50

7. **VSI an institution promoted largely by the Cooperative Sector sugar mills in Maharashtra**

SUGARCANE MANAGEMENT IN CO-OPERATIVE SUGAR MILLS

DEVELOPMENT OF CO-OPERATIVES IN SUGAR

- The sugar mills in co-operative sector started in 1949.
- Sugarcane growers formed co-operative sugar mills with the help of the State Government to ensure processing of their raw material for appropriate returns.
- The co-operative sugar mills are totally owned by the cane growers and the relationship between them and sugarcane growers is of organic nature.

Objectives of cooperative mills

- To have a right to timely processing of cane and receive maximum possible cane price
- To establish loyalty bond between sugarcane growers and sugar mills
- To have overall socio-economical development in the operational area.
- To have democratic management through elected representatives.

System of cane development and management

1. Seed production and distribution program

Three tier seed production program in the form of breeder, foundation and certified seed of recommended varieties and supply to the cane growers.

2. Seasonal and varietal planting program

- Considering the crushing capacity of the sugar mill, they plan for optimum area under plant & ratoon crop of recommended varieties.
- As per the agro-climatic conditions, the area under Adsali (long duration 16 to 18 months -10%), Pre-season (30%), Seasonal (15%) and Ratoon crop (45%) is decided.

3. Registration of cane

Varietywise and datewise area under plant and ratoon crop is registered by grower with the mill.

Seed plot



4. Harvesting program

Planning and implementation of harvesting program based on planting / ratooning dates and maturity age.

5. Harvesting and transport

Borne and controlled by sugar mill to have an un- interrupted supply of sufficient fresh and quality cane.

6. Assistance by co-operative sugar mills to the cane growers

Seed

The mill undertakes seed production program in three - tier system i.e. breeder, foundation and certified seed. The nucleus seed is obtained from research institutes/ agricultural universities.

Green manuring

The seed of green manuring crops like sunhemp and dhaincha is supplied on subsidized rates.

Basal dose of chemical fertilizers

The mill supplies basal dose of NPK fertilizers to the cane growers on credit and subsidy basis.

Bio-fertilizers

The mill arranges supply of N-fixing, P-solubilizing bio-fertilizers and decomposing cultures.

Compost production and supply

The mill produces good quality compost through press-mud, dung, agricultural wastes with the help of decomposing cultures and enriches with micronutrients and bio-fertilizers for the cane growers at subsidized rate.



Soil testing

The mills arrange soil testing of grower's lands through their own / outside laboratories for appropriate fertilizer recommendations.

Irrigation water management

The mills support co-operative lift irrigation schemes for sustainable development of sugarcane. They also provide capital financial assistance to drip irrigation system in addition to subsidy from state and central government.

Mechanization

Mills supply farm machinery / implements like sugarcane planter , inter-culturing equipments, trash shredder and sugarcane harvesters on hire basis at subsidized rates.

Plant protection

Procurement and supply of weedicides and pesticides on credit or subsidy to the cane growers.





Mechanical sugarcane harvester in operation





Incentives to early maturing varieties

The mills promote high sugared early maturing varieties in the operational area by giving additional sugarcane price per tonne of cane to increase yield and sugar recovery.

Human Resource Development

The mill arranges agriculture staff and farmer's (men and women) training programs at sugar mills and also at research stations . The farmers rallies are also organized in operational area.

Demonstrations

The field demonstrations of improved cane cultivation technologies like promising sugarcane varieties, planting systems , drip & raingun sprinkler irrigation systems, ratoon management, integrated nutrient management, pesticide use and bio-fertilizer use.

Publications

The mill publishes leaflets, charts, booklets on improved cane cultivation technologies.

Infrastructure development

The mills develop internal roads, education facilities, medical facilities and consumer stores for the benefit of cane growers.

Support in natural calamities

The mills support the cane growers in a natural calamities like flood, drought, hailstorms, fire etc.

The co-operative mills in Maharashtra state have established Vasantdada Sugar Institute as R & D, Technical, Educational and Advisory Institute to cater to the services to the mill and cane growers.





8. New Machines on the anvil

Sugarcane Planter

Sugarcane is highly labour intensive crop. The cost of cultivation is very high. Sugarcane planting requires second highest manpower next to that of harvesting. The timely planting is not possible on many occasions because of acute shortage of labour at peak time. The labour costs are always increasing. Untimely / delayed planting affects adversely on germination of sugarcane, number of malleable canes at harvest and thereby both sugarcane yield and sugarcane recovery. The only solution of this issue is to introduce Mechanical Sugarcane Planters for sugarcane planting to reduce dependability on manual labour and saving in the cost of planting. The advantages include:

- Application of basal dose of chemical fertilizers in the soil placing the sets in the furrow and covering them with soil at a time.
- Postural discomfort to labour is reduced.
- It saves 48% in cost of planting as compared to conventional cane planting.
- Germination of sugar cane is more than 72% as against about 60% in manual plantation.
- The planter covers average area of 5 acres in a day of 8 hours.

IISR, Lucknow, VSI, Pune as well as many state agriculture universities have developed machines suitable for particular geographies which need speedier adoption.

Sugarcane Sampler

This is a machine which can be used to determine sugar percentage in cane pulp. It is world proved technology adopted by rest of the cane growing countries. In India, VSI, Pune, had initiated the project for development of sugarcane sampler for Maharashtra along with Syno Engineering Pvt. Ltd. Mumbai. The machine has been developed and introduced in Narmada Khand Udyog Mandal Gujarat for trial run. However, the machine developed by Syno Engineering Pvt. Ltd. in collaboration with VSI, Pune costs nearly Rs. 2 crores. The future developments should concentrate on a cost effective machine which can be easily adopted by the industry.

The technology basically involves a machine with 80 HP motor which takes vertical drilling of sugarcane loaded in truck, tractor or bullock cart. Number of sample required for every vehicle of sugarcane loaded. The sample taken by the machine is tested with computerized laboratory and determines the percentage of sugar in that cane sample of vehicle. The result of cane sampler is tested with standard practices of sugar percentage in the laboratory.

9. Sugarcane information portal



CaneInfo website

- a free-to-access, database-driven website exclusively on sugarcane
- **First** user-centered website on sugarcane, by any public-funded institution
- **Interactive features:**
Encouraging response for 'Ask a Specialist' module from Farmers & Cane Development Personnel

Available in www.caneinfo.nic.in

A screenshot of the CaneInfo website interface. It features a header with the CaneInfo logo and navigation links. The main content area displays a grid of images related to sugarcane cultivation and processing. The website has a clean, professional layout with a mix of text and visual elements.



A few modules in *CaneInfo*..



केन इन्फो
कैन इनफो
केन इनफो
केन इनफो



'Cultivating Cane' Section

Package of
Practices



“Sugarcane Statistics”

Sugarcane productivity over the years/ Local Sugarcane Research Stations





Streaming videos : www.youtube.com/caneinfo

Weeding with mini tractor Video







"Suggest a variety" module

Drought tolerant variety..






'Ask a Specialist'

Symptomatic diagnosis






CaneInfo Content

- *Ask a Specialist*
- *OFAS (Online Fertilizer Advisory Service)*
- *Online Directory of research institutions on sugarcane and sugar factories*
- *Discussion Forum*
- *Publications/Bibliographic database on Sugarcane for cane development personnel and cane growers*
- *Multimedia Gallery*
- *Suggest a Variety*
- *News Feeds*
- *Streaming of Video Programmes on sugarcane*
- *What's Available?*



- More than 15 **lakh** hits so far



- Registered member of **CIARD-RING (GFAR)**
- **“Best Telecentre Initiative”** - eWorld Forum 2011
- Included in the **‘Technology & Knowledge resources’** section of **ICAR** website

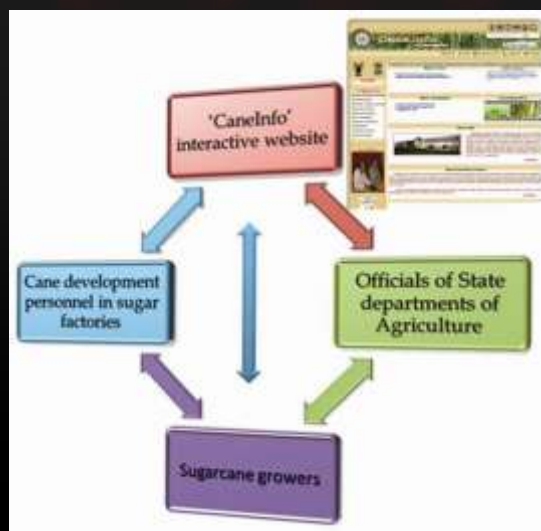


Visits to *CaneInfo* (NIC, 2012)

Country	%
India	47
USA	32
China	5
Russia	2
Germany	1
Australia	1



Sugarcane information transfer process using *CaneInfo*



Enclosures

2. State wise major findings - views of Stake Holders from each state

- ✓ Andhra Pradesh
- ✓ Bihar
- ✓ Gujarat
- ✓ Haryana
- ✓ Karnataka
- ✓ Maharashtra
- ✓ Punjab
- ✓ Tamil Nadu
- ✓ Uttarakhand
- ✓ Uttar Pradesh

Overall perspective from ISMA



State wise major findings - views of Stake Holders from each state

Andhra Pradesh

Views of SBI, Coimbatore:

Sugarcane is an important cash crop of AP. Sugarcane is cultivated on about 2.0 lakh hectare area, which is subject to abiotic stresses like drought, salinity, alkalinity, (cyclones and water logging particularly in coastal area) and biotic stresses like red rot, smut etc. which generally limit its productivity. The average cane productivity in the state is around 79 t/ha. There is decreasing trend in productivity since 2007-08.

Major problems:

- Evolution of varieties with high yield, better quality and red rot resistance.
- Lack of proper seed production and distribution system in sugarcane
- Slow replacement of old varieties (Co 6907 still in cultivation)
- Lodging of sugarcane, particularly in coastal area
- Non-availability of inputs and credits at proper times
- Insufficient irrigation facilities in Telengana and Rayalseema regions

Steps to improve cane yield and sugar recovery:

- ☐ Better performing new varieties will provide scope for improvement in cane yield and sugar recovery. There is need to exploit the potential of these varieties by faster seed multiplication in the state for the benefit of farmers and sugar mills.
- ☐ There is need to strengthen the seed production system in the state.
- ☐ Strengthening of Sugarcane Research Stations.
- ☐ Timely availability of inputs.
- ☐ Mechanization of sugarcane cultivation including harvesting needs to be popularized in order to solve the problem of labour shortage and to reduce the cost of production.
- ☐ Incentive on drip irrigation is suggested for efficient use of water resources.

View of ISMA:

1. Operational Efficiency issues

- Total 45 installed sugar mills (with 1, 28,132 tcd capacity), while only 38 sugar mills are operational from last 3 years (1, 20,050 tcd operational), with 12 cooperative mills & 33 private mills. Total 104 lac tons of average sugarcane crush with an average 110 days of cane crushing period. State having 63% of avg. drawl out of total average of 163 lac tons of cane production. Cane diversion major in Gur & Khandsari.
- The total capacity to crush is 132 lac tons by mills, it signifies the 78% of operational efficiency in state sugar mills. State sugar mills have only 14 Ethanol producers with 562 KL per day installed capacity & 23 cogen unit with 318MW production. By-products generation have good scope in state.

2. Sugarcane Cultivation issues

a) Soil issues.

- AP having Paddy-Paddy-Sugarcane & Paddy –Sugarcane rotation mainly, this has more consumption of water and due to this practice salinity, occurs heavily in soil. Low organic carbon in the soil. Surface crusting in chalky soils (chalky soils are alkaline), as these soils have poor soil structure, low infiltration & hard layer at 0.5m -1m depth.
- The lands are not uniform & are with undulating nature.

b) Seed issues.

- Seed of improved varieties are not available at farmers nearby location, as it should be available within 15 -20km of area.

c) Water/irrigation issues.

- Excess moisture or some time heavy rains create severe water logging problem in coastal area. Improper drainage in coastal area.

d) Crop management issues.

- High cost of cultivation, high labour cost, labour scarcity, hampering the adoption of new improved management practices, which make farmer to switch over to short duration crops like paddy, maize, pulses, vegetable. Zone specific (Telangana, Ryalseema & Coastal) sugarcane varieties are not available in the state.
- No improved package of practices in sugarcane like wider spacing, deep ploughing in Ryalseema & Coastal area, which also actually hampers the yield and recoveries. Lodging of sugarcane crop because of heavy winds in coastal area. Red rot, smut, wilt & grassy shoot disease are the major disease problems in the state.

e) Research & Development issues.

- Limited seed multiplication & location specific varietal development activities are lacking. No such good varieties are there which perform better in water logging condition.

SUGGESTIVE STEPS IN IMPROVISING THE CURRENT SITUATION:

To address the state issues, ISMA is suggesting couple of way forwards in terms of two tier strategy:-

SHORT TERM STRATEGY – (6 months – 1 yr)

1. Crop rotation and intercropping should be adopted in cane to improve the soil health.
2. Proper management of disease pest should be done.
3. Early: Mid: Late maturing varieties have to be grown in 70%:20%:10% proportion respectively for prolong the crushing duration & higher cane yield.
4. Industry institution crop awareness programme should be introduced & promote the farmer's education awareness programme regarding the sugarcane variety, soil health, insect pest & disease management.
5. Encourage wider spacing, drip irrigation, adoption of moisture stress management practices, early planting in drought prone area, application of organic manure needed to sustain sugarcane production in state.
6. Encouraging use of quality seed material of new improved variety.
7. Harvest of sugarcane crop at soil level will improve the sprouting in ratoon.
8. Trash mulching for better ratoon management.
9. Demonstration farms, R & D activities should be organised by mills at farmer's field

to disseminate the new technology.

MEDIUM TERM STRATEGY – (1 yr – 3 yr)

1. Region specific variety should be developed with respect to high sugar, high cane yield, and resistance to disease, pest, drought & water logging.
2. Subsidized the soil health kits, mobile boot van to sugarcane farmers through SDF loans.
3. Adopt suitable crop rotation to improve the soil health & reduction of disease inoculums etc.
4. Promote seed farm concept in the state either providing subsidy to farmers or by the sugar mills, which will help the farmer's to use quality seed for planting.
5. Development of suitable variety for cogen & sugar content to sustain the sugar industry.
6. Adopting tissue culture technique to fast multiplication of seed of new improved varieties.

Cane Commissioner's view point: (pre)



- India is the second largest producer of cane and in the world next to Brazil.
- Presently per capita consumption of sugar in India is at 18 kg, it may go to 22 kg
- There is a dire need for increasing cane/sugar production for meeting the demand of sugar for increasing population.

Statistics of cane area and productivity in India and Andhra Pradesh for a decade

	Cane area (lakh ha)	Cane production (lakh tons)	Sugar production (lakh tons)	Productivity (t/ha)	Recovery (%)
India					
2002-03	45.2	2873.83	201.40	63.6	10.36
2006-07	51.51	2811.72	283.61	69.0	10.17
2011-12	50.38	3610.36	263.42	71.6	10.25
Andhra Pradesh					
2002-03	2.32	153.87	4.08	66.2	9.00
2006-07	2.64	216.92	16.8	82.2	9.71
2011-12	2.04	166.86	4.50	81.6	9.45

• As there is no scope for horizontal development (land, water and other resources), only way is vertical development i.e., increasing tonnage per unit area that is cane productivity.

• There are means and ways to improve the productivity and recovery of sugar industries in Andhra Pradesh through

1. Production/Crop management issues
2. Developmental issues
3. Extension issues
4. Policy issues

a. Production/Crop management issues

Constraint (s)	Critical intervention (s)
Salinity	– Leaching out excess salts with good quality irrigation water. – If good quality irrigation water is not available, saline soils can be reclaimed making use of rain water during rainy season alone
Alkalinity	– Application of gypsum depending upon soil pH – Incorporate gypsum in soil by disk plough after letting water. Allow to settle for 24 hours and drain soluble sodium salts. – Raising of daincha and incorporate into soil at 50 % floral bud production stage and then grow paddy for first on season, incorporate paddy straw and raise sugarcane. – Cane yield can be increased by 50 % in saline soils and 150 % in alkali soils by reclamation
Surface crusting in chalka soils	– Add of paddy husk or powdered groundnut shells @ 2.5 t / ha and incorporate into soil – Providing irrigations at closer intervals and do not allow the soil to dry
Hard pan formation in heavy soils	– Deep ploughing or chistelling or sub soiling will improve root growth, water uptake and anchorage to crop and reduces bulk density. – Deep ploughing helps to increase cane yields by 8 %

Contd.,

Water logging in heavy soils	– Formation of drainage channels at 12-15 mts interval – Draining of excess water with the help of archemidian screw, swing basket / low lift pump – Cultivation of clones viz., Co 6907, 84 A 125, 86 V 96, Co 7219, Co 7805, Co T 8201, 83 V 15, 83 V 288, 87 A 298, Co A 7602, 91 V 83, Co 7706 , 2001A 63, 98A 163, 97A85, 2003V 46 etc., – Early planting (January) – Heavy earthing up – Early application of fertilizer (at 30 and 60 DAP) – Foliar nutrition under ill drained conditions (urea + MOP @ 2.5 %) – Management of white fly
Moisture stress during formative phase	– Growing drought tolerant varieties viz., Co 6907, 81 A 99, 84 A 125, 87 A 298, Co A 7602, 83 A 30, 83 R 23, Co T 8201, 97 A 85, 2001A63, 98A163 – Trash mulching @ 3 t / ha on 3rd day after planting – Adoption of high seed rate – Application of organic manures (FYM / PMC / Vermi compost / Trash compost) – Soaking setts in 10 % lime solution for one hour – Foliar spray with urea and MOP each @ 2.5 % – Basal application of potassium – Adoption of drip irrigation – Alternate furrow irrigation

Contd.,

Low germination	– Use of planting material from short crop (raised from hot water – 52°C treated mature crop planting material) and maintenance of purity of plant material enhances cane yield by 15 %.
Low water holding capacity of light soils	– Application of 25 t / ha of FYM or 12.5 t / ha pressmud cake or raising green manure crops like Sesbania. <i>Sunhemp</i> , Pillipesara, cowpea, daincha etc., and incorporating into the soil at 50 % floral bud production stage.
High irrigation water requirement	– Sugarcane has to be irrigated at weekly intervals during formative phase and at 18 days interval during maturity phase. – Summer irrigations boost cane yields by at least 10 %
Lodging of crop	– Deep ploughing and shallow planting in deep furrows – Working with mould board plough either way twice on the beds to throw the soil towards the sugarcane clump to provide proper anchorage and also to loosen the soil for wide root spread, better uptake of nutrients and rapid growth during grand growth period. Improves cane yield by 8 %. – Trash twist propping is a better practice than stooking as the former facilitates free aeration besides better anchorage to withstand wind blow. Improves cane yields by 3 %.

Contd.,

Improper cane harvest	– Cane has to be harvested after attaining maturity – Harvesting of cane close to the base with sharp knives. Enhances income to the farmers by 3 %.
Incidence of striga	– Hand weeding before flowering and seed formation and their destruction – Trap cropping – growing fodder jowar and removing striga plant along with it before flowering and seed formation – Spraying of 1-2 kg of 2, 4 - mixed in 500 litres of water per hectare
Protracted period of planting	– Adoption of staggered planting facilitates harvesting of physiologically mature crop, increases cane and sugar yields.
Insect pests and diseases	– Adoption of integrated insect and disease management practices
Incidence of weeds	– Weeds reduce cane yields ranging from 15-70 %. The crop has to be kept weed free upto 90 days after planting.
Poor ratoon cane management	– Stubble shaving, gap filling, off bearing, additional dose of N, trash mulching and correction of micro nutrient deficiency

Contd.,

Non adoption of location specific clones	– Selection of location specific / farming system specific clones
Non replenishment of soil nutrients	– Addition of organic sources viz., FYM, PMC, Vermi compost, trash compost and incorporation of green manure crops and application of inorganic fertilizer based on soil test values
Non adoption of sett treatment	– Sett treatment with carbendazim (0.5 g / lt) and malathion (2 ml / lt) for 15 minutes will help in arresting sett transmitted diseases.
Non adoption of proper varietal schedule	– Adoption of proper varietal schedule (70 % early and 30 % mid late clones) helps in increasing cane yield as well as sugar recoveries
Difficulty in the application of insecticides and pesticides on standing crop	– Eco friendly management of pests and diseases of sugarcane using antagonists, bio-pesticides and parasites.
Introduction of diseases / insect pests from neighbouring states	– Strict following of internal quarantine regulation at state level. – Indiscriminate introduction of a variety without phytosanitary certification has to be curbed. Such measures are essential to check the production of red rot from neighbouring states.

- As per the research observations it is revealed that by adopting wider spacing / Sri planting in sugarcane with intensive cultivation coupled with early planting, higher input management and drip irrigation we can reap the potential productivity of the cane (197 t/ha).

b. Developmental issues:

- Heat therapy is an integral component of three tier seed programme for production of disease free high quality seed. Sugar factory managements should provide facilities for heat therapy of seed material.

- Production and supply of short crop as seed material in liaison farms

- Adoption of proper varietal schedule for increasing cane productivity and recovery

- Incentives for cultivation of high yielding and sucrose rich clones so as to encourage the farmers to take up cultivation of specific clones

- Timely supply of credit and inputs by sugar factory managements

- Selection of location / farming system specific clones based on farm testing in liaison farms

- Establishment of soil and micro nutrient testing labs in each sugar factory. Supply of soil health cards for each holding in reserved cane area. This would improve the yield by 15-20 %.

- Establishment of bio control labs for production of bio pesticides and supply to farmers on subsidy basis

- Popularization of drip irrigation for efficient utilization of irrigation water and fertilizers

- Diversification of sugar industry for cogeneration and ethanol production.

- Supply of proven farm implements by Government / Factory managements so as to reduce excessive reliance on human labour and reduce cost of production

- Encouraging the farmers on the use of crop residues from sugarcane and by-products of sugar industry viz., PMC, cane trash and distillery effluents.

- Encouraging bio-fertilizers application in cane production to save 25 % of inorganic fertilizers. Establishment of bio-fertilizer units by providing capital on subsidy so as to encourage towards bio fertilizers application.

Contd.,

- Good quality planting material provide the basis for good sugarcane crop which is propagated vegetatively. The sugar factories could play an important role in raising nurseries from breeder seed obtained from the research stations. The replacement of seeds by the farmers could improve yields by 15 %.
- Sugarcane cultivation is a labour intensive crop. Several operations are to be preformed by manual labour (land preparation to harvesting). Harvesting of cane alone accounts nearly 30-35 % of cost of sugarcane production. Therefore, mechanized cultivation assumes more importance. Crop specific implements need to be provided.
- Promotion of inter cropping in sugarcane.
- Identification of problematic soils and adoption of recommended measures for reclamation
- Establishment of R & D units in each sugar unit.
- Involvement in institute-industry interface programmes.

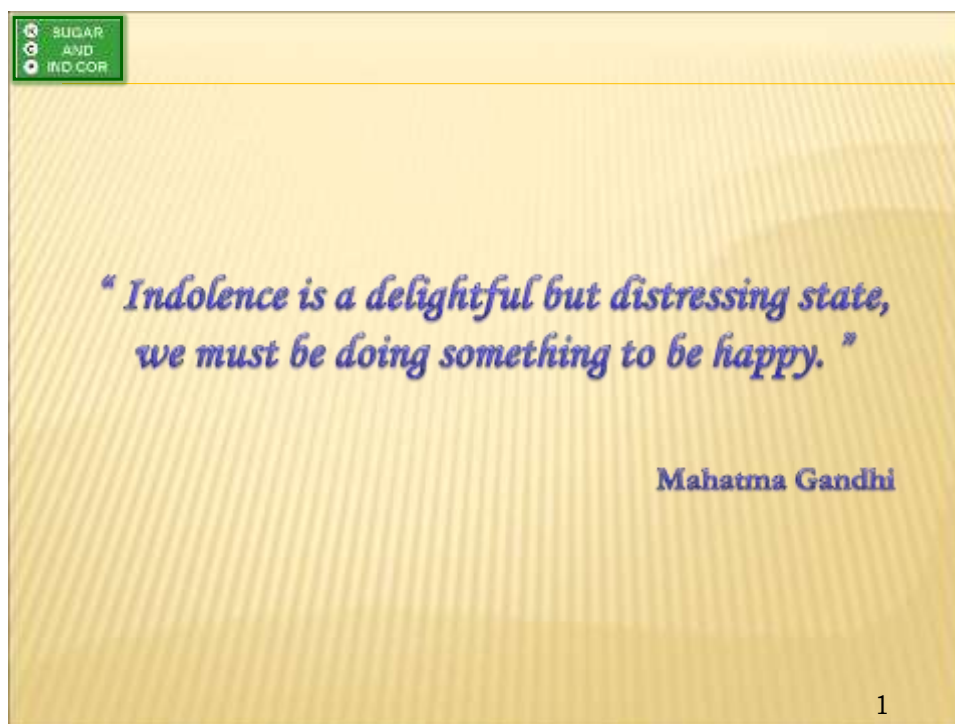
C. Extension issues:

- Extension staff in Department of Agriculture and cane development staff in sugar units should actively take part in transfer of technologies to cane farmers
- Nearly fifty percent of the cane area is under ratoons. The productivity of ratoons are lower compared to plant crop. A small improvement in ratoon yield would add considerably to overall sugarcane production of the state. Extension staff should popularize ratoon cane management practices viz., stubble shaving, gap filling, off barring, additional N application and micro nutrient deficiency correction.
- Particularly in North Coastal zone of AP where rainfed sugarcane is predominant, extension staff should popularize rainfed sugarcane technologies like trash mulching, gap filling, sett treatment with 10 per cent line solution, pre and post emergence weedicides application, foliar N and K sprays under exigency, micronutrient deficiency corrections and detrashing during post monsoon period etc.
- Popularization of improved technologies through training programmes, demonstrations, diagnostic team visits, field days etc.

D. Policy issues:

- Fixation of remunerative statutory minimum price for sugarcane in view of increased cost of sugarcane production and stiff competition from alternate crops. SMP should be announced by the government at least one year in advance.
- Announcement of reasonable price for green power and ethanol produced in sugar factories.
- Avoidance of delay in announcement of Bhargava formula.
- Long term policy for blending of ethanol with petrol / diesel
- Incentives and capital support for ethanol and power production.
- Providing more options to the industry to process the cane as per the market trends.

Sugar mills' view point: **(KCP)**





K.C.P.SUGAR AND INDUSTRIES CORPORATION LIMITED

PRESENT AND FUTURE IMPEDIMENTS FACED BY SUGARCANE FARMERS

1. Low organic carbon (0.3 to 0.5%) and humus content in soils.
2. Indiscriminate application of inorganic fertilizers resulting in depletion of soil fertility.
3. Lack of suitable implements for thorough land preparation.
4. Non availability of soil compatible high yielding, potential varieties impacting poor yields and returns.
5. Stagnated cane yields per acre.

	Tonnes/ha 2011-12
India	71.70
A.P.	81.80
K.C.P. Sugars	100.00

1



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PRESENT AND FUTURE IMPEDIMENTS FACED BY SUGAR CANE FARMERS

6. Quick degeneration of newly released varieties.
7. Lack of suitable varieties which can withstand biotic and abiotic conditions, highly susceptible to pests and diseases.
8. Lack of adequate irrigation facilities to cope up especially in summer months which coincides with formative phase.
9. Improper drainage system is effecting productivity of the crop
10. Non availability of inputs effecting timely application coupled with enormous input costs.

1



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PRESENT AND FUTURE IMPEDIMENTS FACED BY SUGAR CANE FARMERS

11. Acute shortage of labor for sugarcane cultivation and also steep rise in labor costs.
12. The cost of cultivation by and large high all over and more particularly in Andhra Pradesh. Cultivation expenses for own land cultivation to plant crop is Rs.60000/ac and ratoon crop Rs.50000/ac whereas for lease cultivation Rs.90000 and Rs.80000 for plant and ratoon crops respectively.
13. Non availability of suitable low cost equipment and machinery to substitute labor.

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PRESENT AND FUTURE IMPEDIMENTS FACED BY SUGAR CANE FARMERS

14. Since already partial decontrol is imposed it is likely that the factories may switch over to pay the cane price basing on the actual recovery of individual farmers which is in existence in other countries. This action results in farmers getting lower price forcing them to get higher recoveries.
15. The price of two bags of Paddy is equivalent to one tonne of cane (SMP price) five years ago. Currently the price of cane remained the same where as the price of the Paddy is steadily going on putting the cane farmers at a great loss and diversion to other crops.

1



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ACTION TO BE INITIATED BY CENTRAL AND STATE GOVERNMENTS

1. Establishment of soil testing laboratories at the mandal level and strengthening of existing labs to utilize the services for soil mapping of entire cultivable area at frequent intervals.
2. Translation of soil test results to the field level through extension wings.
3. Distribution of green manure seeds, soil reclaimants and bio fertilizers, bio pesticides and bio agents at subsidized cost.
4. Various bio products being released in to the market are spurious and farmers are getting deceived, the government can evolve effective control mechanism only to permit genuine products.
5. Government agencies shall monitor by effective control mechanism for timely distribution of fertilizers on subsidized rates.

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ACTION TO BE INITIATED BY CENTRAL AND STATE GOVERNMENTS

6. The central and state research stations to be adequately funded with competent staff of scientists.
7. The research projects taken up within fixed time frames and scientists shall be accountable if necessary by bringing in suitable statutory changes.
8. The successful completion of on going research projects to be ensured by filling in the slots by having succession planning so that the research projects are not hampered.
9. Setting up of world class agricultural universities will enable to undertake innovative and productive research for better productivity.
10. Timely interventions by the government agencies for effective maintenance of irrigation and drainage systems.
11. Focus shall be given to implement micro irrigation systems by subsidizing to maximum extent for effective water conservation. 1



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ACTION TO BE INITIATED BY CENTRAL AND STATE GOVERNMENTS

12. The agricultural extension services by state government agencies shall be made strong to reach transfer of technology from lab to land.
13. The mechanized harvesters and other implements to be made available to farmers at 75% subsidy till popularization of mechanized farming initially for a period of five years.
14. The government shall frame policies to waive off duties and other taxes on the imported agricultural machinery and implements.
15. Constitution of tripartite body comprising representatives of premier institutions like IITs/NITs, factory representatives and government nominees to design and develop compatible machinery to Indian soils and conditions.
16. Agricultural engineering wing to be set up wherever there are no existing engineering wings and to be strengthened the existing engineering departments at all agricultural universities.

1



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ACTION TO BE INITIATED BY RESEARCH STATIONS

1. Research is to be undertaken to ascertain the fertilizer requirement suitable to the soils and to arrive at afresh correct dosages of fertilizer for refixing and recommending basing on soil conditions.
2. Research on soil enrichment and fertility improvement to be under taken.

1



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ACTION TO BE INITIATED BY RESEARCH STATIONS

3. Varietal research and development through the use of proven high yielding and resistant clones in crossing program and adapting conventional procedures as well as bio tech tools should receive grater attention.
4. Research stations are to be focused on the aspects mentioned hereunder for the varietal development.
 - a. Short duration varieties with a maturity period of 6-8 months.
 - b. Varieties with high yield (70-80 M.T / Ac.,) coupled with reasonable recovery (10.50%).
 - c. Varieties that can resist Biotic stresses (Pests and Diseases).
 - d. Varieties resistant to abiotic stresses (Water logged, drought, salinity /alkalinity).

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ACTION TO BE INITIATED BY RESEARCH STATIONS

- e. Varieties having desirable feature such as
 - i. Erectness.
 - ii. Non-lodging.
 - iii. Self stripping.
 - iv. Thick canes.
 - v. Non-spiny.
 - vi. Non-flowering.
 - vii. High tillering.
 - viii. Multiple ratoon-ability.

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ACTION TO BE INITIATED BY RESEARCH STATIONS

5. Research on genetically modified sugarcane varieties to know their suitability and adaptability like Brazil, Australia and other countries.
6. Research on exploring pest and disease control practices involving major insects and pests based on bio agents, botanical pesticides etc.,
7. Establishment of "Cane Health Clinics" in every sugarcane research stations under the maintenance of experienced scientists.
8. All the research activity to be aimed for at least enhancement of 25% on yield and 5% on recovery in every five years period.
9. Research on design and development of suitable equipment and machinery with the collaboration of engineering experts from premier institutes like IITs and NITs.

1



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ACTION TO BE INITIATED BY FACTORIES

1. Collection of new varieties (pre released) from all the research stations to test at the factory own farms to select high productivity varieties compatible to the soils for commercial multiplication.
2. Research break through to be applied in model farms developed by the factories for demonstration purpose. Groups of farmers to be exposed to such farms to have first hand experience.
3. Factories and research organizations shall work in close interface hand in glove for effective results.
4. Conventions of farmers to be organized to enlighten them on latest trends in farming techniques.
5. The factories to extend subsidies to the farmers for introduction of innovative technologies.

1



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ACTION TO BE INITIATED BY FACTORIES

6. **Factories shall maintain soil and water testing laboratories and the results to be passed on to farmers at the ground level for implementation.**
7. **Bio tech units to be set up by the factories to manufacture bio products and supplied to the cane growers on subsidized costs for soil enrichment.**

1



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ACTION TO BE INITIATED BY FARMERS

1. **Farmers shall adopt all the innovative technologies and implement all the practices, suggested by the research stations and factory model farms.**
2. **Farmers can preserve soil health by applying both organic and inorganic fertilizers recommended by research stations and factories.**
3. **Farmers shall restrain from indiscriminate application of fertilizers and pesticides resulting in saving cost. The recommendations made by research station and factories to be strictly followed.**
4. **Farmers with support and information disseminated by the factories and agricultural research stations aim to achieve higher yields and recovery.**

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ACTION TO BE INITIATED BY FARMERS

5. Farmers to adopt the cultivation practices suitable to the mechanized farming.
6. Farmers are to adopt micro irrigation systems and conserve the water to the maximum extent possible for higher productivity.

1



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CONCLUSION

- All the stake holders shall work in tandem by drawing time bound programs with periodical reviews for effective implementation which will be key to the success for enhancing productivity and quality.
- The problems faced by the factories and farmers are highly varied basing on geographical location and region wise therefore it is imperative that a committee to be constituted with representatives from all the stake holders to fix up time bound research program to develop remedial steps, if necessary the factories can participate and contribute if the results emanate in fixed time frames.
- The concerted actions on the part of all the stake holders will result in benefits to all and thereby contributes to prosperity of the nation.

1

Bihar

Views of SBI, Coimbatore:

Present scenario:

Sugarcane is an important cash crop of Bihar. Sugarcane is cultivated on about 2.7 lakh hectare area, which is subject to abiotic stresses like pre-monsoon drought, heat, salinity, alkalinity and water logging stresses combined with sub-optimal soil conditions, biotic stresses like red rot, wilt, shoot borer, root borer, white grub, top borer, stalk borer and plassey borer which generally limit its productivity. To overcome this vulnerable situation, plant breeders at SRI, Pusa and IISR, Research Centre, Motipur are constantly on the search of genotypes that impart resistance for an array of biotic and abiotic stresses. Hence varietal scheduling specific to each of these regions would help in attaining higher yields.

Figures of area, productivity and sugar recovery % (average of last 10 years, i.e. during 2001-02 – 2010-11) are presented in Table 1. During last 10 years, the area of sugarcane varied from 1.01 (2005-06) to 2.48 lakh hectares (2010-11) with an average of 1.25 lakh hectares. There is an increasing trend in area under sugarcane in the Bihar state. The present area under sugarcane is about 2.5 times of the area during 2005-06. Average cane yield of last 10 years was 43.26 t/ha and ranged from 35.8 t/ha (2007-08) to 51.4 t/ha (2010-11). Cane yield is also showing increasing trend since 2007-08. Mean sugar recovery % during last 10 years was 9.19% which ranged from 8.67% (2006-07) – 9.58% (2004-05).

Table 1. Area, productivity and sugar recovery % of Bihar state during last 10 years

Parameter	Area (000' ha)	Cane yield (t/ha)	Sugar recovery %
Average	124.5	43.26	9.19
Range	101 – 248 (2005-06) (2010-11)	35.8 – 51.4 (2007-08) (2010-11)	8.67 – 9.58 (2006-07) (2004-05)

Area under prominent varieties during 2009-10, 2010-11, 2011-12 is given in Table 2. Out of 45 varieties in cultivation during 2011-12, only four varieties, viz. BO 91, CoSe 92423, BO 110 and CoP 9206 covers more than 5 % sugarcane area in Bihar, the maximum (18.12%) being of BO 91. Ten other varieties occupy more than 2 % of sugarcane area.

Table 2. Variety wise area of sugarcane in Bihar (000' ha) during 2009-10 to 2011-12

S. No.	Variety	2009-10	2010-11	2011-12
1.	BO 91	57.476 (22.87)*	76.379 (24.51)	45.936 (18.12)
2.	CoSe 92423	6.700 (2.67)	8.805 (2.83)	30.035 (11.85)
3.	BO 110	19.331 (7.69)	16.937 (5.43)	16.984 (6.70)
4.	CoP 9206	14.382 (5.72)	12.408 (3.98)	13.991 (5.52)
5.	CoS 95255	8.457 (3.37)	9.293 (2.98)	12.368 (4.88)
6.	CoSe 95422	28.379 (11.29)	68.456 (21.96)	10.884 (4.29)
7.	CoSe 95427	0.013 (0.05)	0 (0)	10.224 (4.03)
8.	CoLk 8102	1.286 (0.51)	2.507 (0.80)	9.490 (3.74)
9.	BO 99	4.310 (1.71)	6.281 (2.02)	9.302 (3.67)
10.	BO 137	12.010 (4.78)	9.107 (2.92)	8.239 (3.25)
11.	CoS 8436	6.604 (2.63)	13.526 (4.34)	7.392 (2.92)
12.	UP 9530	6.550 (2.61)	7.268 (2.33)	7.355 (2.90)
13.	BO 128	2.364 (0.94)	4.554 (1.46)	7.088 (2.80)
14.	CoS 767	4.051 (1.61)	6.581 (2.11)	6.905 (2.72)
Others		79.396 (31.59) 28**	78.668 (25.24) 27**	57.308 (22.61) 31**
Total		251.312	311.663	253.502

*Figures in parenthesis indicates values in percentage

**Number of varieties in others category

Major problems:

1. Present sugarcane varieties possess high fibre % in cane in association with low cane yield and low sugar recovery
2. Slow replacement of old varieties
3. Lack of proper seed production and distribution system in sugarcane
4. Improper varietal balance – Low area under early maturing varieties (22% approximately during 2011-12)
5. Prevalence of early drought and late water logging conditions
6. Lack of sufficient irrigation facilities especially during pre-monsoon season

Prospects

Varietal evaluation trials are being conducted at private sugar mills in sub-tropical India including Bihar by the Indian Sugar Mills Association since 2007. Varieties evolved at SBI, Regional Centre, Karnal i.e. Co 97016, Co 98014 and Co 0238 have been evaluated at 4 sugar mills in ISMA trials. Performance of Co 98014 and Co 0238 is given in Table 3. Co 98014 showed 25.3% and 4.58% improvement in cane yield and pol % in cane, respectively over BO 130 in Bihar. Similarly, Co 0238 showed 30.70% and 6.78% improvement in cane yield and pol % in cane, respectively over BO 130 in Bihar.

Subsequently, Co 0118 and Co 0239 were also introduced in Bihar for conducting ISMA trials. Realising the better performance of these varieties the sugar mills have multiplied the seed and conducted demonstrations at factory and farmers' fields.

Table 3. Mean performance (2 plants & 1 ratoon) of Co varieties in ISMA trials

No. of test locations	Variety	Cane yield (t/ha)	% improvement over BO 130	Pol % in cane	% improvement over BO 130
4	Co 98014	79.20	25.32	12.34	4.58
	Co 0238	82.60	30.70	12.60	6.78
	BO 130	63.20	-	11.80	-

Demonstrations conducted in different mill areas (Sidhwalia, Majhauria and Hasanpur) in Bihar have also shown encouraging results of Co varieties in comparison with local varieties (Table 4 & 5).

Table 4. Performance of Co 0238 and Co 0239 in pit method of planting in Sidhwalia mill area

Variety	Cane yield (t/ha)		% improvement over CoS 8436		% improvement over CoJ 85	
	Pit method	Flat method	Pit method	Flat method	Pit method	Flat method
Co 0238	165.0	102.6	9.6	43.5	15.5	35.7
Co 0239	172.0	98.8	14.25	38.2	20.4	30.7
CoS 8436	150.6	71.5				
CoJ 85	142.8	75.6				

Table 5. Performance of Co 0238 at factory farms of Jai Shree Sugar Mills Ltd., Majhauria

Location	Area (ha)	Cane yield		Pol % in cane (December)	
		Plant	Ratoon	Plant	Ratoon
Auriaya Farm	0.4	130	132	12.0	12.4
Dudha Farm	0.6	100	87.5	11.8	12.1
Kesoban Farm	0.4	115	98	11.8	12.3
Total / Average	1.4	115.0	105.8	11.87	12.27

Twenty demonstrations of Co 0238 were also conducted at farmers' field in an area of 0.3 to 0.8 ha each during 2010-11 autumn season in Hasanpur Sugar Mill area. The total area of these demonstrations was 8.9 ha. Cane yield of Co 0238 varied from 100 t/ha (Baikhaya) to 187.5 t/ha (Jajrampur). The average cane yield of these 20 demonstrations was 125.2 t/ha (Singh et al., 2012).

Steps to improve cane yield and sugar recovery:

- ❑ Strengthening of sugarcane research activities: State department and sugar factory personnel were of the opinion that SRI, Pusa is not fulfilling the varietal requirements of the state. They were of the opinion that an autonomous sugarcane research centre may be established in the state.

It is suggested that the IISR Research Centre, Motipur may be strengthened to breed varieties which can grow well under early drought and late water logging situations prevailing over more than 60% sugarcane area in the state. Also, there is need to bring about changes in breeding strategies for reducing the fibre % and improve cane yield and juice quality atleast in lesser problematic (uplands) areas. High fibre is directly related with low juice extraction % whereas stalk diameter is positively associated with higher juice extraction %. Improvement in stalk diameter of sugarcane varieties might result in favourable changes in fibre % and juice extraction %, which would result in improvement in sugar recovery of sugar mills.

- ❑ Better performance of new Co varieties (Co 98014, Co 0118, Co 0238, Co 0239), developed at Sugarcane Breeding Institute, Regional Centre, Karnal (Haryana), in ISMA trials and at farmers' fields in the state provides scope for improvement in cane yield and sugar recovery. There is need to exploit the potential of these varieties in the state for the benefit of farmers and sugar mills.
- ❑ There is need to strengthen the seed production system in the state.

As per the Annual Plan for the year 2013-14 department of Sugarcane Industries, Bihar has planned to distribute certified seed (3087.50 lakhs), Foundation seed (105 lakhs) and Breeder seed (18 lakhs). Such categories of seeds did not exist during the current season. Source of Nucleus seed for producing Breeder seed was also not known. In the given situation it would be difficult to implement the Annual Plan during next season effectively.

Healthy seed production programme can be implemented either through MHAT treatment or through micro-propagation. On the basis of present area under sugarcane in

Bihar state, 150 ha area under MHAT treated seed will be sufficient in each of 3 zones of every sugar factory (on average area basis) to cover the entire sugarcane area under quality seed in a span of 3 years.

Tissue culture labs may be established in each sugar factory for faster multiplication of new varieties as well as healthy seed production. On average basis, a tissue culture lab with the capacity of producing 7000 plants per year will be sufficient cover the entire sugarcane plant crop area in 5 years.

- ❑ There is need to strengthen the extension activities in the state for desirable sugarcane development.

The problem of reducing the area under other varieties including rejected varieties (about 22.61 % during the year 2011-12), varietal balance, i.e. increasing area under early maturing varieties and faster replacement of old varieties with new high yielding varieties could be tackled by efficient extension activities in the state for desirable sugarcane development.

- ❑ SDF loans may be utilized for improving the irrigation facilities in the state.

Views of ISMA:

KEY FACTS ABOUT BIHAR SUGAR INDUSTRY

We tried to classify the complete Bihar sugarcane and sugar sector issues in three broad categories:-

1. Operational Efficiency issues

Total acreage reported on sugarcane plantation / sugarcane production/ sugarcane yield by state government and by central agriculture statistical department differs significantly. As per 2nd advance estimation by MoAg sugarcane production for 2012-13 is approx. 12.35 mln tonne while state cane commissioner department is projecting 17. 78 mln tonne of sugarcane for the season 2012-13. This clearly indicates lack of base data on the sugarcane acreage/ production/ yields.

Avg. number of sugarcane crushing days is about 113 with 55, 000 tcd operational capacity running during last three crushing seasons. Last year, Bihar sugar mills crushed 4.5 million tonne of sugarcane during their 100 days of operations and this is not even 40% drawl% of sugarcane to sugar mills (moreover, as per state government this drawl % is not even 30%). And this is also true in area where Bihar state has maximum density of sugar mills i.e. West Chaparan- where it has more than 7 mln tonne of sugarcane production but couldn't able to crush even 3 mln tonne during season. This clearly implies the lack of infrastructural facilities either at state level or at farmers' level to supply their sugarcane to mills.

With operational crushing capacity of 55,000 tcd , Bihar state could able to crush not even more than 7 mln tonne of sugarcane against their current production of more than 12-15 mln tonne of sugarcane. This implies the bad capacity utilization of installed mills along with lack of facilities to farmers to supply their sugarcane

2. Sugarcane Cultivation issues

More than 90% sugarcane cultivation is confined to North West part of Bihar i.e. in the districts like West Champarna, East Champaran, Gopal Ganj and Sitamari distt. However, potential of growing sugarcane crop is across the state (Agro-climatic wise and soil condition wise) but in past, sugarcane factories which were widely spread over state were closed. This closure of sugar mills actually left no option in front of farmers, but to take their sugarcane crop either to their own gur units or for some other purpose. Bihar and Eastern Uttar Pradesh have been kept under North Central zones, due to similarity on soil conditions/agro-climatic / cultivation practices. This zone has similar cultivation issues, but irrigation is the major constraint in Bihar state, which is due to lack of land consolidation at one place/ more segregated land parcels/more prone to flooding issues and lack of water drainage options. This actually hold the sugarcane development programs in the state.

State has HYV of sugarcane for their local needs, but multiplication and its propagation is solely depends upon the state sugar mills. No research and development department/ Institutes extends their help in disseminating the information on HYV/ seed multiplication/ variety releases etc

Major a-biotic factors which actually putting constraints in sugarcane development in the state are issues like flooding/ water drainage/ siltation/ soil conditions etc. Actually, if these issues are sorted out in a prima- facia, then most of the issues can be sorted out with ease.

3. Single window knowledge centre issues

Lack of nodal agency/ knowledge centre/ Institute/ autonomous body to support the specific needs of the farmers in the state, which suggest farmers on varieties availability , suitable intercultural operational practices, seed multiplication, disease management , post-harvest management practices etc

SUGGESTIVE STEPS IN IMPROVISING THE CURRENT SITUATION:-

To address the state issues, ISMA is suggesting couple of way forwards in terms of three tier strategy:-

SHORT TERM STRATEGY – (6 months – 1 yr perspective)

- a) First of all, to address the issues we need to have correct data base. ISMA is suggesting to take up the independent study on data set collection on actual acreage, production, productivity, land topography, soil conditions etc for move forward. So that real issues can be put forth for over –all improvement of sugarcane / sugar sector in the state.
- b) After interacting at Institute/ Govt./ Industry level , ISMA found that ,prime focus is to improve the utilization of current sugarcane drawl % to the mills. Currently, state is almost producing same quantum of Gur as it is producing sugar on y-o-y basis.

Basically, sugarcane has been grown across the state but over the years certain mills closed and farmers had no choice of supplying sugarcane to mills rather shift to produce their own Gur at very local level for their self-consumption.

Actually, such practice is not economically sound for farmers for their long term sustainability. So state govt. either should encourage new investors or existing entrepreneurs to spread their reach to these areas (in terms of setting up new ventures or bringing such cane to their fold) or do commercialization of Gur units in that area.

MEDIUM TERM STRATEGY – (1 yr – 3 yr perspective)

- c) Seed Multiplication Programme of existing varieties by rope-in external bodies like SBI, Coimbatore, ISMA sugarcane development programme s etc
- d) Cull-out only 4-5 HYV and do promotions/ propagation through state govt. / Industry machinery
- e) Subsidized the soil health kits to sugarcane farmers through SDF loans

LONG TERM STRATEGY – (3 yr – 6 yr perspective)

- f) Establishment of autonomous state level institute for releasing and multiplying new HYV seeds
- g) Make this autonomous body/ establishing research Institute with representation from Institute/ Govt/ Industry / progressive farmers
- h) Major issue of the area is related with Infrastructural issues like- flooding, drought, siltation etc. All efforts done on HYV varieties will be washed –off if these issues ignored. To address such infrastructural state level issues either SDF funds or state level funds should be apportioned. In future, SDF fund allocation should only be confined to infrastructural projects with special attention to irrigation

WAY FORWARDS:-

Circulate the time bound strategy to all the stake holders for their comments and freeze on the same to move ahead To monitor the progress on regular basis of the suggested strategy, we propose to constitute a group of representatives from state govt. / state level Industry/ state level Institute for Bihar, to appraise the situation on time bound manner. This group shall meet on every quarter to build consensus and forward their request to central level body to extend their support on it.

Views of STAI:

1. Cane area survey is on visual basis which needs to be changed to scientific approach such as satellite.
2. Cane yields are different given by SASA through cropping cutting method. According to their figures it is 69.72 MT per Ha, whereas industry and farmers put it at 40 MT/Ha.
3. Recovery at 9.24% which is arithmetic average of all the factories. Industry view is that, if two factories crushing are too low recovery is not considered, and average is 9.45%.
4. In totality, to improve sugarcane yield and recovery % cane, the opinion of Government (Cane Department) Research (Pusa Institute) and Agricultural Universities and Different sugar Mills of Bihar is as follows:

i) **Irrigation:**

- a. Drought: During summers i.e. April, May June, there is drought condition as surface irrigation through canals are not available. Bore wells and tube wells are insufficient and wherever they are there, they are not functional. Therefore, cane crop suffers enormously on account of drought. Initial phase of the crop, i.e. during tillering phase, the crops get damaged because of shortage of water.
- b. Drainage & water logging: After monsoon sets in majority of sugar mill cane areas are inundated with flood waters and water logging conditions prevail. Sugarcane crop suffers heavily because of continued water stagnation of the fields.

There is no drainage for water to flow out of fields. Everyone who participated in the discussions felt that irrigation during summer and drainage during monsoon is the most significant factor affecting sugar cane yield and quality in the State.

- (ii) Second factor, which is affecting the production of sugarcane according to all three segments, i.e. Government, Research and Industry, is shortage of good sugarcane varieties. This is a serious issue with large number of varieties in cultivation which are poor in yield and quality. The varieties in each factory zone are to the tune of 40 – 50 numbers. Every participant agreed that there should not be more than 2-3 varieties in a factory zone. Recently developed good varieties like Co 238, Co 239 and Co 118 are recognized as potential for increasing on an average cane yield by 10 – 15 Ton/Ha. and recovery by 1%. They are unable to envisage how this can be implemented as there is no varietal development programme formulated either by the State Cane Department or by Research Institutes. Some sugar mills are making efforts but it requires policy and financial support. Policies for introduction of new varieties and rejection of unwanted varieties need to be formulated.
- (iii) Strengthening of research by Independent research institute in PPP model

- (iv) Other issues discussed are:
- a. Post-harvest losses are third most important factor. There is shortage of harvesting labour and transport facilities. There is definitely need to improve mechanization of sugarcane agriculture.
 - b. Decrease in area of autumn sowing of sugar cane is a matter of concern
 - c. Nuisance of animals eating away sugarcane crop
 - d. Inter-cropping sugarcane with other crops.

Views of Sugar Mills'

Presentation by: HARINAGAR SUGAR MILLS LTD. HARINAGAR

01. To study/analyse factors restricting sugarcane productivity/ sugar recovery in the country in each major sugarcane & sugar producing States/Potential State.

- i) Lack of irrigational facilities
- ii) Water logging
- iii) Lack of drainage
- iv) Dearth of high yielding and high sugared varieties
- v) Soil is deficient in organic matter content. In most of the cases it is below 0.5%.
- vi) Deficiency of Micronutrients in the soil.

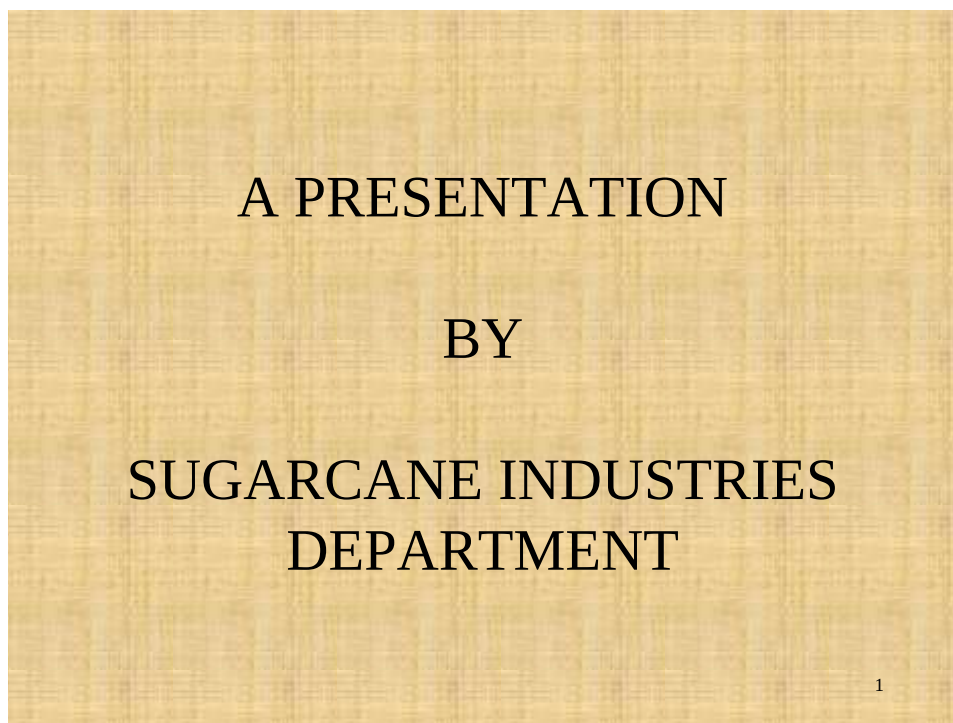
02. To come up with short term and long term recommendations, with actionable plan which are implementation in immediate future to improve the sugarcane productivity and sugar recovery in the country.

- i) For improvement in the productivity of the land, green manuring by using Dhaincha/Sun hemp is a very important component. This will improve the texture and structure of the soil.
- ii) Selection of high yielding and high sugared varieties for rapid multiplication.
- iii) Contour survey of each sugar factory area should be undertaken to implement drainage system.
- iv) Large No. of small borings should be sunk in the farmers' field under the subsidy scheme sponsored by the State Government.
- v) Proper repair and maintenance of all canals namely, Don, Triveni and Tirhut may be undertaken by the State Government and water holding capacity of canals can be increased by de-silting in phases.
- vi) Continuous electric supply should be ensured so that farmers may irrigate their fields using electric power since irrigation by using diesel is cost prohibitive.
- vii) Paired row trench method of planting - row to row distance 4'.
- viii) Suitable inter-crop which does not affect the yield of sugarcane crop may also be popularized between rows of sugarcane crop.
- ix) Sugarcane breeding programme needs to be strengthened for releasing high sugar, high yielding and disease resistant varieties.
- x) Modern Agricultural Extension Technique needs to be popularized in the farmers' field.
- xi) Mechanization of sugarcane farming such as Cane Loader, Two row tractor drawn Trencher cum Cutter Planter, Mini Cane Harvester, Tractor mounted Sprayer etc.
- xii) Strengthening and expansion of Bio-composting project.
- xiii) Strengthening and expansion of Vermi-compost project.
- xiv) Strengthening and expansion of Bio-fertilizer Lab.
- xv) Strengthening and expansion of Tissue Culture Lab.

- xvi) Strengthening and expansion of Soil Testing Lab.
- xvii) Post harvest cane area survey by GPS System.
- xviii) Satellite mapping of acreage of sugarcane crop in the reserved area of each sugar factory.
- xix) Subsidy for adoption of drip irrigation should also be extended to the sugarcane seed farms.
- xx) Following low recovery and diseased cane varieties should be withdrawn by the Government-
 - a) COSE 92423
 - b) COSE 95422
 - c) COLK 8102
 - d) COS 91269
 - e) B0 147
 - f) B0 56
 - g) B0 76
 - h) B0 128

Views of Cane Commissioner Office:

Presentation:





STATUS OF SUGARCANE IN INDIA

State	Area in lakh hectare (2011-12)
Bihar	2.54
Tamil Nadu	3.82
Uttar Pradesh	21.62
Maharashtra	10.22
Gujrat	2.02
Karnatka	4.30
All India	50.87

STATUS OF SUGARCANE IN INDIA (Contd...)	
State	Production in lakh MT (2011-12)
Bihar	177.47
Tamil Nadu	392.84
Uttar Pradesh	1288.19
Maharashtra	818.59
Gujrat	141.77
Karnatka	388.08
All India	3576.67

STATUS OF SUGARCANE IN INDIA (Contd...)	
State	Productivity in MT/hect (2011-12)
Bihar	69.72
Tamil Nadu	102.78
Uttar Pradesh	59.58
Maharashtra	80.09
Gujrat	70.18
Karnatka	90.25
All India	70.31

STATUS OF SUGAR PRODUCTION IN INDIA

State	Production in lakh tonnes (2011-12)
Bihar	4.51
Tamil Nadu	17.94
Uttar Pradesh	69.58
Maharashtra	89.96
Gujrat	10.02
Karnatka	37.57
All India	255.76

STATUS OF YEARWISE SUGARCANE AREA, PRODUCTION AND PRODUCTIVITY IN BIHAR

Year	Area (in lakh hec)	Production (in Lakh MT Ton)	Productivity (in Ton/hect)
2005&06	2-30	129-50	53-20
2009&10	2-51	119-24	47-45
2010&11	2-49	134-14	53-35
2011&12	2-54	177-46	69-72
2012&13	2-92	209-89	73-00 (Estd.)
2013&14 (Estd.)	3-22	252-19	80-00
2011&12 (All India)	50-87	3576-00	70-31

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STATUS OF YEARWISE SUGARCANE CRUSH, SUGAR PRODUCTION AND RECOVERY PERCENTAGE IN BIHAR

Year	Total Cane Crush (in lakh qtls)	Sugar Production (in Lakh qtls)	Recovery Percentage (in %)
2005&06	452-20	42-20	9-49
2009&10	272-34	26-71	9-81
2010&11	414-06	38-50	9-30
2011&12	488-30	45-10	9-24
2012&13 (Estd.)	600-00	55-20	9-20

HISTORY OF SUGAR INDUSTRY IN BIHAR

- Sugar Mills established between 1904-40 33
- Operative Sugar Mills till 1980's 28
- Number of Operational Sugar Mills
- A. Private Sector 09
- B. Public Sector 02
- BSSCL Units under revival (Motipur, Rayam & Lohat) 03
- BSSCL Units to be leased for other Industrial Purpose 03
- (Bihta, Sakri & Samastipur)
- Closed Mills 16
 - Private Sector 01 (Motihari)
 - Bihar State Sugar Corpn. 07 [Hathua (with distillery),
Siwan, New Sawan, Goraul
Banmankhi, Warishliganj &
Goraru]
 - BIC Group 03 (Chakia, Chanpatia &
Marhowrah)

**COMPARATIVE CRUSHING CAPACITY AND PRESENT NORMAL
CANE REQUIREMENT OF SUGAR MILLS OF BIHAR**

Name of the Sugar Mill	Crushing Capacity in 2004-05	Present Crushing Capacity (2012-13) (In TCD)	Normal Cane Requirement (NCR) (2012-13) (In lac Qnt.)
Bagha	2500 TCD	5000 TCD	84.88
Harinagar	7500 TCD	10000 TCD	138.16
Narkatiyaganj	5000 TCD	7500 TCD	92.50
Manjhaulia	3500 TCD	5000 TCD	60.00
Gopalganj	3500 TCD	5000 TCD	70.46
Sidhwalia	2500 TCD	5000 TCD	64.37
Sasamusa	2450 TCD	2500 TCD	33.56
Riga	3500 TCD	5000 TCD	61.90
Hasanpur	1750 TCD	3000 TCD	37.98
Sugauli	Closed	3500 TCD	28.70
Lauriya	Closed	3500 TCD	25.65
Total :	32200 TCD	55000 TCD	698.16
The Crushing Capacity of Bihar Sugar Mills has increased from 32200 TCD in 2004-05 to 55000 TCD in 2011-12.			

**Major Sugarcane Growing District wise Sugarcane
Cultivation Status in Bihar**

District Name	Area in Lakh Hectare, Production in Lakh MT and Productivity in MT/hectare								
	Area (2010-11)	Area (2011-12)	Area (2012-13)	Production 2010-11	Production 2011-12	Production 2012-13 (estd)	Productivity 2010-11	Productivity 2011-12	Productivity 2012-13 (estd)
W. Champaran	1.25	1.22	1.47	69.08	82.04	102.79	54.80	66.73	69.74
E. Champaran	0.16	0.21	0.23	8.59	11.25	12.54	52.35	51.80	53.55
Gopalganj	0.30	0.22	0.28	17.65	15.52	20.08	57.35	68.18	70.39
Sitamarhi	0.14	0.21	0.18	7.45	24.17	21.12	51.85	88.99	90.10
Seohar	0.03	0.033	0.032	1.60	1.50	2.71	50.65	83.56	82.55
Samastipur	0.05	0.065	0.08	2.86	4.40	5.49	57.00	67.56	68.46
Begusarai	0.06	0.070	0.088	3.62	5.91	7.86	57.65	84.20	81.97

Sugarcane Cultivation

•Planting-

**Autumn Planting (Oct-Nov)

**Spring Planting (Feb-Mar)

Common High Yielding Varieties-

COP-9301, COS-88230, COS-96268, COS-8436, COS-767, CO-0118, CO-0238, Co-0239, CoS-8432, Co Pant-98224, CO Pant-97222, COLK-94184, COJ-64, BO-139, COS-7250, COSE-61434, COJ-85, COJ-88, COSE-98231, CO-98014, COSE-3234, UP-9530, CO-233, CO-232

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Constraint in Higher Productivity and Recovery in Sugarcane

- Lack of suitable HYV varieties as per need.
- Lack of identified Breeder seed as per need.
- Lack of irrigation facility specially during the summer season.
- Proper drainage facility.
- Imbalance use of fertilizer.
- Agriculture labour shortage for agricultural operation.
- Poor research strategy.
- Long duration between harvesting and crushing.
- Lack of adoption of proper Post Harvest Technology.
- Poor Ratoon Management.
- Poor Crop Management.
- Lack of trained extension functionaries.

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Initiative taken for higher productivity and recovery

1. Schemes for Sugarcane development-

(a) Mukhyamantri Ganna Vikas Yojna- Cost-35.325 Crores.

Major Component-

- * 3-tier seed production programme.
- * Distribution of HYV varieties on subsidy.
- * Use of Bio-fertilizer.
- * Identification of suitable varieties from out of State and their multiplication.
- * Plantation under SRI/Trench/Ring-pit methods.
- * Production of Breeder Seed in association with IISR, Lucknow.

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(b) Intercropping of Oil seed, Pulses, Vegetables and Spices with Sugarcane- Cost-10.995 Crores.

- * Proper utilization of space between the two rows.
- * Extra income generation for the farmers.
- * Proper utilization of inputs by the main crops.

(c) Post Harvest Technology.

- * Maintenance of harvesting schedule as per maturity.
- * Providing roads for quick transportation system.
- * Improving milling efficiency with new technology.
- * Discouraging growing of non-recommended varieties.

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Initiatives taken by the allied departments

- * Irrigation by canal from the month of April to June- Irrigation Department.
- * Drainage- Irrigation Department.
- * State Tube wells- Minor Irrigation
 - ** 449 closed state tube wells in Sugarcane growing area.
 - ** Out of which 181 under renovation which will be completed in the month of March, 2013.
 - ** Renovation of rest 329 tube wells is under consideration.
 - ** Program for handing over State tube wells to the sugar mills in Sugarcane growing districts.
- ** Drip Irrigation Scheme- Agriculture Department is going to proposed under RKVY (2013-14).

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Major Initiatives Required

A. * Mechanization of Sugarcane production-

- ** Use of planting implements.
- ** Use of interculturing implements.
- ** Use of harvester.
- ** Use of loader.

B. * Establishment/Take over of existing Sugarcane Research Institute as autonomous institution under control of Sugarcane Industries Department.

- * * PPP mode like Vasant Dada Patil Sugarcane Research Institute, Maharashtra and Saharanpur Sugarcane Research Institute, Uttar Pradesh.

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C. Computerization of sugar mills from crop survey to processing for minute-to-minute supervision to check recovery loss.

D. Incentive for higher productivity of sugarcane.

E. Establishment of sugarcane implements banks in all working sugarcane mills.

F. Diesel subsidy for all sugarcane growers.

G. Subsidized private tube wells.

H. Enhancement of drainage system.

Strategies for Sugarcane Development Programs 2013-14

- Sugarcane seed distribution on subsidy – 16.25 lakh qtls.
- Incentive on production of F/S – 700 hec.
- Identification of suitable varieties from out of State and their multiplication
- Training of labourers for wide spacing planting.
- Adaptive trail of new identified varieties.
- Breeder seed production.
- Distribution of non-sugarcane seed for intercropping.

- Diesel subsidy for irrigation during summer season.
- Transfer of technology.

Proposed programs for Sugarcane Development under RKVY

- Establishment of five sugarcane specialized implements bank in five sugar mills @ cost of Rs. 5 crores each for benefits of small and marginal farmers.
- Drip irrigation facility for sugar mills/private sugarcane growers.
- Breeder and Foundation Seed Production.
- Micro nutrients.

Gujarat

Views of SBI, Coimbatore:

Sugarcane is an important cash crop of Gujarat. Sugarcane is cultivated on about 1.6 lakh hectare area, which is subjected to abiotic and biotic stresses, which generally limit its productivity. The average cane productivity in the state is around 65 t/ha. There has been decreasing trends in productivity since 2007-08 and in area since 2008-09.

Major problems:

- ☐ Lack of suitable high yielding and better juice quality varieties.
- ☐ Burning of canes before harvesting and then crushing in 10-12 days.
- ☐ Lack of proper seed production and distribution system in sugarcane.
- ☐ Slow replacement of old varieties.
- ☐ High cost of production of sugarcane.

Steps to improve cane yield and sugar recovery:

- ☐ There is need to develop varieties with high yields and better quality varieties.
- ☐ Many new improved varieties have been released in the peninsular zone to replace old and poor quality varieties. Better performing new varieties will provide scope for improvement in cane yield and sugar recovery. There is need to exploit the potential of these varieties by faster seed multiplication in the state for the benefit of farmers and sugar mills.
- ☐ There is need to strengthen the seed production system in the state for maintaining the potential of old varieties and faster multiplication of new varieties.
- ☐ Mechanization of sugarcane cultivation including harvesting needs to be popularized in order to solve the problem of labour shortage, burning of canes and to reduce the cost of production.
- ☐ Incentive on drip irrigation is suggested for efficient use of water resources.

Views of ISMA:

1. Operational Efficiency issues

- ☐ Total 24 installed sugar mills (with 75,650 tcd capacity), while only 19 sugar mills are operational (66,900 tcd operational), with 17 cooperative mills & 2 private mills. Total 107 lac tonnes sugarcane crush with an average 155 days of cane crushing period. State having 75% of avg. drawl out of total average of 142 lac tonnes of cane production. Cane diversion also happen in Gur & Khandasari which majorly confined to Bharuch district.
- ☐ The total capacity to crush is 103 lac tonnes by mills; it signifies the 103% of operational efficiency in state sugar mills.
- ☐ State sugar mills have only 9 Ethanol producers with 271 KL per day installed capacity & there is no cogen unit installed in any mill. Therefore ample opportunity of by-products in available in state.

2. Sugarcane Cultivation issues

a) Soil issues.

State having major sugarcane – paddy crop rotation, which makes the excess use of water & due to this salinity, occurs in the soil.

b) Seed issues.

Sugarcane varietal planting of Early: Mid: Late season spread like 65%:30%:5% respectively & maximum farmer's goes with Co 86032 in early category, but this variety actually is recommended for mid late planting.

c) Water/irrigation issues.

Over irrigation by canals on sugarcane crop make the loss of nutrient content from upper layer of soil. Excess moisture creates the water logging problem in soil.

d) Crop management issues.

- ☐ Due to labour shortage farmers are burning cane to make harvesting easy.
- ☐ 50% - 70% farmers go for cane burning at harvesting time which leads to the loss of recovery from 0.5% -1%. Burnt cane should be crushed within 12hr. (which is not presently happening) and that leads to bacterial contamination & further reduces the sugar content.
- ☐ Continuous sugarcane planting in the same fields leads to soil deterioration, insect pest & diseases infestation.
- ☐ Less use of organic manure.

3. Research & Development issues.

No such good varieties are there which perform better in water logging condition. Tissue culture facility has to be improvised.

SUGGESTIVE STEPS IN IMPROVISING THE CURRENT SITUATION:-

To address the state issues, ISMA is suggesting couple of way forwards in terms of two tier strategy:-

SHORT TERM STRATEGY – (6 months – 1 yr)

1. Crop rotation and intercropping should be adopted in cane to improve the soil health or generate the farm income.
2. Mechanized harvesting / sugarcane planting should be used / promoted to stop the cane burning by farmers..
3. Reclamation of saline soil through use of gypsum.
4. Organic & vermi compost units encouraged by farmers through mills.
5. Encouraging use of quality seed material of new improved variety.
6. Proper ratoon (which is 40% area presently) management technique should be adopted to improve the recovery (ratoon yield is presently 25% lesser than the plant yield)
7. Enhancement of drip irrigation system in cane fields, so the proper water utilization can be done in water scare region.
8. Promote the farmer's education awareness programme regarding the sugarcane variety, soil health, insect pest & disease management.

MEDIUM TERM STRATEGY – (1 yr – 3 yr)

1. Timely introduction of sugar rich variety which is suitable to climate & disease pest resistant

- with having optimum level of fiber for cogen.
2. Subsidized the soil health kits, mobile boot van to sugarcane farmers through SDF loans.
 3. Adopt different crop rotation or take the less water consuming crop in every season to improve the soil health.
 4. Adopting the Tissue culture concept for developing the good sugar rich varieties.
 5. Promote seed farm concept in the state either providing subsidy to farmers or by the sugar mills.

Haryana

View of SBI, Coimbatore:

Sugarcane is an important cash crop of Haryana. Sugarcane is cultivated on about 1.1 lakh hectare area, which is subject to abiotic stresses like pre-monsoon drought, heat, low temperature, salinity and alkalinity stresses, biotic stresses like red rot, wilt, shoot borer, root borer, white grub, top borer and stalk borer which generally limit its productivity. The average cane productivity in the state is around 73 t/ha.

Major problems:

- ☐ Non availability of sufficient labourers for sugarcane cultivation
- ☐ Problem in recommendation of varieties released by CVRC
- ☐ Lack of proper seed production and distribution system in sugarcane
- ☐ High cost of production of sugarcane
- ☐ Prevalence of abiotic (drought and low temperature) and biotic stresses (diseases and insect pests)
- ☐ Stiff competition from other crops like wheat and rice because of better marketing for wheat and rice in the state
- ☐ Late planting of sugarcane (60%) after harvest of wheat resulting in low yield and sugar recovery

Steps to improve cane yield and sugar recovery:

- ☐ Mechanization of sugarcane cultivation from planting to harvesting. Grants may be given for purchasing 1 or 2 sugarcane harvesters in the state.
- ☐ Area under better performing new Co varieties (Co 0118, Co 0238, Co 0239), developed at Sugarcane Breeding Institute, Regional Centre, Karnal (Haryana) may be increased in the state which will provide scope for improvement in cane yield and sugar recovery.
- ☐ There is need to have strong seed production programme which sustain the health and vigour of a variety is needed for each mill.

Healthy seed production programme can be implemented either through MHAT treatment or through micro-propagation. On the basis of present area under sugarcane in Haryana state, 40 ha area under MHAT treated seed will be sufficient in each of 3 zones of each sugar factory (on average area basis) to cover the entire sugarcane area under quality seed in a span of 3 years. A few farmers may be identified in each village as seed growers by providing sufficient incentives for encouragement.

One more tissue culture lab may be established in the state for faster multiplication of new varieties as well as healthy seed production.

- ☐ Area under autumn planting may be increased with intercrop by giving incentives to the farmers. It will help in reducing the area under late/summer planting.
- ☐ Efforts should be made to increase the area under early maturing varieties.
- ☐ Simultaneous planting of wheat and sugarcane needs to be encouraged. Spaced Transplanting Method (STP) may be promoted under summer planting to compensate the yield loss.
- ☐ Strong research and development units at each factory.
- ☐ Drip irrigation and pit method of planting may be encouraged.
- ☐ Some of the activities / agricultural operations of sugarcane cultivation (especially harvesting) may be brought under MNREGS.

Views of ISMA:**1. Operational Efficiency issues**

- ❑ State having total installed 16 sugar mills and out of that 14 sugar mills are operational in last 3 years. The installed tcd is 50000 in which only 46000 tcd is under working in last three years. Total average sugarcane crush is 47 lac tonnes with an average 115 days period of crushing.
- ❑ State having average 75 lac tonnes of sugarcane production out of that 47 lac tonnes goes in crush by sugar mills, 15 lac tonnes in Gur & khandsari , 3-5 lac tonnes in seed & other purpose & the rest cane slippage happens to neighboring district of UP.
- ❑ Disparity in sugarcane prices among Haryana and UP prompt sugarcane slippage. Actually, rejected variety prices of sugarcane in Uttar Pradesh are equal to the Haryana premium variety prices of sugarcane.
- ❑ Total sugarcane crush is 47 lac tonnes with the total tcd is 52 lac tonnes. So there is 90% operational efficiency comes from the mills, but if we have to increase the operational efficiency from the current level then we should focus more on increasing the cane acreage, increase the yield, stop the slippage & minimize the diversion of cane to Gur & Khandsari.
- ❑ Reported recovery is lower in Haryana, due to old machinery and installations in cooperative sector mills.
- ❑ State sugar mills only have 5 installed cogen plant (only 1/3rd) with an electricity generation of 45MW. This is huge operational inefficiency, because apart from sugar production the mills are not utilizing the byproduct fully.

2. Sugarcane Cultivation issues

- ❑ More than 50% sugarcane cultivation is confined to the districts like Yamunanagar, Ambala, Kurukshetra, Karnal & Panipat. Last 4 years, the sugarcane acreage is increasing in the state.
- ❑ Varietal mix is not consistent with economic length of crushing season, as the mix is 1:5:1 ratio in Early:Mid:Late respectively, but there are few district i.e Karnal, Panipat & Assandh where the sugarcane planting is in 3:4:3 ratio.
- ❑ Cooperative sugar mills have low recover% because of varieties like CoH 119 which covers maximum area under cane cultivation.
- ❑ Other prominent issue in sugarcane cultivation like- Autumn planting is less, location based varieties are not promoted, labour stress problem, less of extension activities in sugarcane plantation & there is some low lying area in Yamunanagar where the cane crop get affected by flood are the major constraints in sugarcane cultivation.
- ❑ Diversification of cropping system is reducing the area under sugarcane, as the farmers prefer to grow short duration crops with better remuneration.
- ❑ Absenteeism of the farmers to field, which force farmers to go with 5 year plantation crops like popular & other tree plantation

3. Research & Development issues

- ❑ Seed multiplication centre will be set from state government initiative, so that the farmers easily can assessable to HYV seeds.

SUGGESTIVE STEPS IN IMPROVISING THE CURRENT SITUATION:-

To address the state issues, ISMA is suggesting couple of way forwards in terms of three tier strategy:-

SHORT TERM STRATEGY – (6 months – 1 yr perspective)

1. Seasonal plantation balance should be in 3:4:3 ratio of Early: Mid: Late respectively.
2. Increase the drawl from 63% to 80% by stopping the slippage of sugarcane & additionally stop the cane which goes to Gur production as the state producing 1.2 lac tonnes of Gur by crushing 15 -18 lac tonnes of cane.
3. To have correct data base ISMA is suggesting taking up the independent study on data set collection on the yield, actual acreage, production, productivity, land topography, soil conditions etc for move forward. So that real issues can be put forth for over –all improvement of sugarcane / sugar sector in the state..
4. Preparation of soil health maps for state so judicious use of inputs can be done.

MEDIUM TERM STRATEGY – (1 yr – 3 yr perspective)

1. Cull-out only 4-5 HYV and do promotions/ propagation through state govt. / Industry machinery, varieties like CoH 128, CoH152, CoH 160 should be promoted as having good yield & good sucrose.
2. Subsidized the soil health kits, mobile boot van to sugarcane farmers through SDF loans.
3. Mechanization at sugarcane field level with using modern technology.
4. Promote Cogen & Ethanol production.
5. Promote local entrepreneur-ship for promoting mechanization at sugarcane field level.
6. Promote seed farm concept in the state by either providing subsidy to farmers or by the sugar mills for faster dissemination of HYV seed in the state.

LONG TERM STRATEGY – (3 yr – 6 yr perspective)

1. Establishment of autonomous state level institute for releasing and multiplying new HYV seeds.
2. Releasing new HYV for the state.

WAY FORWARDS:-

- ❑ Strategies are to be build up for enhancing the area under sugarcane because the state has the potential to mark itself as best in wheat & Paddy.
- ❑ Timely monitoring the progress of the sugarcane varieties with best working in particular area & strategically implementing the work with state govt/ state level cane development bodies. To appraise the situation on timely interval. This group shall meet on every quarter to build consensus and forward their request to central level body to extend their support on it.

Karnataka

Views of SBI, Coimbatore:

Sugarcane is an important cash crop of Karnataka. Sugarcane is cultivated on about 5 lakh hectare area, which is subject to water stress, which generally limits its productivity. The average cane productivity in the state is around 95 t/ha. There is decreasing trend in productivity since 2009-10.

Major problems:

- ☐ Pre-dominance of old varieties, e.g. Co 62175 in southern Karnataka
- ☐ Lack of proper seed production and distribution system in sugarcane
- ☐ Slow replacement of old varieties
- ☐ High cost of production of sugarcane
- ☐ Non-availability of labour and high cost of harvesting
- ☐ Water stress

Steps to improve cane yield and sugar recovery:

- ☐ There is need to replace the poor quality varieties, e.g. Co 62175 in southern Karnataka. Many new improved varieties have been released in the peninsular zone to replace old and poor quality varieties.
- ☐ Better performing new varieties (Co 99004, Co 2001-15, Co 0218) will provide scope for improvement in cane yield and sugar recovery. There is need to exploit the potential of these varieties by faster seed multiplication in the state for the benefit of farmers and sugar mills.
- ☐ There is need to strengthen the seed production system in the state for maintaining the potential of varieties like Co 86032, CoC 671 etc and faster multiplication of new varieties.
- ☐ Mechanization of sugarcane cultivation including harvesting needs to be popularized in order to solve the problem of labour shortage and to reduce the cost of production.
- ☐ Incentive on drip irrigation is suggested for efficient use of water resources.

Views of ISMA:

1. Operational Efficiency issues

- ☐ Total 72 installed sugar mills (with 3.10 lac tcd capacity), while only 59 sugar mills are operational from last 3 years (2.70 lac tcd operational), with 14 cooperative mills (with 44000 tcd) & 58 private mills (with 2,66,000 tcd).
- ☐ Total 227 lac tons of average sugarcane crush with an average 142 days of cane crushing period. State having 81% of avg. drawl out of total average of 280 lac tons of cane production.
- ☐ The total capacity to crush is 383 lac tons by mills, it signifies the 60% of operational efficiency in state sugar mills.
- ☐ State sugar mills have only 19 Ethanol producers with 902 KL per day installed capacity & 39 cogen unit with 553MW in season & 418MW in offseason production. By-products generation have good scope in state.

2. Sugarcane Cultivation issues

a) Soil issues

- ☐ Soil reclamation is not proper in sugarcane- paddy grown area.
- ☐ State soils are saline, alkaline & acidic in nature.
- ☐ At some places sandy soils are also available which needs more irrigation.
- ☐ Fertility level of soil also deteriorating with same kind of package of practices.

b) Seed issues.

- ☐ Production of breeder & foundation seeds are confined to the research station & some R&D centre of sugar mills in state, so large gap between the utilization of seeds for commercial cultivation.
- ☐ Seed of improved varieties are not available at farmers' field level nearby location, as it should be available within 15 -20km of farmer's field.

c) Water/irrigation issues.

- ☐ During rainy season flood occurred in some areas of cane which make the loss of upper layer of soil & crop also, but to overcome this loss crop practices like drainage of stagnate water, gap filling, foliar spray of nutrient etc has to be adopted.

d) Crop management issues.

- ☐ High cost of cultivation, high labour cost, labour scarcity, hampering the adoption of new improved management practices in sugarcane.
- ☐ At fag end of crushing the mills reported to have sharp decline in recovery %, due to high temperature which favors the fast deterioration of harvested cane.
- ☐ Recovery% more in North West of Karnataka (10.5%) while yields are more in south of Karnataka (100 tons/hac average), due to different agro-climatic conditions and varieties at respective zones.
- ☐ Ratoon covers 60% of area in state & no proper management practices is followed to improve the yield of ratoon.
- ☐ No improved package of practices in sugarcane like wider spacing, deep ploughing has been practiced.
- ☐ Early shoot borer, inter nodal borers, whitefly are the major insect pest in the state. Iron deficiency is very common in most of the area.

3. Research & Development issues.

- ☐ Limited seed multiplication & location specific varietal development activities are lacking.
- ☐ Lack of INM & weed management practices training programme.

SUGGESTIVE STEPS IN IMPROVISING THE CURRENT SITUATION:

To address the state issues, ISMA is suggesting couple of way forwards in terms of two tier strategy:-

SHORT TERM STRATEGY – (6 months – 1 yr)

1. For improving the recovery%, minimize the post-harvest losses by way of reducing cut to crush period, proper harvesting & transportation, de-trashing, avoiding green top & roots

during crushing.

2. Tissue culture is effective in fast multiplication of newly released sugarcane varieties.
3. In early & fag end crushing it's ideal to grow more sugar rich varieties which performing good these are CoC 671, Co 94012, Co 86032, Co 92020 & Co91010.
4. Industry research institute interface programme for crop awareness should be introduced & promote the farmer's education regarding the new sugarcane variety, soil health, insect pest & disease management.
5. Encourage wider spacing with drip irrigation system for saving of water & better productivity.
6. Adoption of moisture stress management practices, early planting in drought prone area, application of organic manure needed to sustain sugarcane production in state.
7. Crop rotation and intercropping should be adopt in cane to maintain the sustainable development of farmer's income & farm yield.
8. For better ratoon management trash mulching, timely application of fertilizer, harvesting at soil level all enhance good ratoon.
9. Regular training programme for factory cane development & farmer's regarding plant protection, production & disease pest management.

MEDIUM TERM STRATEGY – (1 yr – 3 yr)

1. To know the realistic data on sugarcane area it is advisable to employ remote sensing, GIS , GPS facilities which help to obtain unbiased data which could interface with manual data, which had collected by sugar mills field staff.
2. Location specific variety should be developed with respect to high sugar, high cane yield, and resistance to disease, pest, drought & water logging.
3. Subsidized the soil health kits, mobile boot van to sugarcane farmers through SDF loans.
4. Adopt suitable crop rotation to improve the soil health & to maintain fertility level.
5. Promote seed farm concept in the state either providing subsidy to farmers or by the sugar mills, which will help the farmer's to use quality seed for planting.

Maharashtra

Views of SBI, Coimbatore:

Sugarcane is an important cash crop of Maharashtra. Sugarcane is cultivated on about 10 lakh hectare area, which is subject to water stress, which generally limits its productivity. The average cane productivity in the state is around 85 t/ha.

Major problems:

- ☐ Inadequate irrigation facilities
- ☐ Water stress
- ☐ Lack of season-wise and variety-wise planting of sugarcane
- ☐ Lack of proper seed production and distribution system in sugarcane
- ☐ Slow replacement of old varieties
- ☐ High cost of production of sugarcane

Steps to improve cane yield and sugar recovery:

- ☐ Many new improved varieties have been released in the peninsular zone to replace old and poor quality varieties. Better performing new varieties (Co 94012, Co 99004, Co 2001-15, Co 0218) will provide scope for improvement in cane yield and sugar recovery. There is need to exploit the potential of these varieties by faster seed multiplication in the state for the benefit of farmers and sugar mills.
- ☐ There is need to strengthen the seed production system in the state for maintaining the potential of varieties like Co 86032, CoC 671 etc and faster multiplication of new varieties. Proper seed production programme is required to sustain the productivity of old varieties.
- ☐ Mechanization of sugarcane cultivation including harvesting needs to be popularized in order to solve the problem of labour shortage and to reduce the cost of production.
- ☐ There is need to give incentive on drip irrigation for efficient use of water resources. Efficient use of available water during the season 2012-13 has resulted in better yields.

Views of ISMA:

1. Operational Efficiency issues

- ☐ Total installed 207 sugar mills (with 5.76 lac tcd) only 169 sugar mills are operational (4.88 lac tcd operational). Total cooperative mills are 106 with 3.33 lac tcd & Private mills are 63 with 1.55 lac tcd.
- ☐ Total average sugarcane crush is 575 lac tonnes (2010-11 having highest crush i.e. 802 lac tonnes) with an average 125 days cane crushing period (2006-07 having highest 176 days mill operation) . State having 96% of avg. drawl out of total average 600 lac tonnes of cane production (2007-08 having highest cane production of 884 lac tonnes). As the mills efficiency and capacity has been increasing y-o-y, there is wide variation in the cane crush & no. of days over last five years.
- ☐ State avg. drawl is 96%, which shows that cane comes in state sugar mills from neighboring state, due to price differential in sugarcane rates.
- ☐ State mills are running at 94% avg. operational efficiency. State having 170 operational sugar mills but only 45 cogen plant with mills which gives electricity generation of 623MW & there are 55 Ethanol producers with 1752 KL per day. So there is huge opportunity of by products in the state.

2. Sugarcane Cultivation issues

a) Soil issues.

- ☐ Poor organic carbon content & soil compaction are the major soil issue which deteriorating the soil fertility level.
- ☐ Alkalinity & salinity soils are increasing in the state.
- ☐ Soil leveling is not properly happened in state, which make the run off the water & soil, no water harvesting is properly occurred.
- ☐ Continuous planting of sugarcane in same field hampers the soil health as the state farmers usually go for sole sugarcane crop.

b) Seed issues.

- ☐ Non availability of early drought tolerant variety, as all available varieties is old. New high sugar &HYV to be introduced in the system.

c) Water/irrigation issues.

- ☐ Number of irrigation done by farmers for different sugarcane planting season is more as compare to other state i.e. 27 to 32 irrigation.
- ☐ Flood irrigation to cane is not appropriate as this make the more loss of water because the state soil having rocky layer at 10 feet down so the drip irrigation is well suited to manage the moisture in soil timely and never make any impact on the crop.

d) Crop management issues.

- Labour scarcity at peak season time.
- Only 4 cane varieties are covering 96% area in the state from last many years, this shows the lack of new such varieties which are not better than these 4 varieties.
- No proper ratoon management.
- Mechanization on harvesting is also not showing any encouraging result.

SUGGESTIVE STEPS IN IMPROVISING THE CURRENT SITUATION:-

To address the state issues, ISMA is suggesting couple of way forwards in terms of two tier strategy:-

SHORT TERM STRATEGY – (6 months – 1 yr)

1. Crop rotation and intercropping should be adopted in cane to improve the soil health or generate the farm income.
2. Trash mulching should be adopted in water scare region to conserve the moisture in soil.
3. Reclamation of saline soil through use of gypsum.
4. Intercropping needs to be given due attention.
5. Encouraging use of quality seed material of new improved variety & developing production chain of new seed material at different zone.
6. Enhancement of drip irrigation system in cane fields so the proper water utilization can be done in water scare region.
7. Application of organic manure/green manuring to improve fertility level of soil.

MEDIUM TERM STRATEGY – (1 yr – 3 yr)

1. Timely introduction of sugar rich variety which is suitable to climate, drought resistance & disease pest resistant with having optimum level of fibre for cogen.
2. Subsidized the soil health kits, mobile boot van to sugarcane farmers through SDF loans.
3. Promote Cogen & distillery production more as state has huge byproduct potential.

4. Promote local entrepreneur-ship for mechanization at sugarcane field level.
5. Promote seed farm concept in the state either providing subsidy to farmers or by the sugar mills.
6. For long term perspective water harvesting should be promoted to support the drip irrigation system for irrigation.

Views of Cane Commissioner:

**Sugar cane Productivity &
Sugar Recovery Issues**

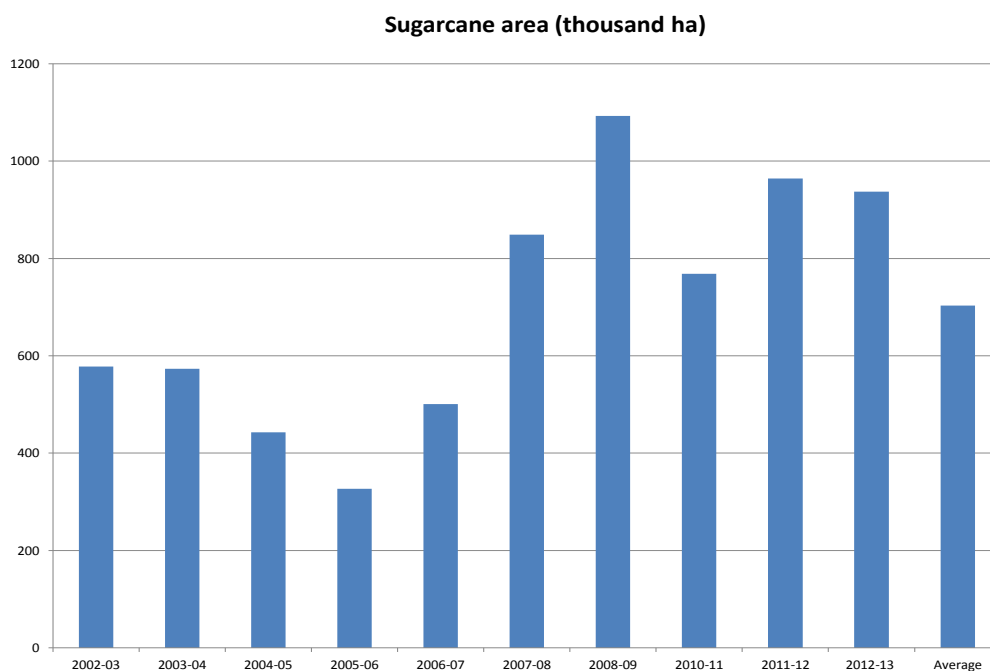
- Maharashtra is leading in Sugarcane & Sugar production (About 33%) in India.
- The average sugarcane productivity is 77 ton/ha which is more than national average of 61.7 ton/ha.
- Average sugar recovery of the state is 11.67% in 2011-12 & 11.40% in 2012-13 which is much higher than national average.

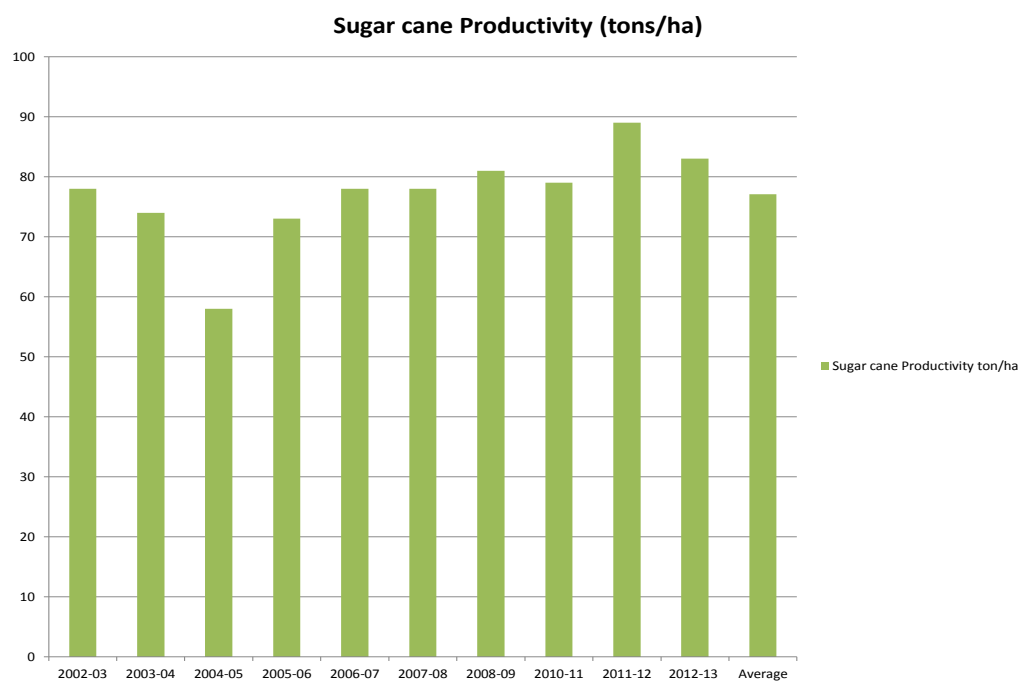
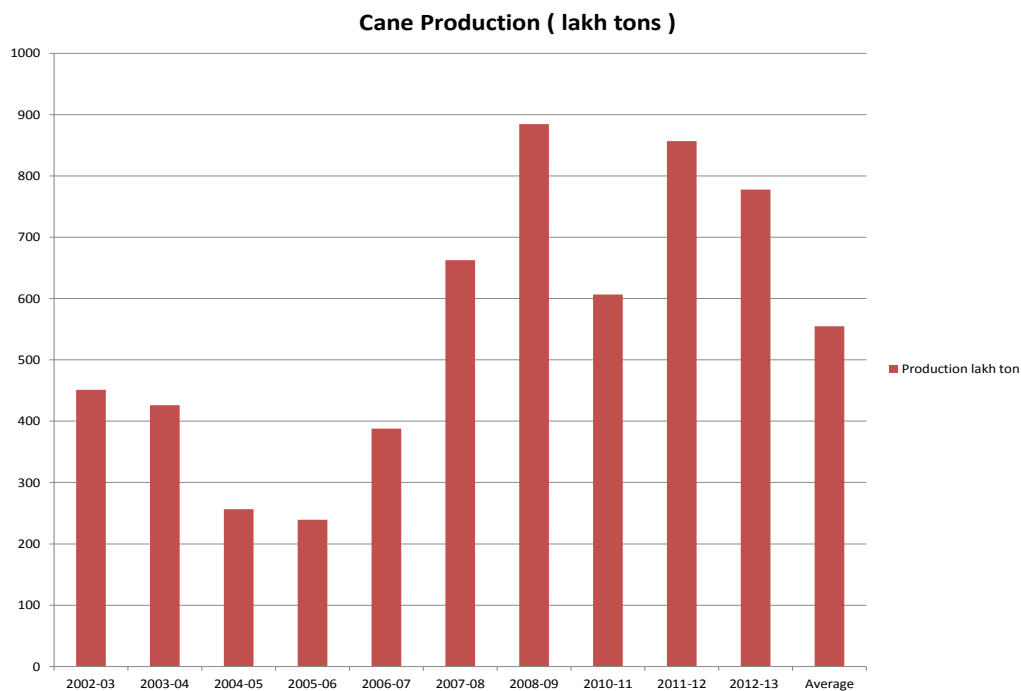
Planting seasons

- Adsali – 15 July to 15 August
- Pre-seasonal – 15 October to 15 November
- Suru- 15 December to 15 February

Sugar Cane Productivity

Year	Area (thousand ha)	Production lakh ton	Sugar cane Productivity ton/ha
2002-03	578.20	451.40	78.00
2003-04	573.10	426.17	74.00
2004-05	442.50	256.68	58.00
2005-06	326.90	239.14	73.00
2006-07	500.70	388.14	78.00
2007-08	848.80	662.77	78.00
2008-09	1092.80	884.37	81.00
2010-11	768.40	606.48	79.00
2011-12	964.50	856.91	89.00
2012-13	937.00	777.71	83.00
Average	703.29	554.98	77.10





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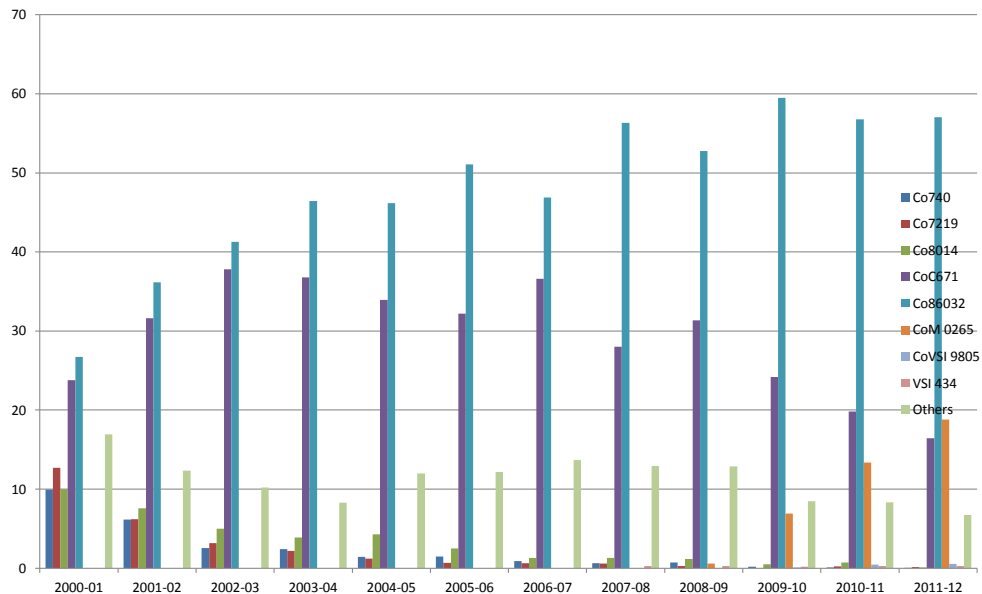
1. Lack of season wise and variety wise planning of sugarcane plantation
2. Inadequate availability of quality seeds
3. Lack of seed replacement
4. Inadequate irrigation facilities and poor water management practices
5. Lack of integrated nutrient management to sustain soil fertility and productivity
6. Poor drainage and ill health of the soil.
7. Inadequate farm mechanization
8. Lack of proper plant protection measures to control insects, diseases and weeds
9. Neglect of ratoon crop
10. Poor attention to cane development programs at State Government and sugar mill level
11. Poor technology transfer mechanism

Measures to increase productivity of sugar cane

Season-wise and Variety-wise Planting Programme

- Implementation of season wise and variety wise planting program in the operational area of sugar mill is the most important aspect of cane development to have continuous supply of good quality and sufficient cane throughout the crushing season.
- In Maharashtra, due to introduction of early and mid-late maturing high sugar varieties like CoC 671 and Co 86032, the area under late maturing varieties like Co740 was decreased.
- The area under high sugar varieties viz. CoC671 and Co86032 increased from 8.59 % in 1995-96 to 84.36 % in 2007-08 resulting maximum sugar recovery of 11.92 %. Thereafter, average sugar recovery is sustained around 11.50.
- This indicates that each sugar mill in the state should implement season wise and variety wise planting program effectively and improve their sugar recovery at their potential.

Variety-wise % Area under Sugarcane in Maharashtra



B. Three Tier Seed Multiplication Programme

- Basic and important input in cane cultivation to increase the productivity by 12 to 15 per cent.
- In Maharashtra, need to change the seed for planting on 2.0 lakh ha area every year for which certified seed on 13,300 ha area and foundation seed on 670 ha area is required.
- It is proposed to develop 50% seed replacement through conventional seed programme and 50% through tissue culture technique.
- To execute this program 55 ha of breeder seed needs to be developed under conventional planting system and 33.50 lakh tissue cultured plantlets needs to be produced.
- The good quality seed material not used even by 10 percent of sugarcane farmers because of inadequate implementation of three-tier seed multiplication programme at sugar mill level.

C. Integrated Nutrient Management for Sustainable Soil Fertility and Productivity

- **Soil fertility management** is an important strategy for increasing sugarcane productivity. An **integrated nutrient management system** having judicious combination of both the organic manures/materials and inorganic fertilizers along with bio-fertilizers may serve a potential tool for sustaining the productivity of soil in the sugarcane-based intensive cropping system on a long-term basis.

D. Efficient Water Management in Sugarcane

- To mitigate the water scarcity situation and to maintain soil fertility and productivity on sustainable basis, sugarcane crop under assured well irrigation needs to be brought under **drip and raingun sprinkler** irrigation immediately with time bound phased programme.
- Fertigation through drip and raingun sprinkler irrigation saves 25 to 30% chemical fertilizers as compared to conventional flow irrigation

E. Mechanization for economic sugarcane production

- Productivity of farm depends considerably on the availability of farm labour coupled with efficient farm implements and their judicious utilization.
- Equipments/machines are enabling efficient utilization of inputs such as seed fertilizer, plant protection chemicals and irrigation water in addition to alleviation of drudgery associated with various farm operations and making farm practices a pleasant job, especially for younger generation to adopt farming as an enterprise.
- In sugarcane cropping, mechanization is urgently required for the time consuming and expensive operations like planting, inter-culturing and harvesting. It is a need to achieve mechanization in sugarcane area with the equipments like sugarcane cutter planter, multi-purpose implement for inter-culturing and mechanical sugarcane harvester.

F. Integrated Pest and Disease Management Programme

- In Maharashtra,, white fly, termites, white grub, rodents, internode borer, shoot borer, woolly aphid, and top borer are major sugarcane pests.
- The losses caused by insects and non-insect pests are estimated to be 25 % in cane yield, therefore, control of insect and non-insect pests at farmer's fields need more attention.
- Integrated pest management practices consist of physical, chemical and biological control measures to be adopted to keep pests level under economic threshold. Various preventive and curative measures need to be undertaken.

G. Ratoon Management To improve the yield

- The proportion of area under plant: ratoon cane is 60:40 in most of the sugar factories. This shows very significant contribution of ratoon crop in the total cane production.
- To increase the sugarcane productivity, it is essential to make efforts for increasing productivity of ratoon cane in all the sugarcane growing areas.
- However, the yield of ratoon per unit area is very low as compared to that of plant crop.

Following techniques of ratoon management need to be adopted on area of ratoon crop.

- 1. Trash mulching and application of trash composting microbial culture
- 2. Planting of green manuring crops like sunnhemp or dhaincha
- 3. Application of micronutrients (FeSO₄ & ZnSO₄)
- 4. Application of Nitrogen fixing and Phosphorus solubilizing microbial culture
- 5. Gap filling
- 6. Stubble shaving
- 7. Off barring

H. Effective extension mechanism

- Extension mechanism for efficient and effective transfer of improved technologies in sugarcane agriculture through sugar factories is most important for increasing sugarcane and sugar productivity at national level. Present extension mechanism in sugarcane agriculture is not up to the desired level and needs to be strengthened immediately.

Drip Irrigation

Need of the hour for Sugarcane Crop in Maharashtra

- The need of the hour is to maximize sugarcane yield per unit area which will help the sugar factories to get more sugarcane for crushing and hence better efficiencies. Hence there is a need to adopt latest Hi-tech technologies which will enhance the productivity. Drip Irrigation is one of these technologies which provide better solutions of higher productivity, efficient use of water availability, salinity, electricity & labor issues.
- In Maharashtra, area of sugarcane crop under drip irrigation is around 50 thousand ha.
- The area under drip irrigation can be increased up to 4 to 5 lakh ha over 3-4 years.

A CASE STUDY

- Chairman of Datta Shirol SSK, Distt. Kolhapur, Mr. S.R. Patil had made innovative plan to increase the sugar cane productivity by 30 to 40 %.
- They selected 14 farmers and given them productivity target of 150 tons/acre.
- The basic things they followed are
 - Established soil testing lab, appointed 1 agriculture assistant for 300 acre area,
 - Farmers are provided with information from tillage to harvesting,
 - Arranged timely supply of inputs i.e. green manuring seeds, Bio fertilizers, chemical fertilizers pesticides, weedicides, liquid fertilizers for foliar spray etc. to the farmers.
 - To achieve 100 tons/acre productivity, they had taken demonstration plots in each village and inspired farmers.
 - They selected 500 member farmers one from each village, to take part in this productivity increase program.
 - Co 86032 and Phule 265 varieties selected for plantation
- 14 farmers achieved the target and got yield ranging from 100.5 ton/acre to 121.89 tons/acre

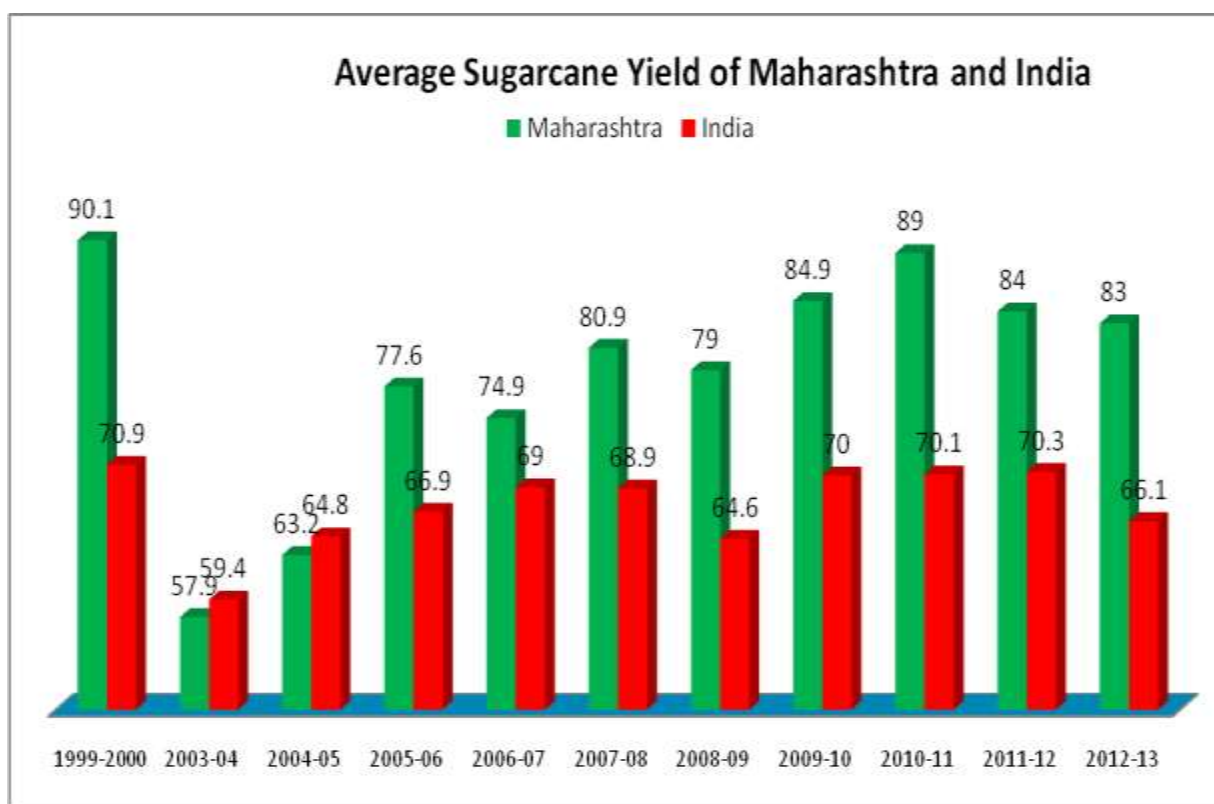
Initiative taken By Datta SSK, Shirol, Kolhapur

- To increase the participation of farmers in this productivity increase campaign they started giving prize to the farmers
- Those farmers who will achieve 125 tons/acre and more were given Rs. 1 lakh prize
 - Between 120 to 125 tons/acre –RS 80000 prize
 - Between 115 to 120 tons/acre - RS 70000 prize
 - Between 110 to 115 tons/acre - RS 60000 prize
 - Between 105 to 115 tons/acre - RS 50000 prize
- This prize scheme helped to increase the participation in this campaign.
- Some features of the scheme are
 - Those farmers whose yield is 70 ton/acre are allowed to participate
 - Area of scheme 750 acres
 - 14 farmers get yield more than 100 tons/acre
 - Highest yield obtained is 122 tons/acre
 - Financial provision of Rs 20 crore
 - Financial provisions were made under SDF, Bank Loan, SSK's own fund etc.
 - Yield increased by 30 to 40 %
- Area is same but production is more because increased productivity

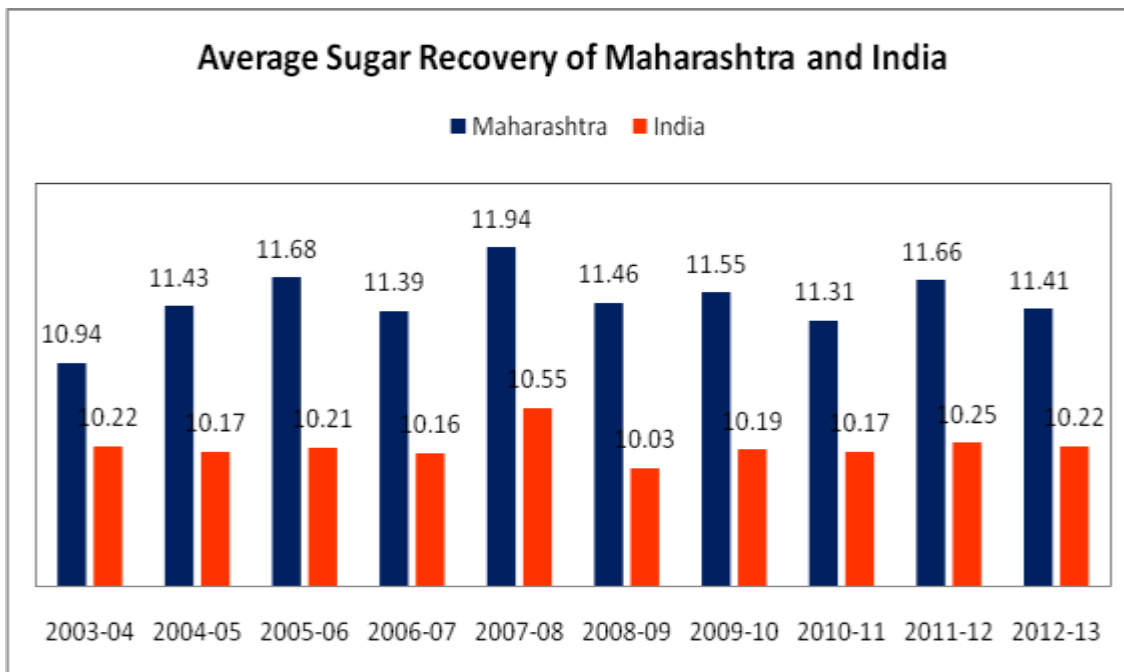
Views of VSI, Pune:

Cane Development Strategy for Increasing Cane Productivity and Sugar Recovery (Shivajirao Deshmukh, Director General, VASANTDADA SUGAR INSTITUTE, PUNE)

Sugarcane is increasing in popularity among the farmers due to its higher production potential and energy production in addition to sugar. This industry is directly related to rural development and about 50 million farmers cultivating sugarcane on about 4.5 million hectares area in India and about one million hectares in Maharashtra State. Maharashtra's contribution in terms of sugar produced is more than 33% of the total sugar produced in India. The major problem and alarming situation in sugar industry of India in general and Maharashtra in particular is the stagnation and continuous decline in sugarcane productivity over the years. National sugarcane productivity of 71.3 t/ha in 1994-95 declined to 59.4 t/ha in 2003-04 and thereafter, increased slightly up to 70.0 t/ha in 2009-10 and remained stagnant during last three seasons. In Maharashtra, the highest sugarcane yield of 90.1 t/ha was achieved in 1999-2000 but declined to 57.9 t/ha in 2003-04 and



74.9 t/ha in 2006-07 due to drought situation and woolly aphid infestation. During last 10 years, the highest cane productivity in the Maharashtra reached to 84.9 t/ha in 2010-11. The average sugarcane yields as also sugar recovery in India have been practically stagnant since last several years as would be evident from the following digram.



The

issue of fluctuations and stagnation in average sugarcane yield urgently requires a fresh look to decide and implement an effective and result-oriented time bound strategy for sustainable sugarcane productivity.

One of the main reasons for the stagnancy is the lack of adequate and effective research infrastructure as also lack of effective extension mechanism. It is therefore, needless to emphasize the importance of implementation of priority cane development programs at sugar mills with the objective to increase per hectare sugarcane and sugar productivity. Sustained application of science and agro-technology to sugarcane farming through effective extension mechanism is therefore the need of future.

Prospects in Sugarcane Agriculture

1. There is wide gap between the potential yield and the present yield of sugarcane. The potential cane yield of 600 t/ha is reported and some of the cane growers have harvested more than 350 t/ha. Therefore, there is a great opportunity to bridge the gap between potential and present cane yield. A target of 120 t/ha of an average cane yield is possible with the planned efforts in cane development.
2. An average sugar recovery more than 12.50 would be possible with well planned efforts in breeding high yielding and high sugared varieties and agro-climatic zone specific seasonal and varietal planning and harvesting programme.
3. Development of sugar beet agriculture as supplementary crop in sugar industry.
4. Ensuring economic security to cane growers

Constraints in increasing sugarcane productivity

In order to increase per hectare sugarcane and sugar productivity, the major constraints are as follows:

1. Lack of adequate participation of the sugar mills in the development of sugarcane. There is no cane development wing in the sugar mills and where ever such wing is existing, it is under staffed, not adequate trained and utilized mainly for harvesting programme. The existing manpower and infrastructure with sugar mills for cane development and technology transfer is not efficient and sufficient.
2. Sugar mills are not implementing season wise and variety wise sugarcane plantation and harvesting programme in their operational areas considering their maturity period.
3. There is no adequate availability of quality seed-cane with sugar mills and the seed replacement ratio is not as per desired requirement. Adequate attention in application of tissue culture technique in seed rearing is lacking or absent.
4. Irrigation water management practices are very poor. Excess use of irrigation water deteriorated soil fertility and productivity. An efficient water management technology of drip irrigation and fertigation is not spreading comprehensively.
5. Lack of integrated nutrient management affected soil fertility and productivity sustainability. Depletion of organic carbon in the soil due to gradual shift towards application of mainly inorganic fertilizers is a serious issue. There is less awareness in biofertilizers and soil test based balanced chemical fertilizers applications.
6. Excess irrigation, poor drainage and mono-cropping system created soil health problems like salinity and sodicity.
7. Inadequate attention to development and dissemination of information regarding better farm appliances/equipments for planting, interculturing, fertilizer applicators, harvesting etc.
8. Negligence in proper plant protection measures to control insects, diseases and weeds
9. Laxity in ratoon crop management, which covered 40 to 45% of total area under sugarcane, therefore less average cane productivity
10. Problems in timely and adequate availability of quality inputs including credit
11. Inadequate attention to use of crop residue from sugarcane and sugarcane industry by- products such as press mud, sugarcane trash and distillery effluents
12. Low adoption level of available technologies for increasing production and productivity

Strategies of Cane development

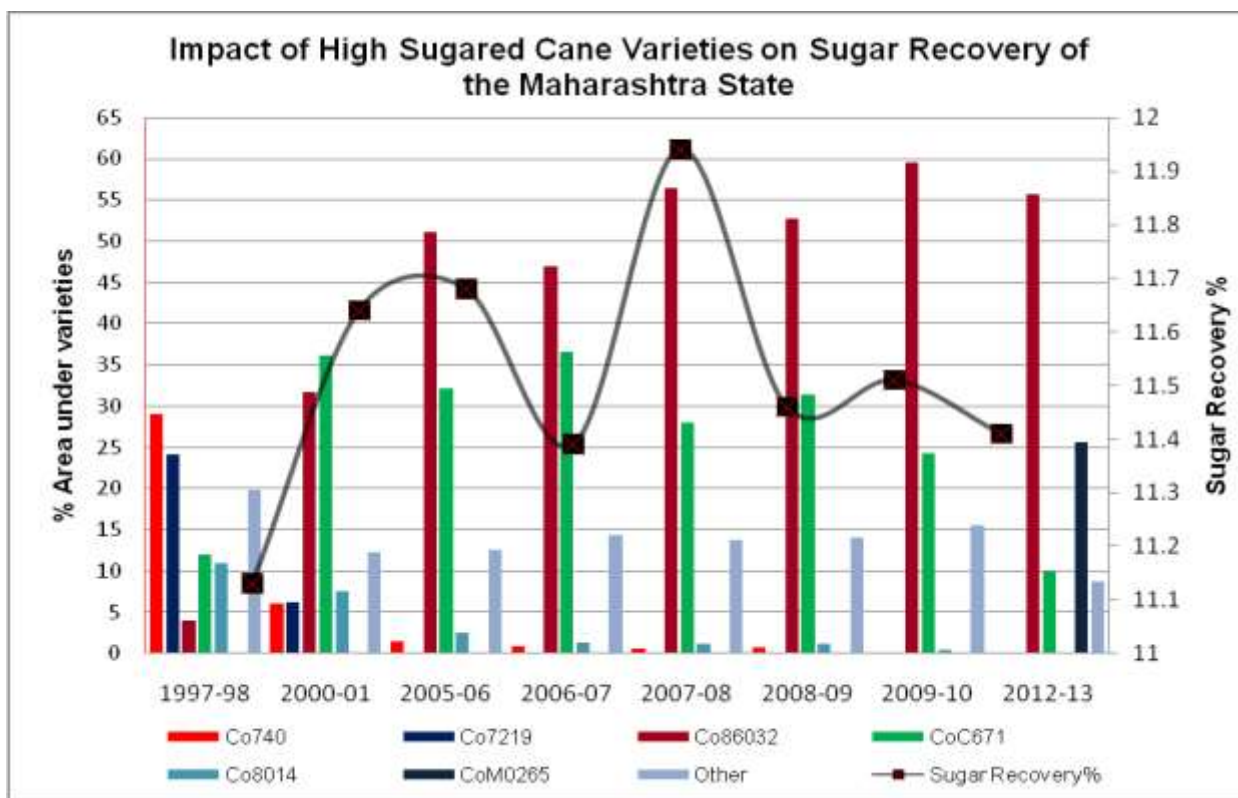
To overcome these constraints, meticulous planning and time bound implementation of following important cane development programs in the operational area of all the sugar mills in our country is required with massive input and financial support from Government of India, which alone can make the industry self-sufficient and globally competitive.

Vasantdada Sugar Institute and Agriculture universities have made a number of recommendations with reference to above said constraints. However, these recommendations were not put into the practice completely by the sugarcane growers in the state. If these recommendations are successfully implemented, the average sugarcane yield and sugar recovery is

expected to increase to 90 to 120 t/ha and 12.50%, respectively. The cane development programmes to be implemented are suggested and elaborated as below

I) Season-wise and variety-wise planting programme

Implementation of season wise and variety wise planting programme in the operational area of sugar mill is the most important aspect of cane development to have continuous supply of good quality and sufficient cane throughout the crushing season. In Maharashtra, due to introduction of early and midlate maturing high sugared varieties like CoC671 and Co86032, the area under late maturing varieties like Co740 was decreased. The area under high sugar varieties viz. CoC671 and Co86032 increased from 8.59 % in 1995-96 to 84.36 % in 2007-08 resulting maximum sugar recovery of 11.92 %. Thereafter, average sugar recovery is



sustained around 11.50. This indicates that each sugar mill in the state should implement season wise and variety wise planting programme effectively and improve their sugar recovery at their potential.

Sugarcane Breeding Centre established by VSI at Amboli is made fully operational with a wide range of germplasm. CoVSI 9805 a mid-late maturing variety is released in 2009. VSI 434 an extra early maturing high sugared and drought tolerant variety has been released in 2012 for general cultivation in Maharashtra. A variety CoM0265 released from CSRS Padegaon is high yielding variety recommended for saline and saline-alkali soils. Considering varietal features, the ideal season-wise and variety-wise planting programme for south Maharashtra, central Maharashtra, Marathwada and Vidharbha region is suggested as below:

I deal season-wise and variety-wise planting programme for Maharashtra

Region	Planting Season	% area to total required area	Recommended varieties
South Maharashtra	Preseason	35-40 %	CoC 671, Co 8014, Co 86032, VSI 434, CoVSI 9805, CoM 0265
	Suru	20-25%	Co86032, CoC 671, VSI 434, CoM 0265
	Ratoon	40-45%	All varieties up to 15 th February
Central Maharashtra	Adsali	15-20 %	Co86032, CoVSI 9805, CoM 0265
	Preseason	30-35 %	CoC671, Co86032, CoVSI 9805, VSI 434, CoM 0265
	Suru	10-15 %	Co86032, CoC671, VSI 434, CoM 0265
	Ratoon	40-45 %	All varieties up to 15 th February
Marathwada, Vidharbha & Khandesh	Preseason	35-40 %	CoC 671, Co 8014, Co 86032, VSI 434, CoVSI 9805, CoM 0265
	Suru	20-25%	Co86032, CoC 671, VSI 434, CoM 0265
	Ratoon	40-45%	All varieties up to 15 th February

II) Seed Multiplication Programme

Seed is the basic and important input in cane cultivation to increase the productivity. The good quality seed material is not used even by 10 percent of sugarcane farmers in the state because of inadequate implementation of three-tier seed multiplication programme at sugar mill level. The programme for production of breeder, foundation and certified seed needs to be supported. The sugar factories could play an important role in raising nurseries with foundation seeds from research stations. Replacement of seed is important and the replacement of seeds by the farmers every fourth year itself improves the yield by 10% to 15%. Therefore, there is an urgent need to implement proper three-tier seed multiplication programme in each sugar mill considering their area under sugarcane. In Maharashtra, there is need to change the seed for planting on 2.0 lakh ha area every year for which certified seed on 13,300 ha area should under certified seed and foundation seed on 670 ha area. It is proposed to develop 50% seed replacement through conventional seed programme and 50% through tissue culture technique. To execute this program 55 ha of breeder seed needs to be developed under conventional sett planting system and 33.50 lakh tissue culture plantlets needs to be produced. There is a need to reduce the seed quantity at the farm level. The cost of seeds could be reduced substantially by transplanting polybag raised seedlings or planting one eye-bud setts. Tissue culture needs to be encouraged for assured genetic purity, better and early germination, quicker coverage by better varieties and higher sugarcane yield. The sugar factories need to be supported by availing sufficient tissue culture plantlets. VSI and State Agriculture Universities need to plan the breeder seed production through conventional & tissue culture (T.C.) technique.

Impact due to Change in Source of Seed Material on Cane Yield

Sr. No.	Particulars	No. of Farmers/ Farms	Cane Yield (t/ha)	Increase in Cane Yield. t/ha.
1	Seed from Conventional seed nursery	137	103.52	25.79
2	Seed raised through tissue culture plantlets	137	129.31	

In Maharashtra, there are 1250 TCD, 2500 TCD and 5000 TCD sugar mills require 2 lakh, 4 lakh and 8 lakh tonnes of sugarcane, respectively every year. Taking the average sugarcane yield as 84 tonnes per hectare these mills would require 2400 ha, 4800 ha and 9600 ha under cane cultivation respectively. If the mill decides to cover 50% of the cane area by planting material obtained from tissue cultured plantlets and remaining area with conventional planting material then the mill will require the following area under foundation seed nursery and certified seed nursery. Area under Foundation and Certified seed nursery required to be planted every year if two eye budded system of seed multiplication is followed:

Particulars	Area under Foundation seed nursery (ha)		Area under Certified seed nursery (ha)		No of tissue culture plantlets required
	Conventional seed	Tissue Culture	Conventional seed	Tissue culture	
1250 TCD	5.5 ha	1.5 ha	80 ha	40 ha	22500
2500 TCD	11 ha	3 ha	160 ha	80 ha	45000
5000 TCD	22 ha	6 ha	320 ha	160 ha	90000

III) Integrated Nutrient Management

Integrated nutrient management is an important strategy for increasing sugarcane productivity. An integrated nutrient management system having judicious combination of organic and inorganic fertilizers coupled with bio-fertilizers may serve a potential tool for sustaining the soil fertility and productivity in the sugarcane-based intensive cropping system on a long-term basis.

Organic Manuring:

Organic matter has a remarkable beneficial effect on soil behavior and crop yields, especially in the form of humus, which improves physical condition of soil and nutrient availability. Therefore for the better sugarcane productivity and to maintain the soil fertility, organic manure availability at the time of land preparation is very important. Farmyard manures (FYM) or compost @ 20 to 25 t/ha is recommended for sugarcane. However, to supplement FYM or compost, the sugar mill by-product press mud cake and sugarcane trash can be used in sugarcane fields either directly or after composting.

Green manuring

FYM or compost is not easily available in sufficient quantity due to reduction in cattle population and intensive agriculture. Under these circumstances, the green manuring is effective and easy source of organic matter. Green manuring practice with Sunhemp or Dhaincha is very useful to improve soil fertility. The implementation of this programme at each mill level will increase sugarcane productivity by 10 t/ha, and make available additional cane for crushing.

Chemical Fertilizer management

Balanced use of N, P and K fertilizers maintains soil fertility and productivity, but in an intensive cropping system, the productivity is found deteriorating due to certain deficiencies and imbalance use of plant nutrients. To increase the efficiency of fertilizers, proper balance and placement of fertilizers at root zone is important. Fertilizer briquettes placement also increases fertilizer use very efficiently. The fertility status of soil changes from field to field and therefore, level of available nutrients in the soil cannot be assessed without soil testing. The soil testing helps to recommend adequate and balanced plant nutrients needed for optimum crop yield and thereby saving in the cost of fertilizer nutrients. Soil testing is useful in identifying problematic soils and their reclamation also. Application of fertilizers in right quantity at proper time as per schedule is essential to increase the cane productivity. The application of basal dose increases the sugarcane yield by 10 to 12 t/ha. Besides macro nutrients, there should be integration of secondary and micronutrients application based on soil test approach. As a functional element application of silicon @ 400 kg ha⁻¹ through bagasse ash by mixing with compost is also recommended as a basal dose for increasing sugarcane and Sugar yield of plant and two successive ratoon crops.

Use of Biofertilizers

Biofertilizer have the ability to fix atmospheric N and to mobilize the plant nutrients and growth regulating substances. Use of different biofertilizers viz. *Azotobacter*, *Azospirillum*, *Acetobacter*, *P-solubilis* and *decomposing culture* significantly increases the cane yield. Biofertilizers are used in sugarcane by both sett treatments and soil application. There is 25% saving in inorganic nitrogen with the application of *Azotobacter* or *Azospirillum* and 50 % saving with *Acetobacter*. Vasantdada Sugar Institute has passed recommendations in Joint AGRESCO viz. i) Foliar application of *Acetobacter diazotrophicus* liquid bioinoculant @ 3 lit. /ha in 500 liters of water at 60 days after planting with 50% recommended dose of nitrogen is recommended for maximum cane and sugar yield and ii) Application of consortia of Sulphur Oxidizing Microbial (SOM) liquid bioinoculant @ 5 lit./ha. by mixing with compost @ 2 t/ha. at the time of planting for maximum cane and sugar yield.

Reclamation of salt affected soils

The soil fertility of the soils under sugarcane is found to be declining in Maharashtra. The heavy irrigation under canal and lift irrigation command are responsible for addition of huge amount of salts to the soils. These soils are ill drained and do not have any provision for drainage or leaching of salts. Therefore, the soils under sugarcane are becoming saline, saline alkali and alkali in nature. Identification of such salt affected soils in sugarcane growing areas through soil testing and Remote Sensing Technique and preparation of reclamation plan with provision of surface and sub-surface drainage system and chemical amendments is most essential and should be taken on priority.

Recommendation: It is recommended that each sugar mill should establish their own soil-testing laboratory, biofertilizers production unit and good quality biocompost production

programme. The sugar mills should make provision of green manuring seeds, fertilizers and supply of Azotobacter, Acetobacter, PSB and decomposing culture to the farmers at proper time before sugarcane planting.

IV) Water Management

Availability of irrigation water at right time in right quantity throughout growing season of sugarcane crop has become a major constraint in achieving desired yield. Due to acute shortage of irrigation water especially in summer, the sugarcane yield is adversely affected and many of the sugar factories in the state are facing great danger of insufficient cane for crushing to utilize their fullest capacity throughout the crushing season. Under this scenario, it is imperative to use available water; the precious commodity, most judiciously and scientifically so that land and water use efficiency can be increased manifold. Presently, serpentine ridges and furrow method of irrigation is commonly adopted in sugarcane under canal and lifts command areas, which have only 30 to 40 % irrigation efficiency, and also adversely affects crop growth.

Therefore, extensive research, development and extension work on micro irrigation techniques like drip and raingun sprinkler irrigation in sugarcane was initiated in Vasantdada Sugar Institute. It is inferred from the research findings that the drip irrigation is effective in saving of 45 to 50% irrigation water, increasing the cane yield by 25 to 30% and water use efficiency 2 to 2.5 times more as compared to conventional irrigation in sugarcane crop. Raingun sprinkler irrigation in sugarcane also saves 30 to 35 % irrigation water, increases cane yield by 15 to 20 % and overall, water use efficiency by 1.50 to 2.00 times over conventional irrigation. Fertigation through drip and raingun sprinkler irrigation saves 25 to 30% chemical fertilizers as compared to conventional flow irrigation. Application of 70% of recommended dose of NPK in the form of Urea, Phosphoric acid (61% P2O5) and Muriate of Potash respectively in thirteen equal splits starting from planting at an interval of 15 days up to 6 months through drip irrigation is recommended for higher productivity and monetary returns in pre-seasonal and ratoon sugarcane. A new technique of subsurface drip irrigation is also very efficient system for increase water and fertilizer use efficiency in sugarcane.

Intercropping of Lady's finger in suru sugarcane in paired row method (90-180 cm) under Rain gun sprinkler irrigation system is also recommended

Recommendation: To mitigate the water scarcity and efficient use of available water sugarcane crop should brought under drip and raingun sprinkler irrigation with time bound phased programme. Fertigation techniques needs to be adopted so as to increase fertilizer use efficiency and cane productivity.

V) Mechanization in sugarcane

Productivity of farm depends considerably on the availability of farm labour coupled with efficient farm implements and their judicious utilization. Agricultural equipments/machines are enabling efficient utilization of inputs such as seed fertilizer, plant protection chemicals and irrigation water in addition to alleviation of drudgery associated with various farm operations and making farm practices a pleasant job, especially for younger generation to adopt farming as an enterprise.

In sugarcane cropping, mechanization is urgently required for the time consuming and expensive operations like planting, inter-culturing and harvesting. It is a need to achieve mechanization in sugarcane area with the equipments like sugarcane cutter planter, multi-purpose implement for inter-culturing and mechanical sugarcane harvester. VSI has developed mechanical sugarcane planter which is recommended for planting in furrow spacing of 0.90 m, 1.20 m, 1.50 m and paired row spacing of 0.90 - 1.80 m to get

more than 72% germination with 48.05% saving in cost of planting in comparison with conventional manual planting.

VI) Integrated Pest and Disease Management Programme Integrated Pest Management

In Maharashtra, shoot borer, woolly aphid, white fly, termites, white grub, internode borer, top borer and rodents are major sugarcane pests. The losses caused by insects and non-insect pests are estimated to be 25 % in cane yield, therefore, control of insect and non-insect pests at farmer's fields need more attention. Integrated pest management practices consist of physical, chemical and biological control measures to be adopted to keep pests level under economic threshold. **Biological Control Measures** The biological control measures need to be implemented for the economic and effective management of many pests of sugarcane like white woolly aphid, early shoot borer, pyrilla, white grub, white fly etc. Therefore, there is a need to establish biocontrol laboratory at every sugar mill for rearing of biocontrol agents like *Conobatra aphidivora*, *Trichogramma chilonis*, *Crysoperla carnae*, *micromus*, *Beauveria bassiana*, *Metarrhizium* etc. **Integrated Disease Management** In Maharashtra, whip smut, grassy shoot, rust, pokkah boeng, pineapple, wilt, mosaic, sett rot, ratoon stunting, leaf scald, eye spot, leaf spot, are the important diseases which determine the quantity, quality and stability of yield in sugarcane crop. Diseases caused by fungi, bacteria, viruses, phytoplasma, and nematodes pose a serious threat to sugarcane cultivation. It is estimated that, loss caused by different kinds of diseases of sugarcane crop ranges from 10 to 15 per cent. For the management of sugarcane diseases, strategy viz., seed selection, cultural practices, phytosanitary practices, thermo therapy, chemotherapy, surveillance, quarantine and resistant varieties may be adopted to keep sugarcane diseases under threshold level. Besides above management aspects following preventive and curative control measures suggested for the management of the sugarcane diseases .

1. Supply of disease free healthy seed.
2. Seed treatment either by hot water at 500 C for 120 minutes or moist hot air at 540C for 150 minutes and carbendazim at 0.1 per cent before planting for the control of seed borne diseases. Heat therapy should be used for the preparation of breeder seed only. For the foundation seed, certified seed and commercial crop seed should be treated by 0.1 % carbendazim fungicide.
3. Roguing of the smut, wilt and grassy shoot infected stools and destruction.
4. Spraying of Mancozeb (0.3 %) or Carbendazim (0.1 %) for the control of foliar diseases viz., rust, pokkah boeng, eyespot and leaf spot etc.
5. Control of sucking pests of sugarcane for control of the transmission of viral diseases.

VII) Ratoon Management

To improve the yield and sucrose content of sugarcane and to reduce cost of production are of prime importance for improving the efficiency of the sugar industry and making it competitive at global level. The proportion of area under plant: ratoon cane is 60:40 in most of the sugar factories. This shows very significant contribution of ratoon crop in the total cane production. However, the yield of ratoon per unit area is very low as compared to that of plant crop. The main reason for low productivity in ratoon is its neglect, low tillering, poor crop growth, depletion of soil nutrients, perpetuation of diseases and pest result into low stalk population and their weight. It has been emphasized that there is significant increase in cane productivity when ratoon management practices are followed correctly.

To increase the sugarcane productivity, it is essential to concentrate efforts for increasing productivity of ratoon cane in all the sugarcane growing areas. The techniques of ratoon management viz. trash mulching and application of trash composting microbial

culture, Stubble shaving, Off barring, gap filling, application of micronutrients like FeSO_4 & ZnSO_4 , application of Nitrogen fixing and Phosphorus solubilizing microbial culture need to be adopted in ratoon crop.

VIII) Effective extension mechanism

Extension mechanism for efficient and effective transfer of improved technologies in sugarcane agriculture through sugar factories is most important for increasing sugarcane and sugar productivity at national level. Present extension mechanism in sugarcane agriculture is not up to the desired level and needs to be strengthened immediately. The impact of the extension program can be very well understood from the example of "Operational Research Program" (ORP) implemented by Vasantdada Sugar Institute during 1995-1998 in Maharashtra. Under ORP program VSI demonstrated the improved cane cultivation technologies on 100 ha plant cane and 100 ha ratoon area on 25 sugar mills. The components of ORP program were healthy planting material from seed plots, long furrow / Paired row planting layout, Integrated nutrient management including organic, inorganic and biofertilizers, integrated pest and disease management and adoption of improved ratoon management practices. It would be apparent that the ORP program contributed a great deal in increasing the crop yields (36.50 t/ ha in plant cane and 27.83 t/ha in ratoon crop) on selected plots thereby fulfilling its objective to establish a extension methodology

At present the spread of the technology is through conventional extension methodology by existing staff of Agril. Department of the mill through farmers rallies/ training/demonstrations etc. This present system is not sufficient to cover the entire sugarcane development at micro level and hence the strengthening of the extension mechanism assumes great importance. Strengthening the extension mechanism involves micro level adoption of improved cane cultivation technologies and Computer and Web based training. To implement these programs at mill level following major components involved.

1. Every mill should have a separate full pledged extension wing comprising of trained staff. The existing staff of cane development department needs to be trained.
2. For effective extension every mill should develop minimum infrastructure viz. computer with multimedia kit, LCD Projectors, Audio – visual aids like TV, VCR, DVD/CD players, mobile screen and vehicles for Extension staff
3. Development of training material like CDs on various cane development topics, video films, booklets, leaflets etc.
4. Training and field demonstrations

By strengthening the extension mechanism and implementing cane development programs in the mill operational area of all the mills, the sugarcane yield will increase positively.

IX) Other issues in sugarcane production

Besides, cane development programmes to improve sugarcane productivity and sugar recovery other issues of cyclicity of sugarcane production, policy issues from Government and sugar mill side are directly or indirectly affecting the economy of the farmers.

Cane Area reservation and cane development policy

After de-zoning policy, cane growers are free to supply the cane to any nearby sugar mill for his benefit. Therefore, sugar mills in the State blocked their cane development programmes and incentives on the inputs supplied to the cane growers due to uncertainty of cane drawl and recovery of the investment made on cane development from respective beneficiaries. There should be bonding between cane growers and sugar mills in allotted area.

Sugar mill should give assurance of crushing of entire cane grown by farmers or the disposal of excess cane from operational area to other sugar mills on their own.

Encouragement through juice quality based cane price

Presently, FRP and SAP system of cane payments set by Central and State Government is minimum cane price and is partly based on sugar recovery of the sugar mill. However, cane growers are planting various cane varieties having different characters of sugar recovery. There is no difference in cane price for high, medium and low sugared cane varieties or mature and immature cane fields. Implementation of juice quality based cane price system will encourage farmers for growing high sugared varieties and also improve sugarcane productivity for better remuneration.

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Punjab

Views of SBI, Coimbatore:

Sugarcane is an important cash crop of Punjab. Sugarcane is cultivated on about 84,000 hectare area, which is subject to abiotic stresses like pre-monsoon drought, heat, salinity and alkalinity stresses, biotic stresses like red rot, wilt, shoot borer, root borer, white grub, top borer and stalk borer which generally limit its productivity. The average cane productivity in the state is around 70 t/ha.

Major problems:

- Non-availability of sufficient cane for crushing due to lesser area under sugarcane cultivation
- Problem in recommendation of varieties from other states
- Lack of proper seed production and distribution system in sugarcane
- Lower proportion of ratoon crop (24%)
- High cost of production of sugarcane
- Prevalence of abiotic (drought and low temperature) and biotic stresses (diseases and insect pests)
- Non availability of sufficient labourers for sugarcane cultivation
- Stiff competition from other crops like wheat and rice because of better marketing for wheat and rice in the state
- Insufficient electricity supply for irrigating sugarcane crop

Steps to improve cane yield and sugar recovery:

- ❑ Mechanization of sugarcane cultivation from planting to harvesting. Entrepreneurships on sugarcane mechanization need to be developed.
- ❑ Better performing new Co varieties (Co 0118, Co 0238, Co 0239), developed at Sugarcane Breeding Institute, Regional Centre, Karnal (Haryana) may be approved for cultivation in the state which will provide scope for improvement in cane yield and sugar recovery. There is need to exploit the potential of these varieties in the state for the benefit of farmers and sugar mills.
- ❑ There is need to have strong seed production programme which sustain the health and vigour of a variety is needed for each mill.

Healthy seed production programme can be implemented either through MHAT treatment or through micro-propagation. On the basis of present area under sugarcane in Punjab state, 26 ha area under MHAT treated seed will be sufficient in each of 3 zones of each sugar factory (on average area basis) to cover the entire sugarcane area under quality seed in a span of 3 years. A few farmers may be identified in each village as seed growers by providing sufficient incentives for encouragement.

One or two more tissue culture labs may be established in the state for faster multiplication of new varieties as well as healthy seed production.

- ❑ Soil testing lab may be established in each factory, which would help in use of balanced fertilizers as per the recommendations.

- ❑ Simultaneous planting of wheat and sugarcane needs to be encouraged. Spaced Transplanting Method (STP) may be promoted under summer planting to compensate the yield loss.
- ❑ Strong research and development units at each factory.
- ❑ Drip irrigation to take care of depleting water table in the state.

Views of ISMA:

1. Operational Efficiency issues

- State with total installed 24 sugar mills, but only 16- 17 sugar mills are in operation from last 3 years in crushing season. The installed tcd is 51000 in which only 42000 tcd is under working since last year with average 100 operational days and on average mills crush 42.71lac tonnes, which actually leads no operational inefficiency from mills. But to increase the level of crush from current level, we need to bring more area under sugarcane cultivation. In past, state has reported about maximum 2 lakh hac under sugarcane cultivation, so it means, that atleast 1 lakh hac potential more to take up from current level of sugarcane acreage.
- Major discrimination is in the yield reported from different agencies. The Ministry of Agriculture gives 60 tonne/ hac while State Government advocate 70 tonnes/hac yield, this is more than the average yield of country. So to understand the issues in practical perspective, we should take up independent view on yields/ productivity.
- Sugar mills less concentration on by-product production. Currently, only 7 sugar mills have co-gen facility with production of about 145 MW of electricity, much below their potential. Moreover, only one mill has got ethanol facilitation with 60 kl production. So apart from merely sugar production units, mills need more focus on by-product realization for improving operational efficiency.

2. Sugarcane Cultivation issues

- More than 90% sugarcane cultivation is confined to North Eastern part of Punjab i.e. in the districts like Gurdaspur, Hoshiarpur, Amritsar, Jalandhar and Ludhiana. In last 4 years, the sugarcane acreage is increasing in state (but after continuously declining from 2002) which shows that the Punjab potential toward the sugarcane. As the state having Paddy- Wheat rotation which posed serious problem of lowering down of ground water level, thus causing the depletion of essential soil nutrients. However, farmers having the better alternate towards the sugarcane plantation.
- From last many years state doesn't get the good high yielding & disease resistant varieties which impact on the productivity and the production of sugarcane. The agro- climatic condition of Punjab is favorable to sugarcane but this climate also comes with many disease & insects in crop which affect the yield.
- Lack of new technique in sugarcane cultivation Trench/Ridge planting, Furrow plantation etc, no intercropping is taken in sugarcane and multiplication of new varieties and its propagation is solely depends upon the state sugar mills. No research and development department/ Institutes extend their help in good quality seed & its multiplication.
- Plant ratoon ratio which is 70:30 respectively in the state actually increases the cost of cultivation & never gives the full time to mature the crop for crushing. That way, crush usually starts late and farmer push early immature crop for crushing.

- Farmers bring immature cane for crushing. After wheat sowing in month of November, farmers harvest their crop in April, after that they go with sugarcane plantation which actually gives only 8 – 9 month for completing its cycle and by this time crop never get full mature, which actually hits on sugar recovery.
- Late starting of the mills, because the state has more plant rather than ratoon and to give the crop 8 -9 months for maturing.,

3. Research & Development issues

- Lack of nodal agency/ knowledge centre/ Institute/ autonomous body to support the specific needs of the farmers in the state apart from PAU, which suggest farmers on varieties availability , suitable intercultural operational practices, seed multiplication, disease management , post-harvest management practices etc. Farmers are relying on sugar mills for varietal introduction/ propagation / dissemination etc
- Seed multiplication centre will be set from state government initiative, so that farmers easily can assessable to HYV seeds.

SUGGESTIVE STEPS IN IMPROVISING THE CURRENT SITUATION:-

To address the state issues, ISMA is suggesting couple of way forwards in terms of three tier strategy:-

SHORT TERM STRATEGY – (6 months – 1 yr perspective)

1. Bring more area under ratoon system. Early, mid & late varieties of sugarcane in the ratio of 3:4:3 respectively, which is actually not practiced currently in the state.
2. Bring more area under sugarcane with more emphasis on plant ratoon ratio, i.e 50:50. So the mills can avoid the late starting running
3. Increase the drawl from 72% to 80% by stopping the slippage of sugarcane to Gur production, as the state producing 1.2 lac tonnes of Gur, which majorly produce to cater the demand of illicit liquor manufacturing.
4. We need to have correct data base. ISMA is suggesting of taking up the independent study on data set collection on the yield, actual acreage, production, productivity, land topography, soil conditions etc for move forward. So that real issues can be put forth for over –all improvement of sugarcane / sugar sector in the state.
5. Preparation of soil health maps for state so judicious use of inputs can be done. Break the monotonous crop cycle of wheat- paddy, to not only stop soil nutrient depletion but also help in conserving water levels.
6. Varieties released by Central varietal release committee (GoI) through all India coordinate research program on sugarcane mandatorily be included in the approved list of varieties state.

MEDIUM TERM STRATEGY – (1 yr – 3 yr perspective)

1. Seed Multiplication Programme of existing varieties by rope-in external bodies like SBI, Coimbatore, ISMA sugarcane development programme s etc.
2. Cull-out only 4-5 HYV and do promotions/ propagation through state govt. / Industry machinery.

3. Subsidized the soil health kits, mobile boot van to sugarcane farmers through SDF loans.
4. Mechanization of sugar mills with Co-gen units & Ethanol production. Merely concentrating on sugar production, actually gives not much economic feasibility from operational point of view.
5. Re-structure SDF loan sanction pattern for the state.

LONG TERM STRATEGY – (3 yr – 6 yr perspective)

1. Establishment of autonomous state level institute for releasing and multiplying new HYV seeds.
2. Make this autonomous body/ establishing research Institute with representation from Institute/ Govt/ Industry / progressive farmers.

WAY FORWARDS:-

- Circulate the time bound strategy to all the stake holders for their comments and freeze on the same to move ahead.
- To monitor the progress on regular basis of the suggested strategy, we propose to constitute a group of representatives from state govt. / state level Industry/ state level Institute for Punjab, to appraise the situation on time bound manner. This group shall meet on every quarter to build consensus and forward their request to central level body to extend their support on it.

Tamil Nadu

Views of SBI, Coimbatore:

Sugarcane is an important cash crop of TN. Sugarcane is cultivated on about 3.9 lakh hectare area, which is subject to abiotic stresses like drought, and biotic stresses like red rot in coastal region, smut etc. which generally limit its productivity. The average cane productivity in the state is around 105 t/ha. There is decreasing trend in productivity since 2007-08.

Major problems:

- Pre-dominance of variety Co 86032
- Lack of proper seed production and distribution system in sugarcane
- Slow replacement of old varieties {major area (about 85%) under Co 86032}
- Improper varietal balance, i.e. pre-dominance of midlate varieties
- High cost of production of sugarcane
- Non-availability of labour and high cost of harvesting
- Insufficient irrigation facilities and frequent power cuts

Steps to improve cane yield and sugar recovery:

- ❑ With the presence of Sugarcane Breeding Institute in the TN, the state is having good extension system. Research and Development Meetings are conducted by SBI in collaboration with TNAU and sugar industry on regular basis to discuss the burning issues, varietal scheduling etc. Many new improved varieties have been released in the state to replace Co 86032.
- ❑ Better performing new varieties (Co 99004, Co 2001-15, Co 0218) will provide scope for improvement in cane yield and sugar recovery. There is need to exploit the potential of these varieties by faster seed multiplication in the state for the benefit of farmers and sugar mills.
- ❑ There is need to strengthen the seed production system in the state. Co 86032 is a very old variety and has starting showing decline in productivity over the years. Proper seed production programme is required to sustain the productivity of Co 86032. The variety is also showing symptoms of YLD and may be one of the causes of reduction in productivity. Seed production through micro-propagation is a better option to manage the YLD.
- ❑ Mechanization of sugarcane cultivation including harvesting needs to be popularized in order to solve the problem of labour shortage and to reduce the cost of production.
- ❑ Incentive on drip irrigation is suggested for efficient use of water resources.

Views of ISMA:

1. Operational Efficiency issues

- Total 46 installed sugar mills (with 1, 54,750 tcd capacity), while 43 sugar mills are operational from last 3 years (1, 48,500 tcd operational), with 14 cooperative mills & 32 private mills.
- Total 202 lac tonnes of average sugarcane crush with an average 180 days of cane crushing period. State having 62% of avg. drawl out of total average of 328 lac tonnes of cane production. State 25 -30 lac tonnes cane goes to gur & khandsari.
- The total capacity to crush is 267 lac tonnes by mills; it signifies the 75% of operational efficiency in state sugar mills.

- State sugar mills have only 9 Ethanol producers with 380 KL per day installed capacity & 27 cogen unit with 514MW production. By-products generation have good scope in state.

2. **Sugarcane Cultivation issues**

a) **Soil issues.**

- Sugarcane planted on sandy loam soil which cover maximum area under sugarcane require 40 irrigations In state major crop rotation is of paddy-groundnut, paddy-pulses & paddy-sugarcane which cause salinity & alkalinity in soil.
- Maximum state soil has iron deficiency.

b) **Seed issues.**

- Quality seed production or seed farm concept is less in the state.

c) **Crop management issues.**

- Labour cost is very high i.e. Rs.30- Rs.60/qtl for harvesting. More flowering in sugarcane is retard the yield of plant. Ratoon yield 20 ton/hac lesser as compare to plant, but still farmers opt for 2-3 ratoon crops. This is due to improper management on ratoon crop. Dependency on monsoon is higher by farmers.
- Intercropping in sugarcane is very less & it is only with Turmeric.

SUGGESTIVE STEPS IN IMPROVISING THE CURRENT SITUATION:

1. Sugarcane planting has to be promoted in such a manner that crops grand growth phase should coincide with the onset of monsoon, which increases the yield & recovery.
2. Less flowering sugarcane varieties should be promoted as state have high flowering occurrence varieties.
3. Ratoon productivity should be improved by making trash mulching, harvesting at soil level, timely fertilizer dosage etc.
4. Red rot & smut resistance variety should promote i.e. Co99004, Co2001-13, Co94008, co2001-15.
5. Drip irrigation should be promoted more, which help farmer's to manage the water properly & dependency on monsoon can come down.
6. The research institute should develop appropriate crop production & crop protection technologies without increasing the cost of cane production.

Uttarakhand

Views of SBI, Coimbatore:

Sugarcane is an important cash crop of Uttarakhand. Sugarcane is cultivated on about 1.1 lakh hectare area, which is subject to abiotic stresses like pre-monsoon drought, heat, salinity, alkalinity and water logging stresses, biotic stresses like red rot, wilt, shoot borer, root borer, white grub, top borer, stalk borer and tarai borer which generally limit its productivity. The average cane productivity in the state is around 60 t/ha.

Major problems:

- Lack of high yielding and better quality varieties
- Slow replacement of old varieties (major area under CoS 767 and CoSe 92423)
- Lack of proper seed production and distribution system in sugarcane
- Improper varietal balance – Low area under early maturing varieties (26% approximately during 2011-12)
- Prevalence of abiotic (water logging) and biotic stresses
- Non availability of P and K fertilizers
- Low drawl rate
- Increase in area under poplar plantation
- Lack of soil testing facilities

Steps to improve cane yield and sugar recovery:

- ☐ Strengthening of sugarcane research activities
- ☐ Better performing new Co varieties (Co 98014, Co 0118, Co 0238, Co 0239), developed at Sugarcane Breeding Institute, Regional Centre, Karnal (Haryana) may be approved for cultivation in the state which will provide scope for improvement in cane yield and sugar recovery. There is need to exploit the potential of these varieties in the state for the benefit of farmers and sugar mills.
- ☐ There is need to strengthen the seed production system in the state.

Healthy seed production programme can be implemented either through MHAT treatment or through micro-propagation. On the basis of present area under sugarcane in Uttarakhand state, 55 ha area under MHAT treated seed will be sufficient in each of 3 zones of every sugar factory (on average area basis) to cover the entire sugarcane area under quality seed in a span of 3 years. A few farmers may be identified in each village as seed growers by providing sufficient incentives for encouragement.

One or two Tissue culture labs may be established in the state for faster multiplication of new varieties as well as healthy seed production.

- ☐ There is need to strengthen the extension activities in the state for desirable sugarcane development.

The problem of reducing the area under other varieties including rejected varieties (about 15 % during the year 2011-12), varietal balance, i.e. increasing area under early maturing varieties and faster replacement of old varieties with new high yielding varieties could be tackled by efficient extension activities in the state for desirable sugarcane development.

- ❑ Farmers are leaving sugarcane cultivation and going for poplar plantation, which more remunerative. Efforts need to be made to increase the income of farmers through intercropping.
- ❑ Soil testing lab may be established in each factory, which would help in use of balanced fertilizers as per the recommendations.

Views of ISMA:

1. Operational Efficiency issues

- State having total installed 10 sugar mills and out of that 9 sugar mills are operation in last year. The installed tcd is 44500 in which only 38250 tcd is under working in 2012- 13. Total avg. sugarcane crush is 38 lac tonnes with 110 days of an average cane crushing period.
- State has 58% drawl % out of total 65 lac tonnes of sugarcane production.
- Total sugarcane crush is 38 lac tonnes with the total tcd is about 42 lac tonnes, so there is 90% operational efficiency from 110 days of crushing operations. However, to increase the operational efficiency state needs to focus on areas like - increase the cane yield, increase the drawl % & by minimizing the diversion of cane to Gur & Khandsari units.
- State sugar mills only have 1 installed cogen plant with an electricity generation of 28MW. So there is huge opportunity of by-products in the state.
- There is only one player in Uttarakhand i.e IGL (Indian Glycols ltd) of ethanol production which invites maximum quantity of Molasses from state sugar mills, which creates monopolistic market trends.

2. Sugarcane Cultivation issues

- Varietal mix is not consistent with economic length of crushing season, as the mix is 3:7:0 ratio in Early: Mid: Late respectively in state.
- Late application of nitrogenous fertilizer & higher application of Reagent on sugarcane crop also reduces recovery%.
- Other prominent issue in sugarcane cultivation like- deficit in organic carbon level in soil, no appropriate crop rotation, tree plantation like poplar accentuated to yield & productivity reduction in the state.
- Certain pocket in state where water logging is also an issue.
- Late application of fertilizer to cane i.e. beyond Grand growth phase or not timely application of fertilizer dosage, is hampering the yield. It actually happens due to non timely payment of cane arrears to farmers by sugar mills.

3. Research & Development issues

- Seed multiplication centre will be set-up by state government initiative, so that farmers can easily assessable to HYV seeds.
- Lack of state level soil testing laboratory.
- Variety trial & new development activities are only confined to sugar mills.
- Lack of extension work activities & information dissemination.

SUGGESTIVE STEPS IN IMPROVISING THE CURRENT SITUATION:-

To address the state issues, ISMA is suggesting couple of way forwards in terms of three tier strategy:-

SHORT TERM STRATEGY - (6 months - 1 yr)

1. Seasonal plantation balance should be in 3:4:3 ratio of Early: Mid: Late respectively.
2. Increase the drawl from 58% to 80% by stopping the slippage of sugarcane which goes to Gur production.
3. Variety replacement i.e CoS 767 & CoSe 92423, as these varieties are covering 60% of area & giving lower yield & recovery.
4. Preparation of soil health maps for state, so judicious use of inputs can be done.

MEDIUM TERM STRATEGY - (1 yr - 3 yr)

1. Cull-out only 4-5 HYV and do promotions/ propagation through state govt. / Industry machinery, varieties like Cos 8436, CoS 88230, CoS 8432 should be promoted as having good yield & good sucrose.
2. Subsidized the soil health kits, mobile boot van to sugarcane farmers through SDF loans.
3. Satellite mapping to earmark the potential area of the sugarcane in state & individual mills command area to get the correct acreage assigned to them for sugarcane procurement.
4. Promote Cogen & distillery production.
5. Promote local entrepreneurship for mechanization at sugarcane field level.
6. Promote seed farm concept in the state either providing subsidy to farmers or by the sugar mills.

LONG TERM STRATEGY - (3 yr - 6 yr)

1. Establishment of autonomous state level institute for releasing and multiplying new HYV seeds.

WAY FORWARDS:-

- Strategies are to be build up for enhancing the area and yield under sugarcane with respect to control the diversion of cane to other part which help in revival of sugar mills in state.
- More focused be on byproduct realization so that the sugar mills are better acquainted with resource utilization.
- Timely monitoring the progress of the sugarcane varieties with best working in particular area & strategically implementing the work with state govt/ state level cane development bodies/sugar mills. To appraise the situation on timely interval. This group shall meet on every quarter to build consensus and forward their request to central level body to extend their support on it.

Views of IISR, Lucknow

Constraints in Sugarcane & Sugar Productivity in Uttarakhand

The State of Uttarakhand is agro-climatically very suitable for maximizing sugarcane production with improved sugar recovery. Out of total 13 districts in the state, sugarcane intensively cultivated in 3 plain districts namely, Haridwar, Dehradun and Udham Singh Nagar. Sugarcane statistics in the state is given here as under:

Sugarcane	India	Uttarakhand
1.Area (Lakh ha)	50.8	1.08
2.Production (lakh tones)	3479	61.30
3.Average yield(t/ha)	67	60.73
4.Sugar Production (Lakh tones)	244.9	3.03

There are 10 sugar mills in the state which are mentioned as under:

Private sugar mills (04)	Coop. sugar mills (04)	State run corporation sugar mills (02)
1.Kashipur	1.Nadehi	1.Doiwala
2.Liberhedi	2.Sitarganj	2.Kiccha
3.lkbalpur	3.Bajpur	
4.Laxar	4.Gadarpur	

Haridwar district having 03 private sugar mills(Liberhedi, lkbalpur andLaxar) has the maximum area under sugarcane (53736 hal followed by U.S. Nagar (Kiccha, Nadehi, Sitarganj, Bajpur and Kashipur) and Dehradun (Doiwala) with 06 and 01 sugar factories, respectively.

Constraints in Sugarcane and Sugar Production in the State

- 1) Very low-to-low availability of soil organic carbon (on an average: 0.28%).
- 2) Imbalanced application of fertilizers: farmers, generally apply only nitrogenous fertilizers. Do not apply P and K fertilizers as per recommendation.
- 3) Availability of P and K fertilizers: Low to medium.
- 4) Late application of nitrogen i.e. beyond June which reduces sugar' accumulation in cane plants.
- 5) Late and fairly high dose application of "Regent" insecticide (Fipronil @ 40-45 kg/ha as against 10-15 kg/hal which impedes maturity of cane thus reduces the accumulation of sugar in cane plants.
- 6) Wide spread deficiency of micronutrients particularly Zn and S.
- 7) Most of the cane fields in the state are waterlogged and moreover, during maturity phase farmers generally irrigate the crop to have more cane weight. This drastically hinders sugar accumulation in cane plants.
- 8) Supply of stale cane to sugar factories is very common.
- 9) High pH (>) of soils leading to alkaline condition which has adverse affect on growth and sucrose content.

10) Sugarcane cultivation with old and degenerated varieties".

- a) CoS 767 = 60-65%
- b) CoP 97222 = 7-8%
- c) CoS 8436 = 20%
- d) CoS 97264 = 10%
- e) CoSe 92423 = 10-15%

Scientists from IISR, Lucknow have extensively surveyed the cane area in the state and have reported the wide spread incidence of diseases (red rot, smut and wilt) and insect pests (termite, shoot borer, top borer, internode borer, pyrilla etc.) due to waterlogged soils and adoption of old and degenerated cane varieties. Such canes not only produce lower cane yield but also reduce sugar recovery drastically. Secondary inoculums of certain diseases have also been seen in the soils of this zone.

11) Faulty cropping systems being followed by the farmers.

- a) Sarson - Sugarcane (10%)
- b) Cane after cane (60%)
- c) Wheat late cane (30%)

12) Burning of cane trash in some areas, this leads to poor soil health and crop yield.

13) Recently, farmers have started growing poplar with sugarcane. This hampers the growth and yield of cane drastically.

14) Ratoon management practices are not followed.

15) Non-availability of P and K fertilizers to farmers in the planting season.

Uttar Pradesh

Views of SBI, Coimbatore:

Sugarcane is an important cash crop of UP. Sugarcane is cultivated on about 22.5 lakh hectare area, which is subject to abiotic stresses like pre-monsoon drought, heat, salinity, alkalinity and water logging stresses, biotic stresses like red rot, wilt, shoot borer, root borer, white grub, top borer, stalk borer and tarai borer which generally limit its productivity. The average cane productivity in the state is around 55 t/ha.

Major problems:

- Lack of high yielding and better quality varieties
- Lack of proper seed production and distribution system in sugarcane
- Continuation of old and rejected varieties (12.5% of total area)
- Slow replacement of old varieties {major area (about 61%) under CoS 767 and CoSe 92423}
- Improper varietal balance – Low area under early maturing varieties (8.9% approximately during 2011-12)
- Summer planting of sugarcane after harvest of wheat
- Prevalence of abiotic (water logging and water stress) and biotic stresses (diseases and insect-pests)
- Imbalance use of fertilizers – excessive and late use of N fertilizers
- Non availability of P and K fertilizers
- Lack of soil testing facilities
- More time between harvest and crushing resulting in staling of canes
- Increase in area under poplar plantation particularly in Western UP

Steps to improve cane yield and sugar recovery:

- ❑ Strengthening of sugarcane research and development activities in the state
- ❑ Better performing new Co varieties (Co 98014, Co 0118, Co 0238, Co 0239), developed at Sugarcane Breeding Institute, Regional Centre, Karnal (Haryana) have been approved (during June 2012) for cultivation in the Western and Central UP will provide scope for improvement in cane yield and sugar recovery. There is need to exploit the potential of these varieties by faster seed multiplication in the state for the benefit of farmers and sugar mills.
- ❑ There is need to strengthen the seed production system in the state.

Healthy seed production programme can be implemented either through MHAT treatment or through micro-propagation. A few farmers may be identified in each village as seed growers by providing sufficient incentives for encouragement.

One Tissue culture lab may be established for each group of 5 to 6 sugar factories for faster multiplication of new varieties as well as healthy seed production.
- ❑ There is need to strengthen the extension activities in the state for desirable sugarcane development.

The problem of reducing the area under other varieties including rejected varieties (about 12.5 % during the year 2011-12), varietal balance, i.e. increasing area under early maturing varieties and faster replacement of old varieties with new high yielding varieties could be tackled by efficient extension activities in the state for desirable sugarcane

development. It is suggested that each factory may have a strong Research and Development Unit.

- ❑ Area under summer planting (i.e. after harvest of wheat) needs to be reduced by sowing wheat crop by FIRB method and planting sugarcane in standing wheat crop during February. This technology has already been demonstrated in UP, Haryana and Punjab. Incentives may be given to the farmers following this technique.
- ❑ Cane supplying bonding on the pattern of Haryana state may be introduced to reduce the diversion of cane to jaggery and khandsari units.
- ❑ Reducing the area under rejected varieties in phased manner as factories continue to pay for rejected varieties for more than 10 years. Difference in rate of recommended and rejected varieties may also be increased to more than Rs. 20/q from the existing Rs. 5/q. Another option is to pay FRP for rejected varieties instead of SAP after 2 – 3 years.
- ❑ Farmers are leaving sugarcane cultivation and going for poplar plantation, which is more remunerative. Efforts need to be made to increase the income of farmers through intercropping.
- ❑ Soil testing lab may be established in each factory, which would help in use of balanced fertilizers as per the recommendations.
- ❑ Cordial coordination among scientists – government agencies – sugar factories – farmers.
- ❑ Long term reservation of areas (about 10 years) to sugar factories for proper development of sugarcane in the allotted areas.
- ❑ Maturity based harvesting.
- ❑ Reduction in time from harvesting to crushing and avoiding piecemeal harvesting.

Views of ISMA:

1. Operational Efficiency issues

- Out of the total installed 158 sugar mills (with 7.96 lac tcd) only 121 sugar mills are operational (7.35 lac tcd operational). Total average sugarcane crush is 653 lac tonnes with an average 115 days cane crushing period. This shows average tcd in UP is about 6000 per mill. State having 53% of avg. drawl out of total average 1230 lac tonnes of cane production. Diversion of the cane from sugar mills is the main concern.
- Total avg. sugarcane crush is 653 lac tonnes with the total capacity to crush is 831 lac tonnes. So there is 78% operational efficiency comes from the mills. State sugar mills have only 54 installed cogen plant with electricity generation of 960MW, 27 Ethanol producers with 2106 KL per day installed capacity. So there is huge opportunity of by- products in the state.

2. Sugarcane Cultivation issues

- State having 9% area in early sowing, 78% in mid late sowing & 13% area in rejected variety. So the crushing period is limited to few months only. Major cane comes together with huge pressure of crushing & obstructs the maturity & recovery. This also actually happens due to limited period availability of labour for harvesting and other operations.
- Varietal mix is not consistent as the mix is 1:9:0 ratios in Early: Mid: Late respectively in state. Varietal plantation is not appropriate as per their maturity period & seasonal time, so the farmers have less sucrose rich varieties.
- Eastern zone in the state have water logging & flooding issue.
- Rejected varieties covering 15% of the total area in state & in 2013-14 one more major

variety comes under rejected category i.e. CoSe 92423 variety, which having 28 % area in the state. Once it is included in rejected variety list, total acreage of sugarcane under rejected varieties will reach to the level of 40% sugarcane. Due to lesser differentials cane rates among approved and rejected varieties actually substantiating rejected variety plantation in the state.

- Late application of fertilizer to cane i.e. beyond Grand growth phase or not timely application of the fertilizer dosage is hampering the yield, it all happen due to non-timely payment of cane prices to farmers.

3. Research & Development issues

- Uptill now only State research institute at Shahjahanpur, UP, is authorized to release the variety, is also actually restrained the growth and introduction of new varieties in the state.
- Seed multiplication centre to make the HYV which can assessable by farmers, which is actually not present in the state as a separate entity.
- Lack of extension work activities & information dissemination.

SUGGESTIVE STEPS IN IMPROVISING THE CURRENT SITUATION:-

To address the state issues, ISMA is suggesting couple of way forwards in terms of three tier strategy:-

SHORT TERM STRATEGY – (6 months – 1 yr)

1. Seasonal plantation balance should be in 3:4:3 ratio of Early: Mid: Late respectively. So that sugarcane comes through-out the season with full maturity & improved recoveries, moreover farmers also get regular cash, fodder for their animals, and farmers can do intercropping in better way.
2. Increase the drawl from 53% to 75% by stopping the slippage of sugarcane which goes to Gur & khandsari production. As state have 23000 odd Gur & khandsari units which crushes approximately 40 -45 million tonne of sugarcane every year.
3. Variety replacement i.e. CoS 8102, Bo 91, Co 1148 & CoSe 91269 as these varieties are rejected by state but still these varieties are covering good % of area & giving lower yield & recovery.

MEDIUM TERM STRATEGY – (1 yr – 3 yr)

1. Cull-out only 4-5 HYV and do promotions/ propagation through state govt. / Industry , varieties like CoS 767, CoS 8432, CoSe 95423 etc, should be promoted as having good yield & good sucrose.
2. Subsidized the soil health kits, mobile boot van to sugarcane farmers through SDF loans.
3. Promote Cogen & distillery production more as state has huge byproduct potential.
4. Promote local entrepreneur-ship for mechanization at sugarcane field level.
5. Promote seed farm concept in the state either providing subsidy to farmers or by the sugar mills.
6. Establishment of autonomous state level institute for releasing and multiplying new HYV seeds.

WAY FORWARDS: -

- Modules are to be build up for enhancing the drawl % & yield with respect to control the diversion of cane to Gur & Khandsari which actually diverted 35% of total cane production in state. This help to increase the crushing period of sugar mills and more production of sugar. Majority of gur production actually goes to local liquor production to the neighboring states
- More focus should be given on byproduct realization so that the sugar mills are better acquainted with resource utilization.

Views of IISR, Lucknow:

Uttar Pradesh in the sub-tropical zone is an important sugar belt of Northern India accounting for > 35% of the total sugarcane output of India. Despite the high acreage and production of cane in Uttar Pradesh, it lags behind in terms of average productivity and sugar recovery. Compared to the tropical zone, the cane yield and sugar recovery are low in this region. The acreage of sugarcane in U.P. was 44.2% (2.25 Million ha) of the national sugarcane acreage (5.09 Million ha) in 2011-12. During the ensuing season (2012-13) the sugarcane acreage in U.P. has further increased to 45.8% (2.42 Million ha) of the national sugarcane acreage (5.28 Million ha). The average sugarcane yield in U.P. is around 59 tonnes/ha, which is much below the national average of 69 tonnes/ha. Similarly, sugar recovery in U.P. was around 9.2% as against national average of 10.25%.

Uttar Pradesh's sugar industry has evolved, from a leading producer of sugarcane as well as sugar, prior to independence, going through a decline during the 1960s and then staging a comeback during the 1990s, all set to reclaim its rightful position in the sugar map of the nation. At present, the sugar mills are functioning in all the three sectors. There are a total of 125 operational sugar mills situated in 38 districts and drawing cane from 44 major cane growing districts of the state. The large scale modernization of the private sugar mills compared to the other sectors have resulted in a much higher average crushing capacity in the state. 30% of the sugar units and 25% of the sugar output of the country is concentrated in Uttar Pradesh. With almost 85% of the gur and khandsari units of the country in its kitty, the state produces about 50% of the gur and khandsari in India. Thus there is tremendous scope for growth in this state with respect to the sugarcane and sugar production and the related products.

Sugar sector in Uttar Pradesh has been facing several constraints, apart from those related to the cultivation aspects. In India sugar industry is one among the most highly regulated sectors which to some extent has been challenging to the industry. This is apart from the cyclic nature of the industry emanating from the fluctuations in the sugar and sugarcane production. The situation is not different in Uttar Pradesh too, where the government policies and price fluctuations determine to a great extent, the final sugarcane and sugar production. The low cane productivity and sugar recovery needs arises due to a variety of reasons ranging from constraints in the field situations to those inside the sugar mills. The main constraints faced by the farmers can be grouped as (i) those specific to the sugarcane crop and its management (ii) those related to policy issues.

A. Crop-specific issues

- ❖ **Varietal imbalance:** On an average only 10 % of the varieties cultivated in the state are early maturing while the rest 90% falls in the category of mid-late varieties. This has serious and lasting impact on sugar recovery of the state. A recent survey by IISR revealed that a few

sugar mills have only less than 4% area under early maturing varieties. Further, area under autumn planted cane is low.

- ❖ **Prevalence of old and de notified varieties:** Cultivation of rejected/denotified varieties by the farmers invariably leads to a reduced productivity, ultimately resulting in low sugar recovery. Rejected varieties were found to occupy major area 25-40 % in many mills. Varieties like CoSe 92423, CoS 91269 and CoS 767 have already deteriorated but still occupy a sizeable area in UP. These have poor productivity and low sucrose content.
- ❖ **Non availability of quality seed and use of unhealthy/improper seed material:** Healthy seed forms the most important component for a good crop and there- by, for a high yield and sugar recovery. In the present set up there is not much of an organized practice of proper distribution of healthy seed material. Proper varietal replacement practices are also not in place to ensure that healthy seeds of recommended varieties are being used by the farmers.
- ❖ **Improper agronomic practices including application of sub-optimal inputs-** In Uttar Pradesh, nearly 70% of the sugarcane farming community has small/marginal farm holdings. This results in a situation where optimal level of inputs is not being provided to the crop. There are complaints that fertilizers/nutrients/ insecticides supplied to farmers are of poor quality. This may lead to nutrient deficiency which in turn reflects on the final output, i.e., cane productivity and recovery.
- ❖ **Deteriorating soil health:** Recent survey by IISR shows a decline in soil nutrient status, with organic C content less than 0.3% in many areas, which is an important factor leading to low cane productivity. Deficiency in micronutrients like Cu and Zn is also prevalent in many soils. Green manuring is almost negligible.
- ❖ **Incidence of pests and diseases and their changing dynamics:** Insect pests form a major cause of yield and recovery losses in sugarcane. In Uttar Pradesh, infestation of sugarcane crop by borers, pyrilla, white grubs etc. have been reported during different period. Top borers, early shoot borers, internode borers etc. are prevalent in Eastern and western parts of the state. Serious white grub infestation has been reported in this crop in western U.P. On an average 15-20% losses have been estimated due to insects. Change in insect dynamics due to climatic aberrations is also a cause of concern. Delayed monsoon rains and prevailing high temperature incidences of early shoot borer and mealy bug were noticed affecting several sugarcane areas of western districts of Uttar Pradesh. Diseases like red rot and GSD are other problems leading to reduced cane productivity. Increasing incidence of GSD in most of the cane growing areas is causing concern.
- ❖ **Low ratoon productivity:** Poor productivity of ratoons and yield reduction in successive ratoons are serious problems in UP due to poor management and almost no nutrient application. This is apart from the varietal differences for ratooning potential as well as for sustaining productivity over several ratoons.
- ❖ **Frequent climatic aberrations during crushing period :** Frequent climatic aberrations due to Western disturbances is an important reason contributing to low sugar recovery. It has been generally observed that during the present crushing season, the mean minimum temperature and relative humidity was higher in Uttar Pradesh. The mean minimum temperature during February and March 2013 in Balrampur Chini Mill, Babhan area were 13.76°C and 17.23°C respectively compared to corresponding months during 2011-'12. Similarly relative humidity in this area was higher during this season (89.35% and 86.57% in January and February 2013 as against 74.45% and 63.22 % during the corresponding months of 2012), thus adversely affecting sugar accumulation. This has resulted in a reduction in sugar recovery by approximately 0.5%. The relative humidity reported from Haidargarh Chini Mill, Haidargarh shows values ranging from 82.18 % during November 2012 to 93.77 % and 89.32 % respectively during January and February 2013 showing a reduction in mean sugar recovery of upto 0.78% (8.78 % in February 2013 as compared to

9.56% in January 2012). Areas like Saharanpur experience frosty conditions during ripening, contributing to reduced sugar recovery.

- ❖ **Climatic aberrations during growing period:** Sugarcane being a long duration crop is subjected to extremes of temperature. In summers the temperature reaches upto 40-45°C while the winter temperatures may fall as low as 5°C or below. These extremities will invariably have an effect on the cane productivity and recovery.
- ❖ **Abiotic stress:** Area specific stress like water logging, drought, non-availability of irrigation, salinity have major impact on cane productivity and sugar recovery in many areas.
- ❖ **Cane after cane:** Taking continuous crops of sugarcane is also one reason for the lower cane productivity. This contributes to soil health deterioration thereby bringing down the productivity.
- ❖ **Late-planted cane:** In Uttar Pradesh, especially in Western UP, the practice of late planting of sugarcane after wheat harvest is prevalent. It is estimated that 3.0 lakh hectares (14 %) of sugarcane area in the country is under Wheat - Sugarcane - Ratoon - Wheat system. More than 2/3rd of the sugarcane area in western U.P. and 10-14 % in other sub-tropical states are covered by this system. A drastic reduction (30-50 %) in sugarcane yield is a common feature when sugarcane is planted late (summer) after the harvest of wheat crop. Due to the shorter duration, sugar accumulation and sugar recovery are also adversely affected.
- ❖ **Post-harvest losses:** The cut-to crush delay is a major contributing factor for low sugar recovery under sub-tropical conditions, esp. in the state of Uttar Pradesh. A recent study of IISR showed that over 1.0 unit loss in pol% cane takes place from harvest to milling stage, this is a serious issue. Some degenerated varieties in the eastern UP like CoSe 92423 Vs CoS 91269 have tendency to deteriorate faster due to dextran formation and rapid inversion.
- ❖ **Improper harvesting schedule:** An improper harvesting schedule leads to immature canes being harvested and crushed early in the season, along with mature ones. A proper schedule would be to harvest ratoon (early crop), autumn planted cane, plant (early crop), ratoon (midlate), and then spring planted cane. A change in this schedule leads to low productivity and more importantly low sugar recovery.
- ❖ **Short growth period:** The sugarcane in the sub-tropical zone is characterized by a comparatively shorter grand growth period compared to that available in sub-tropical zone. This results in availability of less time for growth and sugar accumulation which may result in low recovery.
- ❖ **Poor winter sprouting:** Low temperature during the period of December- January results in poor sprouting of ratoons and autumn planted crop under the low temperature conditions. This is bound to have an effect on the crop stand and growth, ultimately leading to low productivity and recovery.
- ❖ **Gaps in technology adoption by farmers:** A well-oiled technology transfer system needs to be in place so that the technologies generated in the laboratories are effectively transferred to the farmers. Many a times the sugarcane farmers are not aware of the latest technologies due to which out-dated agronomic practices, varieties etc. are being adopted by them. Needless to say, this has an effect on the final yield and sugar recovery.
- ❖ **Excessive extraneous matter in the cane supplies:** Due to labour shortage and low level of mechanization, trash and binding material percentage in cane have increased drastically. In some cases more than 10% trash enters into tandem.

B. Policy Issues:

- **Piece-meal harvesting:** This is one of the major lacunae in the sugarcane supply management which impact cane productivity and sugar content. Irregular supply of harvest parcels to the farmers result in piece-meal harvesting (and to improper harvesting schedule). This may even result in immature cane being harvested at early stages. This is an important policy constraint that invariably lowers the productivity and sugar recovery in the crop.
- **Diversion of quality canes to Gur-Khandsari units:** The diversion of quality cane by farmers to these units is also one major factor that results in the lower productivity of raw sugar. Thus, to some extent, these units may be responsible for the lower availability of cane for raw sugar production.

Strategies to overcome the constraints for low cane productivity and recovery:

- Proper varietal planning to increase the area under early maturing varieties. Ideally, the area under early maturing varieties needs to be 40-50% of the total area under cane.
- A shift in emphasis from localized UP bred varieties to CVRC recommended varieties with better adaptability and resistances to abiotic and biotic stresses.
- A gradual replacement of rejected / denotified varieties with high yielding early maturing stress tolerant varieties like CoLk 94184, CoLk 9709 etc.
- Area under autumn planted cane should be increased.
- Strengthening of seed production programme with emphasis on use of healthy seed material and proper varietal replacement. The use of MHWT /HWT needs to promote for a healthy crop stand.
- Development of varieties suited to the changing climatic situations with their full package of agronomy.
- Proper agronomic practices to be followed including planting methods, irrigation schedule, integrated nutrient management and use of bio- fertilizers etc.
- Adoption of integrated disease and pest management strategies including bio-control techniques.
- Proper harvesting schedule which will help in maturity-based harvesting.
- Minimizing cut-to-crush delay thereby reducing the post-harvest losses. Use of other post-harvest management practices like suitable chemicals may also be adopted.
- Scientific ratoon management practices including timely ratoon initiation, appropriate inputs and use of mechanical devices such as RMD/ Ratoon Manager developed by IISR will greatly help in improving ratoon productivity.
- Adoption of mechanization for ensuring timely operations in the field. Water efficient and water saving devices will improve productivity and minimize cost of production.
- Development of a strong transfer of technology system for ensuring effective transfers and proper adoption of technologies.

Apart from the technological and other" interventions, certain policy issues can help in improving the cane productivity and sugar recovery. Better access to financial assistance for farmers, easy and quick payment to farmers, access to quality seeds and plant protection chemicals, soil testing and other services, subsidy to small and marginal farmers, imparting trainings on improved management practices etc. are some examples. Even though there are programmes which cater to the needs to the sugarcane farmers, more intensive efforts are needed in this direction for addressing the problems.

Overall perspective from ISMA

- Encouragement to ISMA/ NFCSF's farm level programmes /initiatives on the varietal development, identification and propagation by respective State Governments
- We are all aware that on average sugarcane ratoon lasts just about 1 year, except in a few cases where the ratoon lasts for two years also. However, the productivity of the ratoon drops significantly even in the first year, discouraging the farmers to continue with ratoon thereafter. We are aware that increase in the length of ratoon would reduce the costs of the farmers as well as the need for the farmers to decide every second year on whether they need to continue with sugarcane or shift to some other crop. Therefore, a longer ratoon would not only reduce costs but reduce the cyclicity in sugarcane production. Therefore, there needs to be specific recommendations on technology and adequate farm practices for ratoon management which will improve the sugarcane productivity and sucrose content.
- In order to improve the returns of farmers from same plot of land, lot of farmers in the country have adopted inter-cropping along with sugarcane. The results have been excellent with several crops. This inter-cropping has become more and more important since plot size is not only already small but is reducing day by day.
- In the Northern part of the country, the age and duration of the sugarcane crop is generally 9-10 months only as compared to 13-14 months in Maharashtra. Due to the lower age/duration of the crop, the sugarcane productivity as well as sugar recovery have been noted to be on the lower side, adversely affecting both the farmers and millers. Therefore, there is need to strategize to either develop varieties which give faster growth and sucrose formation or educate farmers to increase the duration/age of the crop.
- Ensure that the harvesters are developed in India, which are suitable to the Indian conditions. Plot sizes are not only smaller in size, but prevailing planting pattern in India is also different. Recommend on subsidies from the States as well as the Central Government and SDF loan for purchase of harvesters. Need strategy to develop the harvesters suited for the Indian conditions and incentives to be provided by the Central and State Governments.
- Need to also recommend on other irrigation schemes apart from drip irrigation, like tubewell boring, deepening of well, water harvesting system etc. especially in areas with better water availability. We need to also recommend for specific subsidy schemes on these irrigation systems.
- There is no doubt that there is need to check unreasonable increase in sugarcane prices by the State Governments because it is only making the Indian sugar industry uncompetitive. Therefore, the urgent need to link sugarcane price to sugar price as recommended by the Rangarajan Committee.

You would be aware that earlier, two loans could be availed by a sugar factory individually for both modernization/expansion of capacity and cane development. But the Central Government has recently decided to give only one loan for each of these purposes. Concessional loans can increase developmental activities of sugarcane, and, therefore, the Committee should strongly recommend that two loans each for modernization/expansion and sugarcane development should be reintroduced from SDF.

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This report would have not taken the shape, but for continuous words of wisdom from Shri Sudhir Kumar, Secretary (F & PD).

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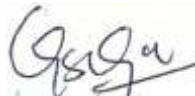
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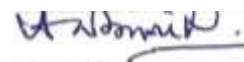
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