ANSWERS TO PARLIAMENT QUESTIONS

Answer to Lok sabha Starred Question No. 1406

Sub: Question raised by Shri Ashk Ali Tak regarding encouragement for sugarcane production

a) Whether Government has formulated any scheme to promote sugarcane production to contain the continuous rise in the prices of sugar

Yes

b) If so, the details thereof;

Sugarcane Breeding Institute, Coimbatore is conducting research to develop improved high yielding, high sugared varieties of sugarcane with the following mandate:

i) Breeding of superior sugarcane varieties / genotypes having higher sugar productivity as well as sustainability and to assist State sugarcane breeding programmes

ii) To conduct basic and strategic researches on crop improvement, production and protection aspects of sugarcane cultivation

iii) Collection, maintenance, evaluation, documentation and conservation of sugarcane/ *Saccharum* species genetic resources

iv) Effecting technology transfer, consultancy and human resource development in the areas of sugarcane agricultural research

Several research projects are in progress to develop high yielding, high sugared varieties with tolerance to biotic and abiotic stresses and develop necessary crop production and crop protection technologies besides transferring the technologies to the end users. New sugarcane varieties with higher productivity were released from Sugarcane Breeding Institute and their cultivation was promoted. The quality breeder seed of the popular varieties and the new varieties were supplied for periodical replacement of planting material to prevent varietal degeneration.

The details of the new varieties from the Institute released in the last three years is given in the table below:

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Variety</th>
<th>Year of release</th>
<th>Cane yield t/ha</th>
<th>Sucrose % juice</th>
<th>Maturity group</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>North West Zone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Co 0118 (Karan-2 )</td>
<td>2009</td>
<td>78.20</td>
<td>18.45</td>
<td>Early</td>
<td>Resistant to red rot. Tolerant to drought and water logging.15.70% improvement in cane yield and 3.07% improvement in sucrose % over CoJ 64.</td>
</tr>
<tr>
<td>2</td>
<td>Co 0238</td>
<td>2009</td>
<td>81.08</td>
<td>18.0</td>
<td>Early</td>
<td>Moderately resistant to red rot and resistant to wilt and smut. Tolerant</td>
</tr>
</tbody>
</table>
to drought, water logging and low temperature. Non-lodging.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>2010</th>
<th>79.23</th>
<th>18.58</th>
<th>Early</th>
<th>17.22 % improvement in cane yield and 3.80% improvement in sucrose over CoJ 64. Tolerant to drought and water logging. Resistant to red rot, smut and wilt.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2010</td>
<td>75.71</td>
<td>18.44</td>
<td>Midlate</td>
<td>MR to red rot. Tolerant to water stress, water logging and low temperature conditions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2012</td>
<td>82.47</td>
<td>18.00</td>
<td>Midlate</td>
<td>MR to red rot, tolerant to low temperature conditions</td>
</tr>
<tr>
<td>North Central Zone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Co 0232</td>
<td>2009</td>
<td></td>
<td></td>
<td>Early</td>
<td>Resistant to red rot. Waterlogging tolerant</td>
</tr>
<tr>
<td>7</td>
<td>Co 0233</td>
<td>2009</td>
<td></td>
<td></td>
<td>Midlate</td>
<td>14.91 % improvement in cane yield and 12.14 % for CCS over BO 91. Resistant to red rot and water logging</td>
</tr>
<tr>
<td>Peninsular Zone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Co 2001-13 (Sulaabh)</td>
<td>2009</td>
<td>108.6</td>
<td>19.03</td>
<td>Midlate</td>
<td>High tillering with good ratoonability. Tolerant to drought and salinity. Moderately resistant to red rot and smut. A1 quality jiggery</td>
</tr>
<tr>
<td>9</td>
<td>Co 2001-15</td>
<td>2009</td>
<td>108.18</td>
<td>18.09</td>
<td>Midlate</td>
<td>Tolerant to drought and salinity. Moderately resistant to red rot and smut. A1 quality jiggery</td>
</tr>
<tr>
<td>10</td>
<td>Co 0218</td>
<td>2010</td>
<td>104.53</td>
<td>20.63</td>
<td>Midlate</td>
<td>Moderately resistant to red rot and smut. Tolerant to drought and salinity. A1 quality jaggery</td>
</tr>
<tr>
<td>11</td>
<td>Co 94012</td>
<td>2010</td>
<td>92.85 t/ha</td>
<td>19.82</td>
<td>Early</td>
<td>Resistant to smut, tolerant to salinity, drought. Susceptible to red rot. Released for Maharashtra and Karnataka</td>
</tr>
<tr>
<td>12</td>
<td>Co 92005</td>
<td>2011</td>
<td></td>
<td></td>
<td>Midlate</td>
<td>Very good quality jaggery. Released for Maharashtra.</td>
</tr>
</tbody>
</table>
c) If not, the reasons thereof ; and

Not applicable

d) The details of production and consumption of sugar during last three years:

<table>
<thead>
<tr>
<th>Year</th>
<th>Sugar Production in ml. tonnes</th>
<th>Sugar consumption in lakh tonnes</th>
<th>Gur &amp; Khandsari consumption in lakh tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008-09</td>
<td>145.39</td>
<td>23.000</td>
<td>10.792</td>
</tr>
<tr>
<td>2009-10</td>
<td>18.912</td>
<td>21.000</td>
<td>7.312</td>
</tr>
<tr>
<td>2010-11 (P)</td>
<td>24.394</td>
<td>20.736</td>
<td>5.994</td>
</tr>
</tbody>
</table>

Source: Cooperative Sugar, June 2012 Vol. 43 No.10

Answer to Lok sabha Question No. Dy.No. 5679A

Sub: Regarding availability Drought Seeds raised by Shri Rajendra Agrawal, Dr. P.Venugopal, Shri Dinesh Chandra Yadav, Shri RajivRanjan Singh alias Lalan Singh and Shri Mangutta Srinivasulu Reddy.

a) Whether the Government has recently released drought resistant seeds of various crops to combat drought like situation in the country

Yes

b) If so, the details thereof crop-wise

Details of drought tolerant sugarcane varieties released during the last three years from Sugarcane Breeding Institute

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Variety</th>
<th>Year of release</th>
<th>Parentage</th>
<th>Cane yield (t/ha)</th>
<th>Sucrose % juice</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>North West Zone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Co 0118 (Karan-2)</td>
<td>2009</td>
<td>Co 8347 x Co 86011</td>
<td>78.2</td>
<td>18.6</td>
<td>Early maturing, red rot resistant, performs well under waterlogging conditions also. Suitable for autumn planting also</td>
</tr>
<tr>
<td>2</td>
<td>Co 0238</td>
<td>2009</td>
<td>CoLk 8102 x Co 775</td>
<td>81.08</td>
<td>18.0</td>
<td>Early maturing, resistant to red rot, wilt and smut diseases, good winter sprouting potential.</td>
</tr>
<tr>
<td>3</td>
<td>Co 0239 (Karan-6)</td>
<td>2010</td>
<td>Co 93016 GC</td>
<td>79.23</td>
<td>18.6</td>
<td>Early maturing, red rot resistant, tolerant to drought and waterlogging.</td>
</tr>
<tr>
<td>4</td>
<td>Co 0124 (Karan-5)</td>
<td>2010</td>
<td>Co 89003 GC</td>
<td>75.71</td>
<td>18.4</td>
<td>Midlate variety, moderately resistant to red rot, tolerant to drought and waterlogging.</td>
</tr>
<tr>
<td>5</td>
<td>Co 05011</td>
<td>2012</td>
<td>CoS 8436 x Co 89003</td>
<td>82.47</td>
<td>18.0</td>
<td>Midlate variety and resistant to red rot</td>
</tr>
</tbody>
</table>

Peninsular zone
c) The Agricultural Universities / Institutes involved in developing such seed and seeds released during last one year crop-wise?

Sugarcane Breeding Institute

Answer to Lok sabha Starred Question Dy.No. 6534

Sub: Question raised by Shri Gopal Singh Sekhawat regarding Research Work by ICAR

a. Whether the Indian Council of Agricultural Research has proposed comprehensive changes in the research work keeping in view the guidelines of the World Trade Organisation

Yes

b. If so, the details thereof along with the nature of changes in research work

The Intellectual property rights of the technologies including plant varieties are being protected as per the relevant laws. For IP protection of extant varieties and new varieties of sugarcane developed at the Institute applications were made with the PPV & FR Authority for their registration. The derived germplasm of sugarcane is being registered with NBPGR. The exchange of germplasm is done under Material Transfer Agreement and as per the provisions in the Biodiversity Act.

- The new project proposals are also examined in detail with reference to WTO guidelines / IP rights
- Scientists are also encouraged to apply for patents for new technologies / products / processes which have commercial potential and are marketable.
- Besides these, no other comprehensive change in the research work is envisaged.

c. The reaction of the Government in this regard?

Not pertaining to the Institute
Answer to Lok sabha Question raised during Zero Hour

Sub: Matter raised in Lok Sabha during zero hour for establishment of Sugarcane Research Station in Narsinghpur district (M.P.) – reg.

- In Madhya Pradesh at Powarkheda (Hoshangabad District), near to Narsinghpur, the Zonal Agricultural Research Station under Jawaharlal Nehru Krishi Viswa Vidyalay (JNKVV), Jabalpur is actively engaged in sugarcane research including breeding. Being a centre of AICRP on sugarcane, scientists from this centre participate in the fluff supply programme by making crosses in the National Hybridization Garden facility at Sugarcane Breeding Institute (SBI), Coimbatore for developing location specific sugarcane varieties for the region. Being a centre for multi-location testing of varieties in the Peninsular zone under AICRP on sugarcane, all the new promising varieties contributed by the research stations across the Peninsular region, including those varieties from SBI, Coimbatore are being tested at Powarkheda and superior varieties are identified.
- So, it is not necessary to have a substation of Sugarcane Breeding Institute at Narsinghpur (M.P.) as the Zonal Research Station at Powerkheda can very well cater to the needs of sugarcane farmers of Narsinghpur.
- Besides, opening substations of Sugarcane Breeding Institute in every state is not feasible for operational reasons.

Answer to Lok sabha Provisional Starred Question Dy No. 5193

Sub: Regarding Sugarcane Farming raised by Dr. Kirit Premjibhai Solanki

a) whether the government has any special schemes or plans to promote sugarcane farming, if so the details there of

b) whether any study has been conducted to increase the output of sugarcane; and Sugarcane varieties with higher productivity are being developed at Sugarcane Breeding Institute.

c) if so; the major findings thereof and the Government's reactions thereto?

A number of improved high sugar varieties have been developed by Sugarcane Breeding Institute and State Research Stations with high productivity and better adaptability suited for different parts of the country. Adoption of these varieties will improve the productivity and rate of recovery in the country. Details of the improved varieties released from SBI are given below:
### Improved sugarcane varieties released from Sugarcane Breeding Institute during 2009 - 2011

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Year of release</th>
<th>Name of variety</th>
<th>Zone</th>
<th>Salient features</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2009</td>
<td>SULABH (Co 2001-13)</td>
<td>Peninsular</td>
<td>A midlate maturing, high yielding clone (108.59 t/ha) and with 19.03% sucrose with good ratooning potential, Moderately resistant to red rot and smut and tolerant to drought.</td>
</tr>
</tbody>
</table>
| 2      | 2009            | Co 2001-15      | Peninsular | A midlate maturing, high yielding clone (103.74 t/ha) with good ratooning potential, Moderately resistant to red rot and smut and tolerant to drought. Sucrose % is 18.9, fibre 14.7 %.
<p>| 3      | 2009            | KARAN-2 (Co 0118) | North-west | Early maturing variety released recently combining high yield (78.20 t/ha) and quality (sucrose 18.88 %). A red rot resistant and drought tolerant clone. |
| 4      | 2009            | KARAN-3 (Co 0238) | North-west | Early maturing variety released recently combining high yield (81.08 t/ha) and quality (sucrose 18.20 %). Drought tolerant, red rot resistant clone with winter sprouting potential. |
| 5      | 2009            | Co 94012        | Maharashtra and Karnataka | High yielding high quality variety (Sucrose % 21.35) with drought, salinity and smut resistance. The variety has thick, greenish pink canes with heavy spines and flowers profusely. Highly susceptible to red rot. |
| 6      | 2009            | Co 0232         | North-central | This early maturing variety was released for cultivation in North Central zone in 2009. It recorded 67.82 t/ha of cane yield, 7.83 t/ha of CCS and 16.51 % of sucrose at 300 days in AICRP trials. Co 0232 is resistant to red rot and tolerant to water logging conditions. |
| 7      | 2009            | Co 0233         | North-central | It is a midlate variety with cane yield of 67.77 t/ha CCS yield 8.25 t/ha and sucrose % of 17.54. This is a red rot resistant variety suitable for cultivation in North Central and North East zones. It is tolerant to water logging and performed well under water logging. |
| 8      | 2010            | Co 0218         | Peninsular | This midlate variety is with cane yield 103.77 t/ha, sucrose % 20.79 at 12 months and fibre 14.7 %. Co 0218 possesses A1 quality jaggery and is a good ratooner with excellent field stand, with erect tall and thick canes. Moderately resistant to red rot. It is |</p>
<table>
<thead>
<tr>
<th>Sl. No</th>
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<th>Zone</th>
<th>Salient features</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>2010</td>
<td>KARAN-5 (Co 0124)</td>
<td>North-west</td>
<td>It is a midlate maturing variety with cane yield 75.71 t/ha, Sucrose % 18.22 % at 12 months and with fibre 12.65 %. It is a non-lodging and non-flowering early clone. It performs better than the standard even under water stress and water logging conditions. This variety is tolerant to low temperature conditions.</td>
</tr>
<tr>
<td>10</td>
<td>2010</td>
<td>KARAN-6 (Co 0239)</td>
<td>North-west</td>
<td>This early variety for North-west zone is with 79.23 t/ha cane yield and 18.58 % sucrose at 10 months. The jaggery is of A1 quality with light yellow colour. This variety is resistant to red rot. It is a non-lodging and non-flowering early cane. It performs better than the standard even under water stress and water logging conditions.</td>
</tr>
<tr>
<td>11</td>
<td>2011</td>
<td>Co 92005</td>
<td>Peninsular</td>
<td>Cane yield: 163.00 t/ha, Sucrose %: 20.01 Early, Susceptible to red rot and resistant to smut. It was released in Maharashtra. This variety gives the best quality jaggery among the existing varieties and fetches a premium price in the market for its high quality.</td>
</tr>
</tbody>
</table>

- The variety Co 86032 developed by this Institute is the ruling variety in Tamil Nadu occupying nearly 90% of the cane area. This variety also occupies 40-50% area in Maharashtra and Karnataka and substantial areas in Gujarat and interior Andhra Pradesh. This variety has helped the farmers to realize higher cane yields.
- Production of healthy seed has been identified as a major input factor for improving the productivity and seed production activities are in progress at different Central and State Institutes. Three tier seed nursery programme developed to continuously provide disease free seed canes to improve productivity. Facilities for genetic fidelity testing and virus indexing of tissue culture plants using molecular techniques were developed at Sugarcane Breeding Institute to test the quality of tissue culture plants to be used as breeder seed.
- Improved agronomic practices such as drip irrigation, wide row spacing, integrated nutrient management, use of bio-fertilizers and organic manures, trash mulching, organic recycling, amendments to reclaim alkali soils and deep trench system of planting for early, drought and late waterlogged conditions, chemical weed control, mechanization of farm operations besides integrated pest and disease management are being recommended to improve sugarcane productivity.
An integrated nutrient management involving chemical fertilizers, organics – enriched press-mud or bio-compost or FYM and bio-fertilizers was developed for sugarcane which resulted in saving of 25% chemical fertilizers besides improving soil health for sustaining the higher productivity.

Drought management practice to improve the productivity comprising of trash mulching, foliar spray of urea + potash @ 2.5% each during formative phase and additional potash application @ 60 kg/ha at the onset of the drought was found suitable for mitigating the drought and improving the productivity.

Sugarcane based intercropping systems have been developed to improve the total productivity and profitability per unit area under tropical and sub-tropical conditions

Better ratoon management: Agro techniques for multiple ratooning without any yield reduction are being standardized. Research is in progress to identify varieties suitable for multiple ratooning.

Integrated diseases and pest management practices had been developed for major diseases and pests of sugarcane.

**Answer to Rajya Sabha Starred Question Dy No. S.6723**

Sub: Rajya Sabha Question Dy No. S.6723 by Shri Bhagath Singh Koshayari regarding development of highly fertile seeds.

a. Whether Government has any plan for developing variety of highly fertile seeds of different crops:

   **Not Applicable**

b. If so, details of highly fertile seeds developed by ICAR during last one year:

   One sugarcane variety, Co 92005, developed at Sugarcane Breeding Institute was notified in 2011 for commercial cultivation in Maharashtra.

   Two new sugarcane varieties, Co 0237 for Punjab, Haryana, UP and Uttarakhand (North West zone) and Co 0403 for Maharashtra, Gujarat, Karnataka, and interior Tamil Nadu and Andhra Pradesh (Peninsular zone) were identified for release in 2011 and release proposals were submitted.

c. Whether highly fertile seed including wheat and maize are being developed abroad only:

   New sugarcane varieties with higher productivity potential is being developed in the Country.

d. If so, the reasons for ICAR being unable to develop such seeds in the country:

   **Not Applicable**
e. The steps being taken for expanding the research activities for preventing the adulteration of transgenic seeds and improving the quality of the seeds in the country for protecting the interest of the farmers.

No sugarcane varieties from abroad are under commercial cultivation in the country and no transgenic varieties were released for commercial cultivation.

**Answer to Lok sabha Starred Question Dy No. 4508**

Sub: Question by Shri N. Chaluvaraya Swamy regarding Quality of Sugarcane

**a. The sucrose content of our sugarcanes**

Range of sucrose content in various regions of India - In the subtropical region, the sucrose % juice of sugarcane varieties ranges from 17 % to 19 %. In the tropical region, the sucrose % juice varies from 18.0 % (Co 94008) to 21.5 % (Co 94012).

**b. The R & D done to increase sucrose content and thereby increase quantity of sugar from indigenous source as this would contribute in arresting the continuous price rise:**

R & D work is being done to increase sucrose content in sugarcane varieties. New varieties are being developed at Sugarcane Breeding Institute, Coimbatore with increased sucrose content by hybridization and clonal selection along with other desirable traits. Most of the presently cultivated varieties are high sugar types. The details of improved varieties released in recent years by SBI Coimbatore are given below.

### Improved sugarcane varieties released from Sugarcane Breeding Institute during 2009 - 2011

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Year of release</th>
<th>Name of variety</th>
<th>Zone</th>
<th>Salient features</th>
</tr>
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<td>KARAN-2 (Co 0118)</td>
<td>North-west</td>
<td>Early maturing variety released recently combining high yield (78.20t/ha and quality (sucrose 18.88 %). A red rot resistant and drought tolerant clone.</td>
</tr>
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<td>KARAN-3 (Co 0238)</td>
<td>North-west</td>
<td>Early maturing variety released recently combining high yield (81.08 t/ha) and quality (sucrose 18.20%). Drought tolerant, red rot resistant clone with winter sprouting potential.</td>
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</tbody>
</table>
c) The FAO / Internationally accepted sucrose content in the sugarcane?

FAO has not prescribed any standards regarding sucrose content for sugar cane.

d) Whether special quality of seeds are available which ensure maximum sucrose content;

Quality of seed material is not likely to affect the sucrose content; as sucrose content is primarily a varietal character. However, the Institute is producing Breeder’s seed (tissue culture plants and seed cane at Coimbatore and seed cane at Karnal) for supply to sugar industry and farmers for further multiplication and supply of good quality seed to cane growers.

e. Whether the Government proposes to launch awareness campaign to sugar-cane growers for Resorting to better seeds and adopting latest sugarcane technologies to enhance sugar output Qualitatively and quantitatively?

The Institute conducts Sugarcane R & D meetings in Tamil Nadu and Karnataka every year involving the sugar factories in these two states, wherein the breeder seed production by different agencies is reviewed. The Sugarcane Research and Development workers meetings also serve as a forum in which information about the new sugarcane varieties and related technologies are given to the cane development personnel through whom the messages are trickled down to cane growers.

Awareness campaigns are also being organized by the institute in villages to make the farmers aware of available sugarcane technologies.

Kisan Melas are organized in the institute as well as its Regional Centre at Karnal to reiterate the importance of the latest technologies to boost the sugarcane productivity.

Training programs for farmers on ‘Sugarcane production technology’ are being regularly conducted in the institute to impart information on the latest technologies.

Farmers visiting the institute are also advised to grow sugar rich high yielding varieties and use quality seed material for increased productivity and thereby higher sugar output.
Answer to Lok sabha Starred Question Dy No. 9429

Sub: Regarding Sugarcane Production.

a) The production of sugarcane registered during each of the last three years and the current year along with the area under its cultivation, State-wise.

Area, Production and Productivity of sugarcane in India

<table>
<thead>
<tr>
<th>Year</th>
<th>Area '000 ha</th>
<th>Sugarcane production (million tons)</th>
<th>Yield t/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008-09</td>
<td>4415</td>
<td>285.029</td>
<td>64.6</td>
</tr>
<tr>
<td>2009-10</td>
<td>4175</td>
<td>292.302</td>
<td>70.0</td>
</tr>
<tr>
<td>2010-11*</td>
<td>4944</td>
<td>339.168</td>
<td>68.6</td>
</tr>
<tr>
<td>2011-12</td>
<td>5026</td>
<td>342.197</td>
<td>68.1</td>
</tr>
</tbody>
</table>

Source: Cooperative Sugar Vol 43 (4), Dec 2011
- Provisional

Area, production and productivity of sugarcane in major sugarcane growing states of India

<table>
<thead>
<tr>
<th>STATE</th>
<th>2009-10</th>
<th>2010-11*</th>
<th>2011-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area in '000 ha</td>
<td>158</td>
<td>192</td>
<td>180</td>
</tr>
<tr>
<td>Prod in '000 tons</td>
<td>11708</td>
<td>14784</td>
<td>14040</td>
</tr>
<tr>
<td>Yield in t/ha</td>
<td>74.1</td>
<td>77.0</td>
<td>78</td>
</tr>
<tr>
<td>Gujarat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area in '000 ha</td>
<td>154</td>
<td>188</td>
<td>177</td>
</tr>
<tr>
<td>Prod in '000 tons</td>
<td>12400</td>
<td>14240</td>
<td>13015</td>
</tr>
<tr>
<td>Yield in t/ha</td>
<td>80.5</td>
<td>75.7</td>
<td>73.5</td>
</tr>
<tr>
<td>Karnataka</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area in '000 ha</td>
<td>337</td>
<td>421</td>
<td>440</td>
</tr>
<tr>
<td>Prod in '000 Tons</td>
<td>30443</td>
<td>37595</td>
<td>39710</td>
</tr>
<tr>
<td>Yield in t/ha</td>
<td>90.3</td>
<td>89.3</td>
<td>90.3</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area in '000 ha</td>
<td>62</td>
<td>65</td>
<td>81</td>
</tr>
<tr>
<td>Prod in '000 Tons</td>
<td>2535</td>
<td>2667</td>
<td>2859</td>
</tr>
<tr>
<td>Yield in t/ha</td>
<td>40.8</td>
<td>41.0</td>
<td>35.1</td>
</tr>
<tr>
<td>Maharastra</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area in '000 ha</td>
<td>756</td>
<td>964</td>
<td>1022</td>
</tr>
<tr>
<td>Prod in '000 Tons</td>
<td>64159</td>
<td>78838</td>
<td>83416</td>
</tr>
<tr>
<td>Yield in t/ha</td>
<td>84.9</td>
<td>81.8</td>
<td>81.6</td>
</tr>
<tr>
<td>Orissa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area in '000 ha</td>
<td>8</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Prod in '000 Tons</td>
<td>490</td>
<td>903</td>
<td>608</td>
</tr>
<tr>
<td>Yield in t/ha</td>
<td>61.2</td>
<td>68.7</td>
<td>61.8</td>
</tr>
</tbody>
</table>
## 2009-10 | 2010-11* | 2011-12
---|---|---
Tamilnadu | Area in '000 ha | 293 | 336 | 286
| Production in '000 Tonnes | 29746 | 34292 | 30030
| Yield in t/ha | 101.5 | 102.0 | 105.0

Bihar | Area in '000 ha | 116 | 300 | 246
| Prod in '000 Tons | 5033 | 15000 | 11447
| Yield in t/ha | 43.4 | 50.0 | 46.5

Haryana | Area in '000 ha | 74 | 85 | 106
| Prod in '000 Tons | 5335 | 5987 | 7102
| Yield in t/ha | 72.1 | 70.4 | 67.0

Punjab | Area in '000 ha | 60 | 70 | 85
| Prod in '000 Tons | 3700 | 4170 | 5100
| Yield in t/ha | 61.7 | 59.6 | 60.0

Uttar Pradesh | Area in '000 ha | 1977 | 2125 | 2184
| Prod in '000 Tons | 117140 | 120555 | 123901
| Yield in t/ha | 59.3 | 56.7 | 56.7

All India | Area in '000 ha | 4175 | 4944 | 5026
| Prod in '000 Tons | 292302 | 339168 | 342197
| Yield in t/ha | 70.0 | 68.6 | 68.1

**Source:** Cooperative Sugar. Vol 43(4), December 2011

* Provisional

b) The average yield of sugarcane in the country as compared to the average world yield:

<table>
<thead>
<tr>
<th>Year</th>
<th>India</th>
<th>World</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean of last 3 years (2007-2009)</td>
<td>69.0</td>
<td>73.0</td>
</tr>
</tbody>
</table>

c) Whether the movement propose to increase the quality and production of sugarcane;

Yes, Research work is on-going at Sugarcane Breeding Institute, Coimbatore for improving quality and productivity of sugarcane by developing new varieties and developing appropriate crop production and protection technologies and their transfer..

d) If so, the details thereof?
<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Year of release</th>
<th>Name of variety</th>
<th>Zone</th>
<th>Salient features</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2009</td>
<td>SULABH (Co 2001-13)</td>
<td>Peninsular</td>
<td>A midlate maturing, high yielding clone (108.59 t/ha) and with 19.03% sucrose with good ratooning potential, Moderately resistant to red rot and smut and tolerant to drought.</td>
</tr>
<tr>
<td>2</td>
<td>2009</td>
<td>Co 2001-15</td>
<td>Peninsular</td>
<td>A midlate maturing, high yielding clone (103.74t/ha) with good ratooning potential, Moderately resistant to red rot and smut and tolerant to drought. Sucrose % is 18.9, fibre 14.7 %.</td>
</tr>
<tr>
<td>3</td>
<td>2009</td>
<td>KARAN-2 (Co 0118)</td>
<td>North-west</td>
<td>Early maturing variety released recently combining high yield (78.20t/ha and quality (sucrose 18.88 %). A red rot resistant and drought tolerant clone.</td>
</tr>
<tr>
<td>4</td>
<td>2009</td>
<td>KARAN-3 (Co 0238)</td>
<td>North-west</td>
<td>Early maturing variety released recently combining high yield (81.08 t/ha) and quality (sucrose 18.20%). Drought tolerant, red rot resistant clone with winter sprouting potential.</td>
</tr>
<tr>
<td>5</td>
<td>2009</td>
<td>Co 94012</td>
<td>Maharashtra and Karnataka</td>
<td>High yielding high quality variety (Sucrose % 21.35) with drought, salinity and smut resistance. The variety has thick, greenish pink canes with heavy spines and flowers profusely. Highly susceptible to red rot.</td>
</tr>
<tr>
<td>6</td>
<td>2009</td>
<td>Co 0232</td>
<td>North-central</td>
<td>This early maturing variety was released for cultivation in North Central zone in 2009. It recorded 67.82 t/ha of cane yield, 7.83 t/ha of CCS and 16.51 % of sucrose at 300 days in AICRP trials. Co 0232 is resistant to red rot and tolerant to water logging conditions.</td>
</tr>
<tr>
<td>7</td>
<td>2009</td>
<td>Co 0233</td>
<td>North-central</td>
<td>It is a midlate variety with cane yield of 67.77 t/ha, CCS yield 8.25 t/ha and sucrose % of 17.54. This is a red rot resistant variety suitable for cultivation in North Central and North East zones. It is tolerant to water logging and performed well under water logging.</td>
</tr>
<tr>
<td>8</td>
<td>2010</td>
<td>Co 0218</td>
<td>Peninsular</td>
<td>This midlate variety is with cane yield 103.77 t/ha, sucrose % 20.79 at 12 months and fibre 14.7 %. Co 0218 possesses A1 quality jaggery and is a good ratooner with excellent field stand, with erect tall and thick canes. Moderately resistant to red rot. It is</td>
</tr>
</tbody>
</table>
tolerant to drought and salinity

9 2010 KARAN-5 (Co 0124) North-west It is a midlate maturing variety with cane yield 75.71 t/ha, Sucrose % 18.22 % at 12 months and with fibre 12.65 %. It is a non-lodging and non-flowering early clone. It performs better than the standard even under water stress and water logging conditions. This variety is tolerant to low temperature conditions.

10 2010 KARAN-6 (Co 0239) North-west This early variety for North-west zone is with 79.23 t/ha cane yield and 18.58 % sucrose at 10 months. The jaggery is of A₁ quality with light yellow colour. This variety is resistant to red rot . It is a non-lodging and non-flowering early cane. It performs better than the standard even under water stress and water logging conditions.

11 2011 Co 92005 Peninsular Cane yield: 163.00 t/ha, Sucrose %: 20.01 Early, Susceptible to red rot and resistant to smut. It was released in Maharashtra. This variety gives the best quality jaggery among the existing varieties and fetches a premium price in the market for its high quality.

e). The measures taken by the Government to promote sugarcane cultivation and to provide prices of sugarcane in commensurate with the prices of sugar.

Not applicable to the Institute.

Answer to Lok sabha Question

Sub: Material to DAC for Lok Sabha Question to be replied on 20.3.2012- regarding

Details of sugarcane varieties from the Institute released for commercial cultivation during the last 5 years (2007-2011)

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Year of release</th>
<th>Name of variety</th>
<th>Zone</th>
<th>Salient features</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2007</td>
<td>DAMODAR (Co 99004)</td>
<td>Peninsular</td>
<td>Cane yield 116.82 t/ha, sucrose % 19.21. MR to red rot, drought tolerant, golden yellow jaggery, thick, tall and erect canes with non flowering. Average sugar yield of 16.09 t/ha.</td>
</tr>
<tr>
<td>2</td>
<td>2007</td>
<td>KARAN-1( Co 98014)</td>
<td>North-west</td>
<td>Early maturing with 76.29 t/ha cane yield, sucrose 17.59%, tolerant to drought and waterlogging and resistant to red rot and smut.</td>
</tr>
<tr>
<td>Year</td>
<td>Variety Code</td>
<td>Region</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>--------------</td>
<td>--------</td>
<td>-------------</td>
<td></td>
</tr>
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<p>| 2009 | KARAN-2 (Co 0118) | North-west | Early maturing variety released recently combining high yield (78.20 t/ha and quality (sucrose 18.88 %). A red rot resistant and drought tolerant clone. |
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| 2009 | Co 0232 | North-central | This early maturing variety was released for cultivation in North Central zone in 2009. It recorded 67.82 t/ha of cane yield, 7.83 t/ha of CCS and 16.51 % of sucrose at 300 days in AICRP trials. Co 0232 is resistant to red rot and tolerant to water logging conditions. |
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<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Year</th>
<th>Variety</th>
<th>Zone</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>2010</td>
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</tr>
<tr>
<td>12</td>
<td>2010</td>
<td>KARAN-6 (Co 0239)</td>
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<td>This early variety for North-west zone is with 79.23 t/ha cane yield and 18.58 % sucrose at 10 months. The jaggery is of A1 quality with light yellow colour. This variety is resistant to red rot . It is a non-lodging and non-flowering early cane. It performs better than the standard even under water stress and water logging conditions.</td>
</tr>
<tr>
<td>13</td>
<td>2011</td>
<td>Co 92005</td>
<td>Peninsular</td>
<td>Cane yield: 163.00 t/ha, Sucrose %: 20.01 Early, Susceptible to red rot and resistant to smut. It was released in Maharashtra. This variety gives the best quality jaggery among the existing varieties and fetches a premium price in the market for its high quality.</td>
</tr>
</tbody>
</table>

**Answer to Lok sabha Starred Question No. 15205**

Sub: Regarding Casual labourers at Sugarcane Breeding Institute, Coimbatore raised by Shri. P.R. Natarajan, Hon'ble Member of Parliament (Lok Sabha)

a. Whether Sugarcane Breeding Institutes having daily wage Casual Labourers as Farm Workers and if so, number of workers working on date (Institute-wise)

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Institute/ Centre</th>
<th>No. of Daily wage casual labourers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Sugarcane Breeding Institute (SBI), Coimbatore (Tamil Nadu)</td>
<td>Nil</td>
</tr>
<tr>
<td>2.</td>
<td>SBI, Regional Station, Karnal (Haryana)</td>
<td>16</td>
</tr>
<tr>
<td>3.</td>
<td>SBI, Research Centre, Kannur (Kerala)</td>
<td>Nil</td>
</tr>
<tr>
<td>4.</td>
<td>SBI, Research Centre, Agali (Kerala)</td>
<td>Nil</td>
</tr>
</tbody>
</table>

b. Whether the Casual labourers (Grant of Temporary Status and Regularisation) Scheme of Govt. of India 1993 has been implemented in respect of all daily wage casual labourers?

Yes, the Casual labourers (Grant of Temporary Status and Regularisation) Scheme of Government of India, 1993 has been implemented in respect of all daily wage casual Labourers in Coimbatore. However, at SBI Regional Centre, Karnal (Haryana), the sixteen Casual labourers being engaged for farm work on daily wages on the prescribed Minimum Wages Act (Government of India/State Government approved rates) do not
satisfy the conditions to become eligible for granting Temporary Status, i.e. (i) the workers should have been on the rolls on 01-09-1993 (ii) the workers should have completed 240 days during the preceding one year period before 01-09-1993.

c. If so, the details thereof (Institute-wise / year-wise separately)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Institute/Centre</th>
<th>Temporary Status Scheme</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of DPLs Granted TSL</td>
<td>Effective from 01-09-1993</td>
<td>Year of implementation</td>
</tr>
<tr>
<td>1.</td>
<td>SBI, Coimbatore (Tamil Nadu)</td>
<td>134</td>
<td>01-09-1993 17-03-1995 --</td>
</tr>
<tr>
<td>2.</td>
<td>SBI, Coimbatore (Tamil Nadu)</td>
<td>141</td>
<td>01-09-1993 14-07-2011 As per Hon’ble Madras High Court judgment</td>
</tr>
<tr>
<td>3.</td>
<td>SBI, Regional Station, Karnal (Haryana)</td>
<td>NIL</td>
<td>-- -- -- --</td>
</tr>
<tr>
<td>4.</td>
<td>SBI, Research Centre, Kannur, (Kerala)</td>
<td>2</td>
<td>01-09-1993 17-03-1995 Both TSL retired</td>
</tr>
<tr>
<td>5.</td>
<td>SBI, Research Centre, Agali, (Kerala)</td>
<td>NIL</td>
<td>-- -- -- --</td>
</tr>
</tbody>
</table>

d. Action taken in the Sugarcane Breeding Institute, Coimbatore (Tamil Nadu) in regard to Daily Wage Casual Labourers in pursuance of Honourable High Court Madras Judgment W.P. No.17847 of 1997 dated 28.06.10.

In pursuance of the Hon’ble High Court, Madras judgment in Writ petition No. 17847 of 1997 dated 28-06-2010, 141 (One hundred and forty one) Casual labourers were granted Temporary status with effect from 1.9.93 and the Office Order was issued on 14.7.2011 with the following benefits thereof:

- Wages at daily rates with reference to the minimum of the pay scale for a corresponding regular group D official including Dearness Allowance, House Rent Allowance and City Compensatory Allowance and any other allowances as per Pay Commission recommendations applicable during the relevant period.
- Benefits of increments at the same rate as applicable to a Group D employee would be taken into account for calculating pro-rata wages for every one year of service subject to performance of duty for at least 240 days (206 days in administrative office observing 5 days week) in the year from the date of conferment of temporary status.
- Leave entitlement will be on a pro-rata basis at the rate of one day for every 10 days of work.
- Casual or any other kind of leave, except maternity leave, will not be admissible. They will also be allowed to carry forward the leave at their credit on their regularization. They will not be entitled to the benefits of encashment of leave on termination of service for any reason or on their quitting service.
- Maternity leave / Paternity leave as admissible to regular Group D employees will be allowed.
- 50% of the service rendered under Temporary Status would be counted for the purpose of retirement benefits after their regularization.
- Temporary Status Casual Labourers are eligible for the grant of Festival advance / Flood advance on the same conditions as are applicable to temporary Group D
employees, provided they furnish two sureties from permanent Govt. servants of
the Institute.
♦ Until they are regularized, they would be entitled to Ad-hoc bonus only at the
rates as applicable to casual labourers.
♦ Notional increments for the period from 1.9.1994 to 1.9.2000 have been granted
to them as per rules and their pay on 1.12.2000 i.e., the date of their re-
engagement as per the interim orders of the High Court in the above mentioned
Writ Petition is based on the increment earned by the respective labour on

Answer to Lok sabha Starred Question PQ Dy.No 7757

Sub: Regarding availability of food grains raised by Smt. Jaya Prada and other MP’s

a. Whether the weather related disruptions have resulted in international sugar
prices prevailing at a 30 year high in International market;
Yes. International sugar prices in the global markets are determined by the current
sugar stock and production forecast of world sugar. FO Licht recently lowered its
estimate for world sugar production in the 2010-11 season to 165.1 million metric
tons but remained hopeful of a bumper crop from key producer India. The Germany-
based analyst downgraded expectations for output from top producer Brazil by
500,000 tons to 40 million tons after dryness hampered cane development.
Production in Australia is also expected to fall short of expectations at 3.6 million
tons, down 800,000 tons from the analyst’s October estimate, after torrential rains
battered Queensland’s crop. The sugar production in 2010-11 is expected to be at
about 24.5 million tonnes (Economic Survey 2010-11). Sugar stocks are already at a
two-decade low after two seasons of drawdown. Hence, raw sugars prices are
hovering near a 30-year high after weather problems in several key producers have
dashed hopes for a production surplus this year.

b. If so, whether Food and Agricultural Organization (FAO) has put out an alert
that the wheat crop in China may fail because of sub normal winter rain;
Not relevant to this institute

c. If so the details thereof and the reaction of Government thereto;
Not relevant to this institute

d. Whether the increased buying of staples including wheat, rice and other
commodities in huge quantities is putting further pressure on food prices;
Not relevant to this institute

e. If so, the details thereof; Not relevant to this institute

f. Whether in the past twenty years while approximately 300 million people have
been brought above the poverty line an increase in population by 300 million
during the same period necessitates that one billion more have to be provided
food in 2011 juxtaposed against 1990;
Not relevant to this institute

g. And if so, the details thereof and the action plan formulated by the
Government to tackle this problem?
Not relevant to this institute
**Answers to Queries by Parliamentary Standing Committee**

**Question:** What would be the comparative percentage loss of production, if the differences in areas under cultivation during 2002-03 and 2009-10 are also factored in, for sugarcane and cotton?

**Answer:**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>At</td>
<td>Area under sugarcane during 2002-03</td>
<td>million hectare</td>
</tr>
<tr>
<td>A0</td>
<td>Area under sugarcane during 2009-10</td>
<td>million hectare</td>
</tr>
<tr>
<td>Pt</td>
<td>Production of sugarcane in 2002-03</td>
<td>million tonnes</td>
</tr>
<tr>
<td>P0</td>
<td>Production of sugarcane in 2009-10</td>
<td>million tonnes</td>
</tr>
<tr>
<td>Yt</td>
<td>Productivity in 2002-03</td>
<td>t/ha</td>
</tr>
<tr>
<td>Y0</td>
<td>Productivity in 2009-10</td>
<td>t/ha</td>
</tr>
</tbody>
</table>

\[
\text{At} = 4.52 \text{ million hectare} \\
\text{A0} = 4.202 \text{ million hectare (provisional)} \\
\text{(At-A0) Decline in Area} = 0.318 \text{ million hectare (At – A0)} \\
\text{Pt} = 287.38 \text{ million tonnes} \\
\text{P0} = 277.75 \text{ million tonnes} \\
\text{Decline in Production} = 9.63 \text{ million tonnes} \\
\text{Yt = 63.6 t/ha} \\
\text{Y0 = 66.1 t/ha} \\
\text{(Yt-Y0) = 2.5 t/ha} \\
\]

The Percentage loss in production can be partitioned as the following effects:

- % loss in production due to decline in area = \(-211.34\)% for constant yield \\
  \((-20.352 / 9.63 \times 100)\)
- % gain in production due to increase in yield = \(+117.34\)% for constant area \\
  \((11.30 / 9.63 \times 100)\)
- % loss in production due to the interaction between Area effect and Yield effect = \(-6.00\)%.
- % total loss in production between the 2 periods = \(-100\)%

So, it can be inferred that there is a loss to the extent of 6% in production due to the combined effect of reduced crop area and increased productivity (yield) in Sugarcane between the periods 2002-03 and 2009-10.

**Information for the DAC-ICAR**

**Sub: regarding Information for the DAC-ICAR**

1. **What is the Package of practices for Ring Pit Technology in Haryana**
   - Circular pits of 60 cm diameter are dug to a depth of 30 cm with a tractor mounted digger.
   - 60 cm gap is provided between adjacent pits on all sides. There will be about 2700 pits per acre.
   - Before planting, each pit is filled to a depth of 15 cm with a mixture of loose soil and 5 kg FYM, 45 g DAP & 45 g urea. P & K are applied based on soil test.
   - 22 two-budded setts are placed in one pit and covered with soil to a height of 1-1½”. Setts may be treated with 0.1% carbendazim.
   - Chlorpyriphos @ 5 litres per hectare is applied at the time of planting in pits to control termite and early shoot borer.
• Provide light irrigation in pits. Avoid flooding of pits as it results in re-filling of pits by loose soil and reduces germination. The pits may be interconnected for proper irrigation.
• Hoeing is done to break soil crest and to ensure good germination.
• During March - April or as and when the settlings attain 1 feet height, the pits are filled with 25 g urea per pit + some soil removed from the edge of the pits. During June end or before the onset of monsoon, apply 25 g urea/pit + 4.5 g phorate 10 G or Carbofuron 3 G and fill the pits with soil and do earth-up.
• Control weeds as when required.
• Propping is done 2-3 times during Aug, Sep and Oct.
• Harvest the crop at ground level.
• Immediately after harvest, apply 45 g DAP+45 g urea in each pit and irrigate to get better ratoon crops. It is possible to take 2-3 ratoons.
• Under the local condition of Haryana, cane yield of 220 t/ha of variety Co 89003 was reaped in pit planting as against 72 t/ha of state average.
• Varieties like Co 0238 and Co 0239 have recorded higher cane yield in ring pit planting as compared to CoS 8436 and CoJ 85.
• Ring pit system uses less water. The water use efficiency can be further improved by installing drip irrigation in the system.

2 Whether early high sugar varieties having the capabilities of good ratooning ability are recommended for cultivation? If so names of such varieties may be provided for different regions.

Co 98014, Co 0118, Co 0238 and Co 0239 are the early maturing high sugar varieties with good ratooning potential. Co 98014 and Co 0238 also have the ability to sprout when harvested during winter (winter ratoonability). All these varieties were released by the CVRC for commercial cultivation in North Western Zone.

3 Management practices for enhancing sugarcane productivity in water logging areas, particularly in U.P. and Bihar.

Sugarcane Breeding Institute Regional Centre, Karnal has not worked on this aspect. However, the available information is furnished below.

• Grow tolerant varieties: BO 91, UP 9530 and CoSe 96436 are the recommended varieties for water logging conditions of north Bihar and eastern Uttar Pradesh. Co 98014, Co 89029 and Co 0238 can also be grown under water logging condition.
• Early planting of sugarcane in autumn season or up to February would help in attaining considerable height and vigour by the time flooding occurs, which would avoid significant losses due to water logging.
• It is suggested that setts should be planted deep and earthing up should be done as the crop grows.
• Planting systems should be selected on the basis of nature and extent of water-logging. Ring system of planting where setts are placed deep in pits and cover with soil gradually as the crop grows, serves both these purposes. Trench method proved superior to the other methods because cane roots in trench system penetrated deep into the soil which prevented lodging. Lodging was less under raised-beds and ridges than in the flat-beds.
• Normally 38 to 40 thousand healthy three-bud setts/ha are used for planting. This amounts to 5 to 6 t/ha seed rate.
• Nitrogen application helps in tillering of sugarcane. Therefore, for profuse tillering, heavy dose of Nitrogen is to be applied. Split application helps in minimising nitrate leaching,
the chances of which are more under water-logging. It is believed that foliar spray application of 2.5 per cent urea during water logging increases the yield of cane. Soil application of nitrogen after water logging, increased sugarcane yield significantly. Application of potassium and phosphorus along with nitrogen causes greater root proliferation and stiffness of cane. This makes the cane disease and lodging resistant.

- Application of carbofuran to prevent the attack of Pyrilla and top borer.

The sucrose content increases suddenly after receding of water and drops again a few days later. It has also been observed that canes of waterlogged areas start drying at a faster rate after receding of water in comparison to normally grown canes. So, cane should be harvested as early as possible after water recession so that maximum amount of sucrose is obtained.

**Answer to Parliament Question No. S166**

Sub: Regarding Parliament Question No. S166 raised by Shri Rama Chandra Khuntia, M.P.

1 Whether Government has decided to brand with a logo, all agri and horticultural plant material that have been developed by the associate institutes of Indian Council of Agricultural Research

   Sugarcane Breeding Institute, Coimbatore is not branding any planting material developed by it with a logo.

2 If so, the details thereof;

   Not applicable

3 The steps taken by the Government to evolve a common logo for the ICAR and also to adhere to the guidelines on branding and use of logo?

   The decision is to be taken at ICAR headquarters.

**Answer to Starred Rajya Sabha Question Dy No. 1568**

Sub: Regarding "Better seeds and latest technology to enhance sugar production"

1 Range of sucrose content in various parts of India

   a. In the subtropical region, the sucrose % juice of sugarcane varieties ranges from 17% to 19%. The mean sucrose% in sugarcane juice and pol% in cane based on the results of AICRP Sugarcane trials held during 2008 - 10 is given below

<table>
<thead>
<tr>
<th>Maturity group</th>
<th>North Western India</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean sucrose % in</td>
</tr>
<tr>
<td></td>
<td>juice</td>
</tr>
<tr>
<td></td>
<td>Mean pol % in</td>
</tr>
<tr>
<td></td>
<td>cane</td>
</tr>
<tr>
<td>Early maturing</td>
<td>17.35</td>
</tr>
<tr>
<td>varieties</td>
<td>13.24</td>
</tr>
<tr>
<td>Mid-late varieties</td>
<td>17.77</td>
</tr>
<tr>
<td></td>
<td>13.25</td>
</tr>
</tbody>
</table>

   In the tropical region, the sucrose % juice varies from 18.0 % (Co 94008) to 21.5 % (Co 94012).
2 Sucrose content in other sugarcane growing countries

Average sucrose % in sugarcane (pol % cane) in other countries is given below (Table 1).

<table>
<thead>
<tr>
<th>Country</th>
<th>Average pol% cane</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>12.0</td>
</tr>
<tr>
<td>Mexico</td>
<td>12.0</td>
</tr>
<tr>
<td>Cuba</td>
<td>12.5</td>
</tr>
<tr>
<td>Thailand</td>
<td>12.5</td>
</tr>
<tr>
<td>U.S.</td>
<td>12.5</td>
</tr>
<tr>
<td>South Africa</td>
<td>13.0</td>
</tr>
<tr>
<td>Brazil</td>
<td>13.5</td>
</tr>
<tr>
<td>Australia</td>
<td>15.0</td>
</tr>
<tr>
<td>China</td>
<td>14.0</td>
</tr>
</tbody>
</table>

Source: Fao.org (1997)

3 Reasons for low sucrose content in India /parts (regions of India)

Climate plays an important role in the accumulation of sucrose. Cool dry weather favours sucrose accumulation. Climatic conditions that are suitable for sucrose accumulation are found only in certain parts of the country like Maharashtra and parts of Karnataka. Extreme climatic conditions such as severe winters and summer affect the growth and sucrose accumulation in subtropical regions of India.

Reason for low sucrose content:

- Low sucrose content and sugar recovery in sub-tropical region of India could be attributed to the extremes of weather prevailing in the region. From April to June, it is very hot and dry; from December to January the weather is very cold touching zero degree and often combined with frost. Therefore, the active growth of sugarcane is restricted to hardly 8 months resulting in poor stalk yield, low sucrose accumulation resulting in low sugar content and sugar recovery.
- Lack of proper varietal planning. A mix of early maturing, midlate and late maturing varieties would lead to better exploitation of the climate and higher sugar recovery.
- Post harvest losses: Long time interval between harvesting and crushing of cane results in inversion of sucrose and low recovery.
- Cultivation of low sucrose varieties;
- Poor crop management;
- Biotic and abiotic stress factors;

4 Efforts to increase sucrose content, and achievements so far, if any

In the breeding programme at Sugarcane Breeding Institute, Coimbatore high sucrose content is a major selection criterion. Recurrent selection was employed to increase sucrose content in parental stocks. The sucrose content in the recently released varieties is higher than that of the older varieties. In the tropical region the recently released varieties are with 19.0 % or more sucrose and in subtropical region the recently released varieties are with 18.0 % or more sucrose.

Four early maturing varieties namely, Co 98014, Co 0118, Co 0238 and Co 0239 and one midlate variety Co 0124 from SBI Regional Centre, Karnal have been released by
the Central Varietal Release Committee. These varieties have shown 5.53 to 21.66% improvement in cane yield, 8.73 to 20.72% improvement in sugar yield and 0.50 to 4.92% improvement in sucrose % in juice.

5 (a) Name of sugarcane varieties for higher sucrose content and spread of such individual varieties in different states so far

<table>
<thead>
<tr>
<th>High sucrose varieties</th>
<th>States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co 86032</td>
<td>Tamil Nadu (South and Interior Tamil Nadu), Maharashtra, Gujrat, Karnataka</td>
</tr>
<tr>
<td>CoC 671</td>
<td>Tamil Nadu (South and Interior Tamil Nadu), Maharashtra, Karnataka</td>
</tr>
<tr>
<td>Co 94012</td>
<td>Maharashtra, Karnataka</td>
</tr>
<tr>
<td>Co 0238</td>
<td>Punjab, Haryana, Western UP and Rajasthan</td>
</tr>
<tr>
<td>Co 0118</td>
<td>Punjab, Haryana, Western UP and Rajasthan</td>
</tr>
<tr>
<td>Co 98014</td>
<td>Water logging conditions in U.P. and Uttarakhand</td>
</tr>
<tr>
<td>Co 0239</td>
<td>U.P., Haryana, Punjab and Uttarakhand</td>
</tr>
<tr>
<td>Co 0124</td>
<td>Fertile land with assured irrigation of NWZ.</td>
</tr>
</tbody>
</table>

The best success story of Sugarcane Breeding Institute in the recent years is of the sugarcane variety Co 86032, released for commercial cultivation in the Peninsular Zone in 2000. This is the most popular sugarcane variety in the country for the past six years. The variety occupies over 90 per cent of the cane area in Tamilnadu and over 50 per cent of the cane area in the states of Karnataka, Maharashtra and Gujarat and significant cane area in Andhra Pradesh and Orissa also. This is a very rare instance of a single crop variety occupying almost the entire cultivated area in a state as in Tamilnadu.

Table 2. Area (in ha) of Co varieties in the Sub-tropical India during 2009-10

<table>
<thead>
<tr>
<th>Variety</th>
<th>Haryana</th>
<th>Punjab</th>
<th>U.P.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co 89003</td>
<td>6077</td>
<td>8685</td>
<td>----</td>
</tr>
<tr>
<td>Co 98014</td>
<td>114</td>
<td>147</td>
<td>1200</td>
</tr>
<tr>
<td>Co 0118</td>
<td>385</td>
<td>63</td>
<td>180</td>
</tr>
<tr>
<td>Co 0238</td>
<td>269</td>
<td>149</td>
<td>3547</td>
</tr>
<tr>
<td>Co 0239</td>
<td>366</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Total</td>
<td>7,211</td>
<td>9,044</td>
<td>4,927</td>
</tr>
</tbody>
</table>
(b) List of high sucrose sugarcane variety in tabular form indicating duration, sucrose content, yield and recommended states/regions

Table 3. Details of recently released high sucrose sugarcane varieties

<table>
<thead>
<tr>
<th>Variety</th>
<th>Cane yield t/ha</th>
<th>Sucrose % juice</th>
<th>Maturity group (Duration)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>North West zone</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CoS 91230 (Raseeli)</td>
<td>68.2</td>
<td>18.8</td>
<td>Midlate</td>
</tr>
<tr>
<td>Co 0118 (Karan-2)</td>
<td>78.2</td>
<td>18.6</td>
<td>Early</td>
</tr>
<tr>
<td>Co 0239 (Karan-6)</td>
<td>79.2</td>
<td>18.6</td>
<td>Early</td>
</tr>
<tr>
<td>CoPant 90223 (Pant-90223)</td>
<td>73.3</td>
<td>18.5</td>
<td>Midlate</td>
</tr>
<tr>
<td>Co 0124 (Karan-5)</td>
<td>75.7</td>
<td>18.4</td>
<td>Midlate</td>
</tr>
<tr>
<td>CoH 92201 (Haryana-92)</td>
<td>70.0</td>
<td>18.2</td>
<td>Early</td>
</tr>
<tr>
<td>CoPant 97222</td>
<td>88.2</td>
<td>18.2</td>
<td>Midlate</td>
</tr>
<tr>
<td><strong>North Central zone</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CoLk 94184 (Birendra)</td>
<td>76.0</td>
<td>18.0</td>
<td>Early</td>
</tr>
<tr>
<td>CoSe 96234 (Rashmi)</td>
<td>64.1</td>
<td>17.9</td>
<td>Midlate</td>
</tr>
<tr>
<td>CoSe 95422 (Rasbharti)</td>
<td>67.8</td>
<td>17.7</td>
<td>Early</td>
</tr>
<tr>
<td>CoSe 96436 (Jalpari)</td>
<td>67.1</td>
<td>17.7</td>
<td>Midlate</td>
</tr>
<tr>
<td>BO 128 (Pramod)</td>
<td>69.2</td>
<td>17.6</td>
<td>Midlate</td>
</tr>
<tr>
<td><strong>Peninsular zone</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co 94012*</td>
<td>92.8</td>
<td>21.5</td>
<td>Midlate</td>
</tr>
<tr>
<td>Co 0218</td>
<td>104.5</td>
<td>20.6</td>
<td>Midlate</td>
</tr>
<tr>
<td>Co 86032 (Nayana)</td>
<td>102.0</td>
<td>19.5</td>
<td>Midlate</td>
</tr>
<tr>
<td>Co 85004 (Prabha)</td>
<td>90.5</td>
<td>19.5</td>
<td>Early</td>
</tr>
<tr>
<td>Co 99004 (Damodar)</td>
<td>115.5</td>
<td>19.5</td>
<td>Midlate</td>
</tr>
<tr>
<td><strong>East coast zone</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co 86249 (Bhavani)</td>
<td>104.2</td>
<td>18.7</td>
<td>Midlate</td>
</tr>
<tr>
<td>CoC 01061</td>
<td>110.8</td>
<td>17.4</td>
<td>Early</td>
</tr>
</tbody>
</table>

6 Reasons for low adoption of high sucrose sugarcane varieties

a. The yield of the early maturing high sugar varieties is moderate. Hence farmers do not prefer such varieties.

b. The high sucrose varieties viz., CoC 671 and Co 94012 are highly susceptible to red rot disease thereby restricting their cultivation to red rot free areas.

c. High sugared varieties are more damaged by borer pest, termite, and rats hence warrant stringent plant protection measure which may increase the cost of its cultivation.

d. The ratoonability of high sucrose clones was comparatively poor than the medium sucrose varieties.

e. The adoptability of high sucrose varieties under abiotic stresses like winter, drought, frost and salinity, water loggings are poor under the condition of sub-tropical India.

7 Limitation of variety alone to alter sucrose content

The weather conditions, crop management practices, planting and harvesting time, location etc also can alter sucrose content. The biotic and abiotic stress factors are also to be controlled for obtaining high sucrose content. The source for high sucrose
gene is found in noble cane, *Saccharum officinarum* which is susceptible to insect pests and non-insect pests of sugarcane as well as shows poor adaptability under the condition of sub-tropical India. Further the tillering ability of *S. officinarum* is also poor. Therefore, in the sugarcane improvement programme, accumulating or increasing the *S. officinarum* genome in commercial hybrids would always lead to poor yield and other problems like susceptibility to biotic and abiotic stresses. However, the negative linkage between high sucrose and high yield has been altered to certain extent in the Co varieties evolved in recent years.

8 Role of soil, water and agronomic practices in including sucrose content in sugarcane

A well drained loamy soil that is loose and friable, 45 to 60 cm deep without excess soluble salts and neutral in pH (6.5 - 7.5) is ideal for sugarcane cultivation. However, in India, sugarcane is grown in all types of soils like sandy to clayey, saline-alkali soils and acid soils. The other major constraints encountered are water logging, drought and nutrient deficiency. These conditions limit the sucrose content of cane. Drought and water logging affect juice quality as also the quality of water used for irrigation. It is also necessary to follow proper water management during the different phases of growth for sugarcane crop.

Agronomic practices also play a great role in influencing sucrose content. High sugared varieties that are suitable for that particular eco region should be selected and grown. It is necessary to select the suitable method and time of planting with proper soil preparation. Delay in planting will also lower sucrose accumulation.

Integrated nutrient management practices should be adopted with a mix of organic and inorganic nutrients. Balanced fertilization leads to better sucrose accumulation. Application of nitrogen fertilizer increases growth and yield but higher doses and late application of nitrogen cause reduction in juice sucrose content. Potassium application is necessary along with nitrogen to maintain juice quality. Harvest and ratoon management should be timely. Delay in the harvest leads to lowering of the sucrose. Proper pest and disease management needs to be carried out in the crop, more so with respect to ratoon.

Lodging, water logging, infestation by stalk borer, top borer, root borer and white grub, infection by red rot and wilt pathogens would negatively affect sucrose accumulation and sugar recovery. Therefore, these factors should be taken care of.

9 Work done by Sugarcane Institute of the ICAR and AICRP on Sugarcane for improving sucrose content in sugarcane

At Sugarcane Breeding Institute, Coimbatore through recurrent selection programme parental stocks with high sucrose content were identified and are being used in hybridization.

The high sugared varieties for subtropical region such as Co 0118 and Co 0239 and for tropical region such as Co 94012, Co 0218, Co 99004 and Co 86032 were developed through hybridization and clonal selection or through soma-clonal variation. The details of recently released varieties are furnished in Table 3.
Sub: Question raised by Shri Vijay Jawaharlal Darda regarding output of sugar from sugarcane

a. The Sucrose content of Indian sugarcane

- In the subtropical region the sucrose % juice of sugarcane varieties ranges from 17 to 19%.
- The high sugared varieties are: CoS 91230 (18.8%), Co 0118 (18.64) and Co 0239 (18.58%).
- In the tropical region the sucrose % juice varies from 18.0% (Co 94008) to 21.5% (Co 94012). Other high sucrose varieties are: CoC 671, Co 0218, Co 99004 and Co 86032.

b. The R&D done to increase sucrose content and thereby increase quantity of sugar from indigenous sources, as this would contribute in arresting the continuous price rise;

R & D work is being done to increase the sucrose content in sugarcane varieties. Research on breeding is in progress and new varieties are developed at Sugarcane Breeding Institute, Coimbatore with increased sucrose content by hybridization and clonal selection for high sucrose content along with other desirable traits. The quantity of sugarcane used for manufacture of sugar also has to be sufficient to have required production of white sugar indigenously.

c. The FAO/Internationally accepted sucrose content in the sugarcane?

FAO has not prescribed any standards regarding sucrose content for sugarcane.

d. Is any special quality of seeds available which ensure maximum sucrose content and

Quality of seed material is not likely to affect the sucrose content though very poor quality seed will result in poor growth and sucrose content. Secondly sucrose content is more of a varietal character.

The recently released sugarcane varieties Co 0118 and Co 0238 for North-west zone, Co 99004 for Peninsular zone and Co 94012 for Maharashtra and Karnataka states are with higher sucrose content and sugar yield compared to other existing varieties under cultivation.

e. Whether a special awareness campaign be launched for sugar-cane growers for resorting to better seeds and adopting latest technologies to enhance sugar output qualitatively and quantitatively?

- Use of good quality healthy seed ensures a better crop and thus improves productivity. Sugarcane Breeding Institute produces breeder seed of approved varieties at Coimbatore and Karnal centres for supply to farmers on a limited scale. Institute also produces tissue culture plants for supply to sugar factories and farmers to raise disease-free seed nurseries.
- The varieties that are released by the Institute are high sugared high yielding varieties.
- This Institute conducts Sugarcane R & D meetings in Tamilnadu and Karnataka every year involving all the sugar factories in these two states, wherein the breeder seed production by different agencies is reviewed. The Sugarcane Research and
Development workers meetings also serve as a forum in which information about the new sugarcane varieties and related technologies are given to the cane development personnel through whom the messages are trickled down to cane growers.

- Awareness campaigns are also being organized by the institute in villages to make the farmers realize the available sugarcane technologies. At least eight awareness campaigns were organized since 2008 in the districts of Erode (2 Nos.), Cuddalore (2 Nos.), Karur (1 No.), Dharmapuri (1 No.), Coimbatore (1 No) and Thiruchirapalli (1 No.).
- Kisan Melas organized in the institute as well as its Regional Centre at Karnal also to reiterate the importance of the latest technologies to boost the sugar productivity.
- Training programs for farmers on ‘Sugarcane production technology’ are being regularly conducted in the institute to impart information on the latest technologies.
- Farmers visiting the institute are also advised to grow sugar rich high yielding varieties for increased productivity and thereby higher sugar output

### Points for Parliamentary Committee on Agriculture

**Sub: Points for Parliamentary Committee on Agriculture**

2 (a) Has any assessment been made about the loss in acreage and food grains production in States due to various type of abiotic stresses during each year of the Tenth Plan and eleventh plan so far, state-wise and abiotic stress-wise.

The area under sugarcane during IX, X and XI Five Year Plans is furnished below.

<table>
<thead>
<tr>
<th>Fiver Year Plan</th>
<th>Area under sugarcane (million hectares)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IX Plan</strong></td>
<td></td>
</tr>
<tr>
<td>Average area 9 (1997-98 to 2001-02)</td>
<td>4.186</td>
</tr>
<tr>
<td>Highest area during IX Plan (2001-02)</td>
<td>4.411</td>
</tr>
<tr>
<td><strong>X Plan</strong></td>
<td></td>
</tr>
<tr>
<td>2002-03</td>
<td>4,520</td>
</tr>
<tr>
<td>2003-04</td>
<td>3,938</td>
</tr>
<tr>
<td>2004-05</td>
<td>3,662</td>
</tr>
<tr>
<td>2005-06</td>
<td>4,201</td>
</tr>
<tr>
<td>2006-07</td>
<td>5,151</td>
</tr>
<tr>
<td>Average</td>
<td>4.294</td>
</tr>
<tr>
<td><strong>XI Plan</strong></td>
<td></td>
</tr>
<tr>
<td>2007-08</td>
<td>5,043</td>
</tr>
<tr>
<td>2008-09</td>
<td>4,408</td>
</tr>
<tr>
<td>2009-10</td>
<td>4,202</td>
</tr>
<tr>
<td>Average (3 years)</td>
<td>4.551</td>
</tr>
</tbody>
</table>

As seen from the table above, the average area under sugarcane during the X Five Year Plan (4.294 million ha) and first three years of the XI Five Year Plan (4.551 million ha) was higher than the IX Plan average of 4.186 million ha. This indicates that in general, the area under sugarcane
cultivation is increasing. During the X Five Year Plan period, the highest area of 5.151 million ha was recorded during the year 2006-07 (the last year of the plan period). The drastic reduction in cane area during 2003-05 had been primarily due to severe drought which affected many parts of the country. During the first three years of the XI Plan (2007-08 to 2009-10) the area under sugarcane declined, which is primarily due to the drought conditions which prevailed in the major sugarcane growing states and due to the diversion of sugarcane area for the cultivation of other more remunerative crops.

The area and production of sugarcane in the major cane growing states of Uttar Pradesh, Maharashtra, Karnataka and Tamil Nadu which account for about 80% of the sugarcane area and production is furnished below.

<table>
<thead>
<tr>
<th>Year / IX Five Year Plan</th>
<th>Uttar Pradesh</th>
<th>Tamilnadu</th>
<th>Maharashtra</th>
<th>Karnataka</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area (million ha)</td>
<td>Production (million tonnes)</td>
<td>Area (million ha)</td>
<td>Production (million tonnes)</td>
</tr>
<tr>
<td>IX Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002-03</td>
<td>2.149</td>
<td>120.9</td>
<td>0.261</td>
<td>24.17</td>
</tr>
<tr>
<td>2003-04</td>
<td>2.030</td>
<td>112.8</td>
<td>0.192</td>
<td>17.6</td>
</tr>
<tr>
<td>2004-05</td>
<td>1.955</td>
<td>118.7</td>
<td>0.232</td>
<td>23.4</td>
</tr>
<tr>
<td>2005-06</td>
<td>2.156</td>
<td>125.5</td>
<td>0.336</td>
<td>35.1</td>
</tr>
<tr>
<td>2006-07</td>
<td>2.247</td>
<td>133.9</td>
<td>0.391</td>
<td>41.1</td>
</tr>
<tr>
<td>Average</td>
<td>2.107</td>
<td>122.4</td>
<td>0.282</td>
<td>28.3</td>
</tr>
<tr>
<td>X Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007-08</td>
<td>2.179</td>
<td>124.7</td>
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<td>2008-09</td>
<td>2.084</td>
<td>109.0</td>
<td>0.309</td>
<td>32.8</td>
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<td>2009-10</td>
<td>1.977</td>
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<tr>
<td>Average</td>
<td>2.080</td>
<td>114.1</td>
<td>0.325</td>
<td>34.3</td>
</tr>
</tbody>
</table>

The area and production of sugarcane in the above major sugarcane growing states also showed year to year fluctuations. However the trend is similar to that of the all India figures.

2 (b) Please furnish the details of corrective steps both through R&D efforts and extension services taken by DARE/ICAR during this period for short term and long term mitigation of the harmful effects of these abiotic stress.

Drought is the most important abiotic stress affecting sugarcane production and productivity in the country. In addition salinity and water-logging also occur in several places. The following strategies are suggested to mitigate the adverse effect of the abiotic stress.

1. Use of Tolerant varieties:

Drought tolerant varieties:

Peninsular Zone: Co 86032, Co 85019, Co 94008, Co 94012, Co 99004, Co 2001-13
Northwest Zone: Co 2001-15 for; Co 98014, Co 0238, Co 0118
Salinity tolerant varieties:  
Co 94008, Co 85019, Co 94012, Co 99004, Co 2001-13 and Co 2001-15

Water logging tolerant clones:  Co 8371, CoTI 88322 & Co 99006

2. The following agronomic drought mitigation practices are recommended to manage drought and improve cane yield under drought conditions.

- Sett treatment saturated lime solution
- Foliar application of N&K
- Application of 25% additional potassium
- Plant sugarcane in skip furrow or alternate furrow irrigation
- Trash mulching

3. Drip irrigation is recommended to improve the water use efficiency and economize the irrigation water requirement. Drip irrigation help to save about 40% of the irrigation water.

6(a) Please give details of the public as also private sector research products in crop improvement which have been tested as well as targeted for different agro-ecologies unde the All India Coordinated Crop Improvement Programme of ICAR system during X and XI Plan so far.

North West Zone

X Plan (2002-2007) 130 varieties tested (55 Early, 75 Midlate)  
XI Plan (2007-2010) 52 varieties tested (18 Early, 34 Midlate)

Peninsular zone

X Plan (2002-2007) 130 varieties tested (40 Early, 90 Midlate)  
XI Plan (2007-2010) 66 varieties tested (33 Early, 33 Midlate)

East Coast zone

X Plan (2002-2007) 68 varieties tested (39 Early, 29 Midlate)  
XI Plan (2007-2010) 44 varieties tested (23 Early, 21 Midlate)

North Central/ North West Zone

X Plan (2002-2007) 115 varieties tested (45 Early, 70 Midlate)  
XI Plan (2007-2010) 27 varieties tested (12 Early, 15 Midlate)

6(b) Please indicate the extent to which such improved crops have been successfully adopted by the farmers of the country

At present, the variety Co 86032 released by Sugarcane Breeding Institute is the predominant variety in the tropical zone. It occupies around 90% of the area in Tamilnadu and about 50% of the area in Maharasthra and Karnataka, besides substantial area in Gujarat. The recently released variety, Co 99004 occupies about 2% of the area in Tamil Nadu and the area is increasing.

The approximate area under the improved sugarcane varieties recently released from the Sugarcane Breeding Institute Regional Centre, Karnal for the sub-tropical India is furnished below.
<table>
<thead>
<tr>
<th>Variety</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co 98014</td>
<td>1000</td>
</tr>
<tr>
<td>Co 0118</td>
<td>1500</td>
</tr>
<tr>
<td>Co 0238</td>
<td>7000</td>
</tr>
<tr>
<td>Co 0239</td>
<td>1000</td>
</tr>
</tbody>
</table>

6(c) Also indicate the number of varieties/hybrids of food crops, pulses and oilseeds that have been released/identified for release for different agro-climatic regions of the country during the X and XI plans, year wise

**Sugarcane Varieties released during X and XI Plan:**

- **2002-2007**
  - North west: 7
  - North Central / North East: 3
  - East coast: 1
  - Peninsular: 1
- **2007-2010**
  - North west: 5
  - North Central / North East: 5
  - East coast: 3
  - Peninsular: 4

12. Reportedly recent IPCC Report and a few other global studies indicate a probability of 10-40% loss in crop production in India due to increase in temperature by 2080-2100.

12(a). Please furnish the details of steps taken by DARE/ICAR in view of the such Report/Studies

- A collaborative project with MSSRF, Chennai entitled 'Screening of sugarcane germplasm for tolerance to enhanced temperature and elevated CO₂ levels' has been formulated and is like to be initiated shortly.
- Another project on 'Sustainable sugarcane production under climate change: Impact of supra-optimal temperatures and elevated CO₂ on production, quality and reproductive process of sugarcane' has been formulated. This requires growth chamber facilities to maintain elevated CO₂ and temperature levels and will be submitted for external funding.
- NAIP concept note on 'Holistic approach to increase sugarcane productivity and sugar recovery in subtropical India under normal, water stress, water logged and saline environments and under changing climate through technology development, refinement and integrated delivery system' has been formulated.

12(b). Have DARE/ICAR initiated any independent studies on this aspect apart from IPCC/Global studies? If so, furnish details thereof

No specific studies have been made at the Institute on impact of climate change on sugarcane production. A project on this aspect is under formulation. However studies conducted elsewhere have revealed that:

- Climate change will affect sugarcane productivity through reduced growth, increased weed competition and increased incidence of pests and diseases.
- For every 2°C rise in temperature sucrose yield may be reduced by about 32%.
1. Details of research work done on sugarcane during last three years and current year

Institute has carried out research on various aspects of sugarcane varietal improvement, crop production and crop protection. The major achievements during the past four years are as follows.

**2007-08**

- Two new ‘Co’ varieties viz., Co 98014 (Karan - 1) and Co 99004 (Damodar) were released through the Central Varietal release committee for cultivation.
- Six early maturing clones (Co 08001 to Co 08006) and sixteen midlate clones (Co 08007 to Co 08022) were identified from Pre-zonal Varietal trial conducted during 2007-08 as ‘Co’ canes of 2008 series.
- Molecular fingerprints of recent releases and elite clones viz. Co 99004, Co 99006 and Co 99008 were generated using sugarcane specific STMS primers.
- Three upstream sequence of ubi gene from different plant species were cloned. Of these one was sequenced and clonned in a transformation vector and was used for transforming sugarcane tissue for studying the transient expression. As it was showing transient expression, further studies are in progress for further validation.
- Sugarcane transgenics incorporating cry1AB developed.
- 15,000 tissue culture plants and 331 tonnes of breeder seed was produced and supplied.
- Under drip fertigation, using 75% of the recommended level of N & K fertilizer was found to perform on par with fertigation using 100% of the recommended dose of fertilizer.
- RT-PCR technique was developed to detect yellow leaf disease in symptomless plants.
- Soil application of *Trichoderma harzianum* formulation (three times) is found to improve sugarcane yield and reduce wilt in the endemic locations.

**2008-09**

- Six new 'Co' varieties viz., Co 2001-13, Co 2001-15, Co 0118, Co 0232, Co 0233 and Co 0238 were released through the Central Varietal release committee for cultivation in three Zones.
- In transgenics with Cry1 Ab produced through particle bombardment and agrobacterium mediated transformation transgene integration was confirmed.
- Nearly 75 tonnes of breeder seed of varieties Co 99004, Co 94008 and Co 86032 and 32,000 tissue culture plants were supplied to sugar mills and farmers. 16000 bud chip seedlings were also supplied.
- 10 clones of *Erianthus arundinaceus* with high fiber content of more than 28 % were identified.
For dual row planted sugarcane + soybean intercropping system, application of 75% of the recommended dose of NPK plus organics and biofertilizers for sugarcane and application of 75% of the recommended dose of NPK plus organics adjusted to the population for soybean was found adequate.

Studies were undertaken to characterize *Fusarium* isolates collected from wilt-infected canes by molecular techniques such as ITS sequencing, ITS-RFLP, RAPD and ISSR. Polymorphism generated from the last three techniques showed significant variation among the isolates.

Two proteins from sugarcane and elicitor from *Colletotrichum falcatuum* were separated by 2-dimensional electrophoresis and sequenced by peptide mass fingerprinting.

**2009-10**

- One early variety, Co 0314 and two midlate varieties, Co 0212 & Co 0218 for Peninsular zone, three varieties, Co 0124, Co 0239 & Co 0241 for North-west zone & two varieties Co 0233 and Co 0234 for North-central zone were proposed for release.
- Nine early maturing clones and 13 midlate maturing clones found promising in Pre Zonal Varietal Trials (PZVT) were identified as 'Co' canes.
- Transgenics with a new promoter gene were made and are being tested.
- One germplasm exploration was conducted in September 2009 in Himachal Pradesh and Uttarakhand, and 46 accessions of *Saccharum spontaneum*, 3 accessions of *Miscanthus nepalensis* and two accessions of *Erianthus fulvus* were collected.
- 439 tonnes of breeder seed and 13644 tissue culture plants were distributed. 60550 bud chip seedlings were also supplied.
- Using RLM-RACE technique full length sequences of the following four genes i) 14-3-3 like protein, ii) Chitinase, iii) Xylanase inhibitor and iv) basal antifungal peptide were isolated from sugarcane
- Azole group of fungicides were found to be effective either alone or in combination with Thiophanate methyl for red rot management
- *Steinernema glaseri* (LN1) and *Steinernema* sp. (H III) at the rate of 10000 IJs/grub and *H. indica* (LN2), *H. bacteriophora* LN8 and Hb at 30000 and 40000 IJs/grub respectively recorded 100% mortality of white grubs under pot culture conditions

**2010-11**

- Three new 'Co' varieties developed by the Institute viz., Co 0239, Co 0214 and Co 0218 were released through the Central Varietal release committee for cultivation. Two early sugarcane varieties Co 0209 and Co 0403 which performed well in AICRP trials were proposed for identification for release.
- Seven early (Co 2010-01 to Co 2010-07) 'Co' canes and ten midlate (Co 2010-08 to Co 2010-17) 'Co' canes were identified. Five 'Co' canes viz., Co 2010-18 to Co 2010-22, which possessed high cane yield with moderate sucrose were identified suitable for biomass. From trials conducted at Ugar in Northern Karnataka, five early clones and seven midlate clones were assigned 'Co' numbers Co 2010-28 to Co 2010-34.
- Transgenics were made with new ubiquitin promoter gene identified and higher expression levels of reporter gene was observed. Approval of RCGM was obtained
for confined field trial of transgenics with Cry1Ab gene for insect resistance and planting material was multiplied for laying trials in December, 2010.

• One germplasm exploration was conducted in West Bengal in September, 2010 and 41 clones of wild sugarcane germplasm were collected.

• The variety Co 91002 was registered as germplasm.

• 10,300 Tissue culture seedlings of varieties Co 86032, Co 99004 and Co 2001-13 were produced. 129 tonnes of Breeder seed of varieties viz., Co 86032, Co 99004, Co 2001-13 and Co 2001-15 were supplied to farmers and sugar mills. 5000 bud chip seedlings were also supplied.

• Remote sensing and satellite imaging had been used in demarcating yellow leaf disease infected crop from healthy crop.

2. Details of Benefits accrued thereof

During the four years Institute has released 11 superior varieties, two for North central zone, five for North western zone and four for peninsular zone. Co 99004 in peninsular zone is spreading in area and has superior yield and quality compared to the current variety Co 86032. Co 0238 and Co 0118 released for North western zone is superior to all existing varieties and the area under these varieties is steadily increasing. The other new varieties released also have great potential to improve productivity. Institute produced and supplied 1225 tonnes of breeder seed and 97,974 tissue culture plants and bud chips plants which will contribute to improved productivity of the crop. The new transgenics developed incorporating Cry 1 AB gene has shown promise against shoot borer and DBT has approved the confined field trials of these trangenics. These trangenics will have potential in the management of sugarcane borers in future.

A new promoter gene had been identified which will facilitate the transgenics research. A multiplex PCR technique had been developed through which four viral diseases of sugarcane can be detected and this will greatly facilitate production of healthy sugarcane seed.

Remote sensing and satellite imaging had been used to demarcate yellow leaf disease affected fields. This will greatly help in the effective management of this disease.

Micro-irrigation studies conducted at the Institute showed that 40-50% saving in water could be achieved. Through fertigation 25% of NPK fertilizer can be saved.

Few systemic fungicides Thiophorate methyl, Cabrio and Nativo were identified that can control primary infection of red rot. This will help in the management of red rot.

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**Answer to Starred Lok Sabha question Dy.No.4870**

Sub : Provisional Admitted Starred Lok Sabha question Dy.No.4870 scheduled to be put down for the sitting on 23.11.2010 on research activities

a. The steps taken by the Government

1. Institute operates 93 research projects on various aspects of sugarcane breeding, production and protection technologies.

2. Research in frontier areas like biotechnology had been intensified. Research on molecular breeding, transgenics, sugarcane genomics, molecular diagnostics, remote sensing etc. had been strengthened.

3. Training is being provided to scientists in leading laboratories in the country.
4. Infrastructure has been strengthened. An amount of Rs. 4.87 crores had been allotted for the purchase of equipments in XI Plan. New laboratory and infrastructure facilities are being created at a cost of Rs. 2.94 crores under XI Plan.

b. The activities undertaken in the field of agricultural research during the last three years and the current year and achievements made

Sugarcane Breeding Institute is conducting research on development of improved high yielding high sugar varieties with tolerance to biotic and abiotic stresses as well as appropriate crop production and protection technologies and transfer of technologies to the farmers. The research activities of the Institute are organised under 17 research programmes as indicated below.

1. Breeding superior sugarcane varieties of different maturity with improved cane yield, quality and resistance to biotic and abiotic stresses
2. Basic and strategic researches for sugarcane varietal improvement
3. Sugarcane germplasm : collection, maintenance, evaluation, documentation and utilisation
4. Improving productivity of promising sugarcane varieties by integrated, cost effective and sustainable crop management technologies
5. Physiological investigations on growth productivity and flowering in sugarcane
6. Studies on sugarcane chemistry, maturity, juice and jaggery quality, pre / post harvest technology and technological parameters
7. Studies on the effect of certain soil conditions & fertilisers on nutrient uptake, yield and quality of sugarcane
8. Studies on host pathogen relationship and management of sugarcane diseases
9. Detection and diagnosis of sugarcane pathogens
10. Host plant resistance and behavioural studies of sugarcane pests
11. Biological control of sugarcane pests
12. Development of technologies to evolve IPM packages for sugarcane nematodes
13. Development of statistical models / methods by way of utilising the information technologies viz. Computers and communication facilities
14. Economic analysis of sugarcane production systems and sugar industry
15. Transfer of technologies
16. Development of sugarcane varieties as well as crop production and protection technologies for the North Western Zone
17. Sugarcane germplasm: collection, maintenance, evaluation, documentation and utilisation
18. The total number of research projects under the above programmes was 106, 113 and 92 respectively during 2007, 2008 and 2009. During 2010, 93 research projects are in progress.

The important achievements are listed below.

2007-08

a. Two new 'Co' varieties viz., Co 98014 (Karan - 1) and Co 99004 (Damodar) were released through the Central Varietal release committee for cultivation
b. Six early maturing clones (Co 08001 to Co 08006) and sixteen midlate clones (Co 08007 to Co 08022) were identified from Pre-zonal Varietal trial conducted during 2007-08 as 'Co' canes of 2008 series.

c. Out of 13 clones evaluated in 15 sugar factory areas in five states under the Institute Industry Interface trials, Co 0323 and Co 98010 were found to be high yielding and widely adaptable.

d. The Germplasm Registration Committee of ICAR recommended for registration of four sugarcane clones / hybrids proposed from the Institute. They are CYM 04-420 (INGR 08039), Co 92202 (INGR 08040), Co 93009 (INGR 08041) and Co 99006 (INGR 08042).

e. Molecular fingerprints of recent releases and elite clones viz. Co 99004, Co 99006 and Co 99008 were generated using sugarcane specific STMS primers.

f. Three upstream sequence of ubi gene from different plant species were cloned. Of these one was sequenced and cloned in a transformation vector and was used for transforming sugarcane tissue for studying the transient expression. As it was showing transient expression, further studies are in progress for further validation.

g. Sugarcane transgenics incorporating cry1AB developed.

h. 15,000 tissue culture plants and 300 tonnes of breeder seed was produced and supplied.

i. AVT (Early) clones Co 0314, Co 0312, Co 0310 and CoM 0254 performed better in terms of juice quality, cane and sugar yield under salinity. AVT clones Co 0211, Co 0214, Co 0218 and Co 0219 were found to be resistant to drought

j. Under drip fertigation, using 75% of the recommended level of N & K fertilizer was found to perform on par with fertigation using 100% of the recommended dose of fertilizer.

k. In the varietal study on multiratooning, Co 0209 (81.7 t/ha), Co 0217 (69.8 t/ha), Co 86032 (66.3 t/ha), and Co 91010 (66.2 t/ha), performed better compared to the standard CoC 671 (62.1 t/ha).

l. Woolly aphid incidence has been considerably lower than that in the corresponding period of last year. The aphid was persistent in the field for short periods of about two months wherever it occurred. The parasitoid Encarsia flavoscutellum, accompanied the aphid right from the initial stages of establishment of the host, multiplied in good numbers and effected natural control of the aphid in about two months.

m. RT-PCR technique was developed to detect yellow leaf disease in symptomless plants.

n. Soil application of Trichoderma harzianum formulation (three times) is found to improve sugarcane yield and reduce wilt in the endemic locations.

2008-09

a. Six new 'Co' varieties viz., Co 2001-13, Co 2001-15, Co 0118, Co 0232, Co 0233 and Co 0238 were released through the Central Varietal release committee for cultivation in three Zones.

b. In transgenics with cry Ab produced through particle bombardment and agrobacterium mediated transformation transgene integration confirmed.
c. Molecular fingerprinting of two recently identified elite 'Co' canes viz., Co 2001-13 and Co 2001-15 was carried out with 12 STMS primers. Similarly the molecular profiles of three selections from Karnal Co 0238, Co 0240 and Co 0241 that showed superior performance in AICRP(S) trials of North West zone were also generated to aid their identification.

d. Nearly 75 tonnes of breeder seed of varieties Co 99004, Co 94008 and Co 86032 and 33,000 tissue culture plants were supplied to sugar mills and farmers.

e. 10 clones of *Erianthus arundinaceus* with high fiber content of more than 28% were identified.

f. For dual row planted sugarcane + soybean intercropping system, application of 75% of the recommended dose of NPK plus organics and biofertilizers for sugarcane and application of 75% of the recommended dose of NPK plus organics adjusted to the population for soybean was found adequate.

g. Micro irrigation studies in ratoon crop of sugarcane showed that about 1524.1 mm of water was used under furrow irrigation system while 665.6 mm of water under drip irrigation system till grand growth phase (180 DAR). Thus, drip irrigation saved about 43.7% of irrigation water as compared to the conventional furrow irrigation.

h. Studies were undertaken to characterize *Fusarium* isolates collected from wilt-infected canes by molecular techniques such as ITS sequencing, ITS-RFLP, RAPD and ISSR. Polymorphism generated from the last three techniques showed significant variation among the isolates.

i. Two proteins from sugarcane and elicitor from *Colletotrichum falcatum* were separated by 2-dimensional electrophoresis and sequenced by peptide mass fingerprinting.

2009-10

a. One early variety, Co 0314 and two midlate varieties, Co 0212 & Co 0218 for Peninsular zone, three varieties, Co 0124, Co 0239 & Co 0241 for North-west zone & two varieties Co 0233 and Co 0234 for North-central zone were proposed for release.

b. Nine early maturing clones and 13 midlate maturing clones found promising in Pre Zonal Varietal Trials (PZVT) were identified as 'Co' canes.

c. Transgenics with a new promoter gene were made and are being tested.

d. One germplasm exploration was conducted in September 2009 in Himachal Pradesh and Uttarakhand, and 46 accessions of *Saccharum spontaneum*, 3 accessions of *Miscanthus nepalensis* and two accessions of *Erianthus fulvus* were collected.

e. 130 tonnes of breeder seed was distributed and another 70 tonnes is ready for distribution. 4500 tissue culture plants were distributed and about 6000 plants are being hardened.

f. A new method to assess field tolerance of sugarcane varieties to red rot using pathogen inoculum multiplied on sorghum grain was developed. The varieties can be selected for their tolerance to red rot based on germination and post germination survival and disease expression. The promising varieties recently released viz. Co 99004, Co 0118, Co 0238, Co 2001-13 and Co 2001-15 were identified as red rot resistant in different methods of evaluation.
Using RLM-RACE technique full length sequences of the following four genes i) 14-3-3 like protein, ii) Chitinase, iii) Xylanase inhibitor and iv) basal antifungal peptide were isolated from sugarcane.

Azole group of fungicides were found to be effective either alone or in combination with Thiophanate methyl for red rot management.

Among the exotic clones screened for important pests, 18 and 11 clones have shown resistance to shoot and internode borers respectively, while 10 clones were found tolerant to the white grub.

Steinernema glaseri (LN1) and Steinernema sp. (H III) at the rate of 10000 IJs/grub and H. indica (LN2), H. bacteriophora LN8 and Hb at 30000 and 40000 IJs/grub respectively recorded 100% mortality of white grubs under pot culture conditions.

2010-11

Two early sugarcane varieties Co 0209 and Co 0403 which performed well in AICRP trials were proposed for identification for release.

Seven early (Co 2010-01 to Co 2010-07) 'Co' canes and ten midlate (Co 2010-08 to Co 2010-17) 'Co' canes were identified. Five 'Co' canes viz., Co 2010-18 to Co 2010-22, which possessed high cane yield with moderate sucrose were identified suitable for biomass. From trials conducted at Ugar in Northern Karnataka, five early clones and seven midlate clones were assigned 'Co' numbers Co 2010-28 to Co 2010-34.

Transgenics were made with new ubiquitin promoter gene identified and higher expression levels of reporter gene was observed. Approval of RCGM was obtained for confined field trial of transgenics with Cry1Ab gene for insect resistance and planting material was multiplied for laying trials in December, 2010.

One germplasm exploration was conducted in West Bengal in September, 2010 and 41 clones of wild sugarcane germplasm were collected.

The variety Co 91002 was registered as germplasm.

10,300 Tissue culture seedlings of varieties Co 86032, Co 99004 and Co 2001-13 were produced and 5800 plants were supplied after hardening. Thirty tonnes of Breeder seed of varieties viz., Co 86032, Co 99004, Co 2001-13 and Co 2001-15 were supplied to farmers and sugar mills. 5300 bud chip seedlings were also supplied.

Glucanacetobacter and Pseudomonas were multiplied, dense cell biomass was used for preparation of formulations with new combinations of stabilizers and protective agents. On storage both isolates recorded population levels of >10^8 cfu/g in the different formulations at nine months of storage.

Hormonal application i.e., Kinetin(100ppm) and Ethrel (100 ppm) increased tiller population in a shy tillering variety, Co 99004, by 7,12 and 20% respectively over control.

Confirmatory screening of twenty four clones tolerant to white grubs was carried out at Sugarcane Breeding Institute, Coimbatore under pot culture conditions. Three clones viz., M108/30, KM 724 and KM 730 were found tolerant in all the replications. The remaining clones are to be revalidated.

c. The reaction of Government thereto;

Does not pertain to the Institute
d. Whether there is a shortage of agricultural scientists in agricultural research sector
Eighteen posts of Scientists out of the Sanctioned strength of 79 are vacant as on date.

e. If so, the details thereof along with reasons therefore; and

<table>
<thead>
<tr>
<th></th>
<th>Scientist</th>
<th>Sr. Scientist</th>
<th>Principal Scientist</th>
</tr>
</thead>
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<tr>
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<td>Genetics</td>
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<td>-</td>
</tr>
<tr>
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<td>1</td>
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<td>Agri. Chemistry</td>
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<td><strong>9</strong></td>
<td><strong>6</strong></td>
<td><strong>3</strong></td>
</tr>
</tbody>
</table>

f. The action proposed to be taken by the Government in this regard
Agricultural Scientist Recruitment Board has been requested to fill up the vacancies.

**Answer to Rajya Sabha Q.No.6452**

Subject: Question raised by Hon’ble Shri Mohammed Adeebji regarding research carried out by ICAR w.r.t Uttar Pradesh

1. The detailed of research carried out by ICAR during last 2 years and the current years so far.

   - Research are being carried out at Sugarcane Breeding Institute, Regional Centre, Karnal to evolve high yielding sugarcane varieties suitable for the North Western Zone (NWZ) of India which comprises States of Haryana, Punjab, Uttarakhand, Western U.P. and Gujarat.
   - As a result of our efforts, 2 high yielding, high sugared, early maturing varieties namely, Co 0118 and Co 0238 were released from this Centre during 2009 by the Central Variety Release Committee for commercial cultivation in NWZ which includes Western U.P. as well. In 2010, an early maturing variety, Co 0239 and a midlate maturing variety, Co 0124 was released by the Central Variety Release Committee for commercial cultivation in NWZ.
   - During 2006, an early maturing high sugared variety Co 98014 was released which is also suitable for U.P. As this variety has hard rind it is least damaged by wild animals. Therefore, Co 98014 is recommended in areas where the problems of wild animals like boar, Jackals are more.

2. The details of research conducted which is beneficial for the soil and climate of different regions of Uttar Pradesh?

   - The five sugarcane varieties Co 98014, Co 0118, Co 0238, Co 0239 and Co 0124 released from the Sugarcane Breeding Institute, Regional Centre, Karnal were tested at several locations in the Western U.P. under the All India Coordinated Research Project on Sugarcane. The pooled results are given in Table 1. The results have clearly shown the better performance of Co 98014, Co 0118, Co 0238 and Co 0239 over the early standard CoJ 64 and better performance of Co 0124 over the mid-late standard CoS 767 for cane yield and sugar yield.
Table 1. Details of newly released sugarcane varieties from SBI Regional Centre, Karnal

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Co 98014</th>
<th>Co 0118</th>
<th>Co 0238</th>
<th>Co 0239</th>
<th>Co 0124</th>
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<tbody>
<tr>
<td>Year of release</td>
<td>2006</td>
<td>2009</td>
<td>2009</td>
<td>2010</td>
<td>2010</td>
</tr>
<tr>
<td>Maturity</td>
<td>Early</td>
<td>Early</td>
<td>Early</td>
<td>Early</td>
<td>Midlate</td>
</tr>
<tr>
<td>Cane yield (tonnes/ha)</td>
<td>76.29</td>
<td>78.20</td>
<td>81.08</td>
<td>79.23</td>
<td>75.71</td>
</tr>
<tr>
<td>% increase over check variety CoJ 64/CoS 767#</td>
<td>21.66</td>
<td>15.70</td>
<td>19.96</td>
<td>17.22</td>
<td>8.03#</td>
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<td>Sucrose %</td>
<td>17.59</td>
<td>18.45</td>
<td>17.99</td>
<td>18.58</td>
<td>18.22</td>
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<td>-3.24</td>
<td>3.07</td>
<td>0.50</td>
<td>3.80</td>
<td>3.52#</td>
</tr>
<tr>
<td>Sugar yield (tonnes/ha)</td>
<td>9.26</td>
<td>9.88</td>
<td>9.95</td>
<td>10.37</td>
<td>9.68</td>
</tr>
<tr>
<td>% increase over check variety CoJ 64/CoS 767#</td>
<td>17.22</td>
<td>15.01</td>
<td>15.83</td>
<td>20.72</td>
<td>12.69#</td>
</tr>
<tr>
<td>Area of adoptability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water logging conditions in U.P. and Uttarakhand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haryana and U.P.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.P., Haryana, Punjab and Uttarakhand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.P., Haryana, Punjab</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fertile land with assured irrigation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

# CoS 767 is a midlate standard while CoJ 64 is an early standard

- Co 0118, Co 0238 and Co 0239 were tested under normal, water logging and water stress conditions prevailing in Ajbapur of Uttar Pradesh (Table 2). Under normal condition cane yield of Co 0118 was 4 t/ha higher than CoJ 64 (Table 2). Improvement in cane yield under water stress and water logging conditions was higher by more than 10 t/ha over the respective standards. Pol % in cane (i.e. sucrose%) in Co 0118 was more than 1% higher than the respective standards under normal and abiotic conditions. The variety Co 0238 have yielded 12 t/ha higher cane than CoJ 64 under normal condition. Improvement in cane yield under water stress and water logging conditions was also higher by 20 t/ha over the respective standards. Pol % in cane in Co 0238 was slightly better than the respective standards under normal and abiotic conditions.
Table 2. Cane yield and Pol % of Co 0118 and Co 0238 during 2005-06 at Ajbapur, U.P. under normal and abiotic stress conditions.

<table>
<thead>
<tr>
<th>Varieties</th>
<th>Cane yield (t/ha)</th>
<th>Plant crop pol % in cane during Nov / Jan / Mar</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal Water stress Water logging</td>
<td>Normal Water stress Water logging</td>
</tr>
<tr>
<td>Co 0118</td>
<td>89.30 77.39 78.76</td>
<td>11.87 / 14.49 / 15.60 11.34 / 14.20 / 15.15 11.58 / 13.96 / 14.46</td>
</tr>
<tr>
<td>Co 0238</td>
<td>97.56 89.31 84.75</td>
<td>11.27 / 13.29 / 14.53 9.96 / 14.41 / 14.91 10.67 / 12.33 / 13.91</td>
</tr>
<tr>
<td>Check Var.</td>
<td>CoJ 64</td>
<td>85.45</td>
</tr>
<tr>
<td>CoS 96268</td>
<td>67.68</td>
<td>9.27 / 11.51 / 14.10</td>
</tr>
<tr>
<td>CoSe 96436</td>
<td>8.68 / 11.77 / 12.13</td>
<td></td>
</tr>
<tr>
<td>UP 9530</td>
<td></td>
<td>9.35 / 11.58 / 11.79</td>
</tr>
</tbody>
</table>

- Co 0238 and Co 0239 have been tested at Simbhaoli of Uttar Pradesh during 2005-06 under water stress and water logging conditions (Table 3). The improvement in cane yield of Co 0238 was 85% over CoJ 64 under normal condition whereas it was 322% under water logging condition. Pol % in juice was also higher in Co 0238 than CoJ 64 in both conditions. Co 0239 also showed significant improvement (57-247%) in cane yield and pol % during December of Co 0239 over CoJ 64.

Table 3. Performance of Co 0238 and Co 0239 at Simbhaoli, U.P.

<table>
<thead>
<tr>
<th>Clone</th>
<th>Cane Yield (t/ha)</th>
<th>Pol % (December)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal Water logging</td>
<td>Normal Water logging</td>
</tr>
<tr>
<td>Co 0238</td>
<td>106.90 89.50</td>
<td>17.62 16.92</td>
</tr>
<tr>
<td>Co 0239</td>
<td>90.60 73.60</td>
<td>18.55 18.21</td>
</tr>
<tr>
<td>CoJ 64</td>
<td>57.8 21.20</td>
<td>17.39 15.72</td>
</tr>
</tbody>
</table>

- Under the varietal evaluation trials of Indian Sugar Mills Association (ISMA), New Delhi, Co 98014, Co 0118, Co 0238 and Co 0239 have been evaluated at 5 sugar mills in Western U.P., 7 sugar mills in Central U.P., and 4 sugar mills in Eastern U.P (Table 4). The results indicate the better performance of Co 98014, Co 0118, Co 0238 and Co 0239 in comparison with local varieties. Co 98014 showed 20% and 1.29% improvement in cane yield and pol % in cane, respectively over CoJ 64 in Eastern UP. Co 0238 was better than the standard in all the regions for cane yield (27-38% improvement) and pol % in cane (-0.24 to 1.86% improvement), except in Central UP where it showed 0.24% less pol % in cane. Co 0239 recorded 27.36% improvement in cane yield over CoJ 64 at Western U.P., 12.76%
improvement in Central U.P. and 23.87% improvement in Eastern U.P. Co 0118 and Co 0239 are the best juice quality varieties coupled with fairly good cane yield. The mean pol % in cane of Co 0118 and Co 0239 were better than CoJ 64 at all locations. In Uttar Pradesh, Co 0118 showed 4.66% improvement for pol% in cane and Co 0239 showed 2.85% improvement than CoJ 64.

Table 4. Mean performance (2 plants & 1 ratoon) of elite Co varieties in ISMA trials in U.P.

<table>
<thead>
<tr>
<th>Region</th>
<th>No. of sugar mills</th>
<th>Variety</th>
<th>Cane yield (t/ha)</th>
<th>% improvement over CoJ 64</th>
<th>Pol % in cane</th>
<th>% improvement over CoJ 64</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western U.P.</td>
<td>5</td>
<td>Co 0118</td>
<td>77.30</td>
<td>17.48</td>
<td>13.29</td>
<td>2.70</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Co 0238</td>
<td>90.55</td>
<td>37.61</td>
<td>13.06</td>
<td>0.93</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Co 0239</td>
<td>83.80</td>
<td>27.36</td>
<td>13.42</td>
<td>3.71</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CoJ 64</td>
<td>65.80</td>
<td>-</td>
<td>12.94</td>
<td>-</td>
</tr>
<tr>
<td>Central U.P.</td>
<td>7</td>
<td>Co 0118</td>
<td>73.40</td>
<td>2.37</td>
<td>13.18</td>
<td>4.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Co 0238</td>
<td>93.65</td>
<td>30.61</td>
<td>12.60</td>
<td>-0.24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Co 0239</td>
<td>80.85</td>
<td>12.76</td>
<td>12.99</td>
<td>2.85</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CoJ 64</td>
<td>71.70</td>
<td>-</td>
<td>12.63</td>
<td>-</td>
</tr>
<tr>
<td>Eastern U.P.</td>
<td>4</td>
<td>Co 98014</td>
<td>64.98</td>
<td>20.22</td>
<td>12.54</td>
<td>1.29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Co 0238</td>
<td>68.81</td>
<td>27.31</td>
<td>12.61</td>
<td>1.86</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Co 0239</td>
<td>66.95</td>
<td>23.87</td>
<td>12.63</td>
<td>2.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CoJ 64</td>
<td>54.05</td>
<td>-</td>
<td>12.38</td>
<td>-</td>
</tr>
<tr>
<td>Average for U.P.</td>
<td>16</td>
<td>Co 98014</td>
<td>64.98</td>
<td>1.77</td>
<td>12.54</td>
<td>-0.87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Co 0118</td>
<td>75.35</td>
<td>18.01</td>
<td>13.24</td>
<td>4.66</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Co 0238</td>
<td>84.34</td>
<td>30.09</td>
<td>12.76</td>
<td>0.87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Co 0239</td>
<td>77.20</td>
<td>20.91</td>
<td>13.01</td>
<td>2.85</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CoJ 64</td>
<td>63.85</td>
<td>-</td>
<td>12.65</td>
<td>-</td>
</tr>
</tbody>
</table>

3. **To what extent the benefits of these researches have been made available to the farmers of Uttar Pradesh?**

- The newly released sugarcane varieties such as Co 98014, Co 0118, Co 0238, Co 0239 and Co 0124 are better than the existing local cultivar in terms of cane yield and sucrose% hence they are recommended for commercial cultivation in Uttar Pradesh under normal, water logging and water stress conditions.
- The benefits of newly released sugarcane varieties will be reaped by farmers only if the planting materials of these varieties are made available to them. Realizing this point, the Sugarcane Breeding Institute Karnal Centre has undertaken quality seed production of the newly released varieties. About 2500-3000 quintals seed cane are produced per annum and supplied to farmers and sugar mills of North Western Zone including those in Uttar Pradesh for further multiplication and cultivation.
- Cultivation of these varieties in large scale would surely increase the net return of farmers and sugar mills in Uttar Pradesh.

4. **The steps being taken to open more research Centers of ICAR in Uttar Pradesh?**

   Replied from H.Q.
Answer to un-starred Parliament Question Ey No. 2110

Subject: Un-starred question raised by Sri. M.B. Rajesh on genetically modified crops

a. **The amount invested by ICAR in developing various genetically modified crops in the country.**

At Sugarcane Breeding Institute, Coimbatore the research projects for developing genetically modified crops was started in 1997 and since then an amount of Rs. 84.27 lakhs was invested. The funding was made through AP Cess Fund (57.94 lakhs) and Sugar Development Fund (26.33 lakhs).

b. **Whether the country has any genetically modified crops developed by the Govt. funded research institutes in the country?**

Yes. At Sugarcane Breeding Institute, Coimbatore, transgenics plants with borer resistance were developed.

c. **If so, the details thereof.**

In sugarcane, transgenics with cry1Ab gene for shoot borer resistance were developed and application for approval for Confined Field Trial is pending with RCGM.

d. **Whether the Govt. has any mechanism to check the quality of genetically modified crops introduced by multinational companies and their Indian subsidiaries?**

Not specific to the Institute.

e. **If so, the details thereof.** – Not Applicable

Answer to Parliament Question PQ Dy No. 1129

Subject: Regarding sugarcane production raised by Shri. Jayaram Pangi

a) **The total production of sugarcane recorded during each of the last three years along with the area of land under cultivation thereof, state-wise;**

State-wise Area and Production Under Sugarcane In India

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>State</th>
<th>Area (In '000 hectares)</th>
<th>Production (In '000 tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Andhra Pradesh</td>
<td>264</td>
<td>247</td>
</tr>
<tr>
<td>2.</td>
<td>Assam</td>
<td>27</td>
<td>25</td>
</tr>
<tr>
<td>3.</td>
<td>Bihar</td>
<td>130</td>
<td>119</td>
</tr>
<tr>
<td>4.</td>
<td>Chhattisgarh</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>5.</td>
<td>Gujarat</td>
<td>214</td>
<td>208</td>
</tr>
<tr>
<td>6.</td>
<td>Haryana</td>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>7.</td>
<td>Jharkhand</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>8.</td>
<td>Karnataka</td>
<td>326</td>
<td>296</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>State</td>
<td>Area (In ’000 hectares)</td>
<td>Production(In ’000 tonnes)</td>
</tr>
<tr>
<td>--------</td>
<td>------------------</td>
<td>--------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>9.</td>
<td>Kerala</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>10.</td>
<td>Madhya Pradesh</td>
<td>64</td>
<td>75</td>
</tr>
<tr>
<td>11.</td>
<td>Maharashtra</td>
<td>1049</td>
<td>1088</td>
</tr>
<tr>
<td>12.</td>
<td>Orissa</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>13.</td>
<td>Punjab</td>
<td>99</td>
<td>111</td>
</tr>
<tr>
<td>14.</td>
<td>Rajasthan</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>15.</td>
<td>Tamil Nadu</td>
<td>391</td>
<td>352</td>
</tr>
<tr>
<td>16.</td>
<td>Uttar Pradesh</td>
<td>2247</td>
<td>2179</td>
</tr>
<tr>
<td>17.</td>
<td>Uttarakhand</td>
<td>121</td>
<td>124</td>
</tr>
<tr>
<td>18.</td>
<td>West Bengal</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>19.</td>
<td>Others</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>All India</td>
<td>5151</td>
<td>5043</td>
</tr>
</tbody>
</table>

b) The average yield of sugarcane in the country as compared to the average yield globally;

<table>
<thead>
<tr>
<th>Year</th>
<th>India Productivity (t/ha)</th>
<th>World Productivity (t/ha)</th>
<th>Australia Productivity (t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-07</td>
<td>69.0</td>
<td>70.7</td>
<td>85.6</td>
</tr>
<tr>
<td>2007-08</td>
<td>67.5</td>
<td>71.5</td>
<td>85.2</td>
</tr>
<tr>
<td>2008-09</td>
<td>66.8</td>
<td>71.0 (estimate)</td>
<td>84.6</td>
</tr>
</tbody>
</table>

c) Whether the Government proposes to improve the quality and production of sugarcane in the country;

Yes

d) If so, whether any institution has been selected for doing research work in this field and develop its new variety; and
Research work is ongoing at Sugarcane Breeding Institute, Coimbatore for improving quality and production of sugarcane by developing new varieties.

e) If so, the details thereof?

Six new varieties were released in 2009 for different zones.

### Varieties for North West Zone (Punjab, Haryana, Rajasthan and Uttar Pradesh)

<table>
<thead>
<tr>
<th>Variety Code</th>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co 0118 (Karan 2)</td>
<td>2009</td>
<td>Early maturing variety combining high yield (78.20 t/ha and quality (sucrose 18.88%). A red rot resistant and drought tolerant clone. High yielding variety with high sucrose. Becoming popular in the states of Punjab, Haryana, Uttar Pradesh and Bihar.</td>
</tr>
<tr>
<td>Co 0238 (Karan 3)</td>
<td>2009</td>
<td>Early maturing variety combining high yield (81.08 t/ha) and quality (sucrose 18.20%). Drought tolerant, red rot resistant clone with winter sprouting potential. High yielding variety with good winter sprouting potential and gaining popularity in the entire North-west zone.</td>
</tr>
</tbody>
</table>

### Varieties for Peninsular zone (Maharashtra, Gujrat, Madhya Pradesh, Tamil Nadu, Andhra Pradesh and Kerala)

<table>
<thead>
<tr>
<th>Variety Code</th>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co 2001-13 (Sulabh)</td>
<td>2009</td>
<td>A midlate maturing, high yielding clone (108.59 t/ha) and with 19.03% sucrose with good ratooning potential, Moderately resistant to red rot and smut and tolerant to drought. Red rot resistant variety with high cane yield and juice quality suited for Peninsular zone.</td>
</tr>
<tr>
<td>Co 2001-15</td>
<td>2009</td>
<td>A midlate maturing, high yielding clone (103.74 t/ha) with good ratooning potential, Moderately resistant to red rot and smut and tolerant to drought. Sucrose % is 18.9, fibre 14.7 %. A high yielding variety with good ratoonability and high fibre percentage.</td>
</tr>
</tbody>
</table>

### North Central Zone (Bihar, Eastern U.P, West Bengal and North Eastern states)

<table>
<thead>
<tr>
<th>Variety Code</th>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co 0232</td>
<td>2009</td>
<td>It is an early maturing, water logging tolerant and red rot resistant clone with 67.82 t/ha of cane yield, 7.83 t/ha of CCS and 16.51 % of sucrose at 300 days. This variety is moderately tolerant to top borer.</td>
</tr>
<tr>
<td>Co 0233</td>
<td>2009</td>
<td>It is a midlate maturing, high yielding, water logging tolerant and red rot resistant with cane yield of 67.77 t/ha. It also recorded high sugar yield of 8.25 t/ha and sucrose % of 17.54.</td>
</tr>
</tbody>
</table>

Four new varieties were proposed for release in 2010.

They are Co 0314 (Shyamala) and Co 0219 (Shreyas) for Peninsular Zone and Co 0124 (Karan-5) and Co 0239 (Karan-6) for North West Zone.
Answer to Parliament Question PQ Dy No.368

Subject: Regarding Packaging of Sugarcane juice raised by Sh. M.A. Khan

(a) Whether the Government is taking the steps to bring sugarcane juice in the kind of packing;

Yes. Sugarcane Breeding Institute, Coimbatore had developed technology for the preservation and bottling of sugarcane juice. The Institute is also perfecting technology for the spray dried juice powder which can be reconstituted.

(b) If so, the complete details thereof:

Details of bottling the sugarcane juice.

Choose a variety with high juice content and less fibre percent (CoC 671, Co 62175, Co 7717, Co 86032, Co 86249 and Co 94012).
Grow the cane in normal soils with good quality water.
Use organic manure liberally instead of inorganic fertilizers.
Avoid high and late application of nitrogen.
Choose the pest and disease free cane for crushing.
Harvest the cane at peak maturity. Remove extraneous matter including soil.
Crush the cane within 24 hours after removal of rind in a sterile crusher.
Add one lemon and 2 to 3 g of ginger for every 3 kg of cane material.
Warm the juice to 60 to 70°C and keep it at that temperature for 15 minutes.
Remove the impurities by filtering the juice with a muslin cloth.
To the clear juice add potassium metabisulphite as a preservative at a rate of 12.5 g per 100 litres of juice.
Transfer to a sterilized bottles, close it with a corking machine.
Serve chilled.

Bottled juice can be stored for 6 to 8 weeks.

All the above operations should be done in sterile hygienic conditions.

(c) The views of the industry and the experts in this regard?

Not specific to this Institute
Answer to Parliament Question PQ Dy No. S 4196

Subject: Regarding production of sugarcane raised by Shri M.B. Mysura Reddy

(a) The details of production targets set for sugarcane in the country during the last three years, year-wise and state-wise

Not applicable to the Institute.

(b) The reasons for reduction from 355.50 million tons in 2006-07 to 250.00 million tons in 2009-10

The data on the area, production and productivity of sugarcane in the country during the last three years are furnished below.

<table>
<thead>
<tr>
<th>Year</th>
<th>Area (million ha)</th>
<th>Production (million tonnes)</th>
<th>Productivity (tonnes per ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-07</td>
<td>5.151</td>
<td>355.5</td>
<td>69.0</td>
</tr>
<tr>
<td>2007-08</td>
<td>5.043</td>
<td>340.6</td>
<td>67.5</td>
</tr>
<tr>
<td>2008-09</td>
<td>4.408</td>
<td>294.7</td>
<td>66.8</td>
</tr>
</tbody>
</table>

2009-10 data is not yet available.

- As seen from the table above, the main reason for the reduction in the sugarcane production during the years 2007-08 and 2008-09 is the reduction in the area under sugarcane cultivation.

- The Statutory Minimum Price (SMP) of sugarcane had not been increased substantially in the last three years. It was Rs. 80.25/quintal during 2006-07; 81.18/quintal during 2007-08 and Rs. 81.18/quintal during 2008-09. Due to the increase in the cost of cultivation of sugarcane, the profitability was eroded.

- As a result of higher support price for other competitive crops like paddy, farmers switched over to other remunerative crops. Besides, delay in payment to the sugarcane growers by the sugar factories farmers shifted to other crops. This resulted in reduction in the area under sugarcane cultivation.

- Untimely rainfall received during May – June 2008 in U.P. affected tillering and fertilizers could not be applied on time. This has resulted in lower cane yield during the 2007-08.

- In Maharashtra, low rain fall and inadequate water availability during the grand growth phase coupled with shortage of fertilizer (DAP), labour and power resulted in reduced yields.

- During the year 2008-09 sugarcane ratoon area has increased to 65% compared to 40-45% in the previous years. Generally the productivity of ratoon crop is lower than that of the plant crop. Hence the average cane productivity during the year 2007-08 has declined.
(c) The production of sugarcane per acre in the country vis-à-vis the major sugarcane producing countries in the world and

The data on the productivity of sugarcane (yield per acre) in India and other major sugarcane producing countries in the world is furnished below.

Productivity of sugarcane (tonnes/acre) compared to other major producing countries

<table>
<thead>
<tr>
<th>Country</th>
<th>2006-07</th>
<th>2007-08</th>
<th>2008-09 (estimate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>27.9</td>
<td>27.3</td>
<td>27.0</td>
</tr>
<tr>
<td>Brazil</td>
<td>31.0</td>
<td>30.5</td>
<td>30.3</td>
</tr>
<tr>
<td>USA</td>
<td>32.2</td>
<td>30.5</td>
<td>30.3</td>
</tr>
<tr>
<td>China</td>
<td>30.2</td>
<td>29.8</td>
<td>27.3</td>
</tr>
<tr>
<td>Australia</td>
<td>34.7</td>
<td>34.5</td>
<td>34.3</td>
</tr>
<tr>
<td>World average</td>
<td>28.6</td>
<td>28.9</td>
<td>28.7</td>
</tr>
</tbody>
</table>

(d) The reason for failure of sustainable development of sugarcane based cropping system in the country in the last three years.

During the year 2006-07 the country recorded a very high production of 355.5 million tonnes from 5.15 million ha. This record production created problems of plenty. The price of sugar in the market crashed. The factories were not able to pay the cane price to the farmers in time. In addition, because of the surplus cane production, the mills delayed harvesting the cane and in extreme cases the farmers were forced to abandon the standing crops causing considerable loss to the farmers. Because of the non payment of cane price, delayed harvesting and lower cane price, farmers had switched over to more remunerative crops and this resulted in the decrease in the cane area in the subsequent years. The SMP of sugarcane was increased only marginally during the years 2006-07, 2007-08 and 2009-09.

Studies conducted by the Department of Economics Analysis and Research had showed that sugarcane production especially Haryana and Uttar Pradesh was not an economic proposition / profitable venture as the returns received were insufficient to cover all the costs, particularly when the family labour was accounted for. This fact coupled with higher support price for crops like paddy, soybean etc. had resulted in diversion of sugarcane area to more remunerative crops.

Answer to Parliament Question PQ Dy No. 4202 and 4154

Subject: Developing genetic modifications in cash crops by ICAR raised by Shri. Prasanta Kumar Majumdar and Shri Manohar Trikey

a) Whether Indian Council of Agricultural Research and Department of Bio-technology have recommended various cash crops for developing genetic modifications;

b) If so, the names of cash crops under review in various institutes as on date, institute-wise;

At Sugarcane Breeding Institute, Coimbatore, researches on developing genetically modified sugarcane is being taken up/ in progress. Application was made in December 2009 for the approval of RCGM/GEAC for confined field trial of transgenics of sugarcane with cry 1Ab gene for shoot borer resistance. The approval is awaited.
e) The criteria fixed for examination of such crops

Not applicable.

f) The names of cash crops likely to be released by the Review Committee on Genetic Manipulation and Genetic Engineering Approval Committee in the current financial year?

Not applicable

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Answer to Un-starred Parliament Question  March 2010

Subject: Factual information of the notices of Starred/Unstarred questions raised by Shri Vijay Jawahar Lal Darda (Fact of the case)

a. As the output of sugar from per quintal of sugar-cane depends upon the “Sucrose” content, whether any R&D has been done to increase “Sucrose” as any additional quantity of sugar from indigenous sources, would contribute in arresting the continuously price rising trends?

R & D work is being done to increase the sucrose content in sugarcane varieties. Research on breeding is done and new varieties are developed at Sugarcane Breeding Institute, Coimbatore with increased sucrose content by hybridization and clonal selection for high sucrose content along with other desirable traits. The quantity of sugarcane used for manufacture of sugar also has to be sufficient to have required production of white sugar indigenously.

b. What is the FAO/Internationally accepted sucrose content in the sugar-cane?

FAO has not prescribed any standards regarding sucrose content for sugar cane.

c. Is any special quality of seeds available which ensure maximum sucrose content?

Quality of seed material is not likely to affect the sucrose content; rather sucrose content is a varietal character.

The recently released sugarcane varieties Co 0118 and Co 0238 for North-west zone, Co 99004 for Peninsular zone and Co 94012 for Maharashtra and Karnataka states are with higher sucrose content and sugar yield compared to other existing varieties under cultivation.

d. Whether a special awareness campaign be launched for sugar-cane growers for resorting to better seeds and adopting latest technologies to enhance sugar output qualitatively and quantitatively?

Use of good quality healthy seed ensures a better crop and thus improves productivity. Institute produces breeder seed of approved varieties at Coimbatore and Karnal centres for supply to farmers. Institute also produces tissue culture plants for supply to sugar factories and farmers to raise disease-free seed nurseries.

The varieties that are released by the Institute are high sugared high yielding varieties. Institute conducts Sugarcane R & D meetings in Tamil Nadu and Karnataka every year involving all the sugar factories in these two states, wherein the breeder seed production by different agencies is reviewed. The Sugarcane Research and Development workers meetings also serve as a forum in which information about the new sugarcane varieties and
related technologies are given to the cane development personnel through whom the messages are trickled down to cane growers.

Awareness campaigns are also being organized by the institute in villages to make the farmers realize the available sugarcane technologies. At least eight awareness campaigns were organized since 2008 in the districts of Erode (2 Nos.), Cuddalore (2 Nos.), Karur (1 No.), Dharmapuri (1 No.), Coimbatore (1 No) and Thiruchirapalli (1 No.).

Kisan Melas organized in the institute as well as its Regional Centre also reiterate the importance of the latest technologies to boost the sugar productivity.

Training programs for farmers on 'Sugarcane production technology' are being regularly conducted in the institute to impart information on the latest technologies.

Farmers visiting the institute are also advised to grow sugar rich high yielding varieties for increased productivity and thereby higher sugar output.

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**Answer to Parliament Question Dy No U 1949**

**Subject:** Rajya Sabha question No. U 1949 raised by Shri N.R. Govindarajar, MP, regarding R&D in agriculture sector.

a) Whether India lags behind other nations in spending on Research and Development in Agriculture and Public investment in Agriculture R&D in agriculture decline for the last two decades.

Not applicable

b) If so, the details thereof;

Not applicable

c) The details and annual expenditure incurred in Research and Development with latest research findings for the past three years; and

<table>
<thead>
<tr>
<th>Annual expenditure for the past three years (Rupees in lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Non-Plan(NP)</td>
</tr>
<tr>
<td>Plan(P)</td>
</tr>
<tr>
<td>Total(NP&amp;P)</td>
</tr>
</tbody>
</table>

Research findings for the past three years:

Eight new sugarcane varieties released: Seven new sugarcane varieties were released for commercial cultivation of which Co 99004, Co 2001-13 and Co 2001-15 were for Peninsular zone, Co 98014, Co 0118 and Co 0238 were for North-west zone and Co 0232 and 0233 for North-central zone. The high sugared variety Co 94012, was released in Maharashtra and Karnataka.
Identification of improved sugarcane hybrids as ‘Co’ canes: During the last three years (2007-2009), 86 promising hybrid clones were identified as ‘Co’ canes, of which 39 were early maturing and 47 were midlate maturing.

Transgenics: Transgenics in sugarcane with genes coding for chitinase, 1,3 β glucanase and Dm-Amp1 (defensin) for red rot resistance and aprotinin and cry1Ab (Bt gene) for borer resistance were developed. Agrobacterium mediated transformation in sugarcane was standardised. The application for Confined Field Trial for the sugarcane transgenics was submitted to RCGM/ GEAC.

Sugarcane genetic resources: Explorations for collection of wild related species of sugarcane was conducted in Gujarat (2007), Rajasthan (2008) Himachal Pradesh and Uttarakhand (2009) a large number of Saccharum and Erianthus species were collected. The wild species S. spontaneum and E. arundinaceus were utilized in introgression breeding. Seven derived novel germplasm were registered with NBGPR. Sugarcane hybrids with Erianthus cytoplasm were developed for genetic base broadening.

Molecular markers: Genetic diversity existing among the tropical and subtropical varieties of India was studied using RAPD and AFLP markers revealed a narrow genetic base of the Indian cultivars. AFLP markers revealed that subtropical varieties have more of S. spontaneum genome compared to tropical varieties. AFLP and SSR markers proved efficient in molecular fingerprinting of the sugarcane commercial varieties.

Breeder seed production: The breeder seed of the new popular commercial varieties Co 86032, Co 89003, Co 94008, Co 98014, Co 99004, Co 0118 and Co 0238 were produced and distributed to sugar factories and progressive farmers. Tissue culture plants of Co 86032 and Co 99004 varieties were also produced and distributed.

Drip irrigation in sugarcane economises irrigation water by 30% with a yield improvement of 20%.

An efficient strain of Gluconacetobacter diazotrophicus which can fix nitrogen and solubilise phosphates has been isolated.

Red rot resistant sugarcane varieties: Co 99004, Co 99006, Co 2001-13, Co 0327, Co 0331, Co 0424, Co 05009, Co 05010 and Co 05011 were identified as resistant to red rot.

Red rot Management: Two new fungicides trifloxystrobin + tubuconazole and pyroclostrobin + metiran were found effective against debris borne inoculum of red rot. Molecular diagnostic techniques were developed to detect sugarcane viruses, phytoplasmas and red rot pathogen in seed canes and seedlings.

Tissue culture through meristem culture has been found effective in eliminating sugarcane yellow leaf virus causing yellow leaf disease in sugarcane. Sugar factories were educated to follow seed nursery programmes with meristem derived tissue culture seedlings to manage the disease.

Clones resistant to sugarcane pests: Several clones of sugarcane (more than three hundred) have been identified as showing resistance/ tolerance to major pests such as Early shoot borer, Internode borer, Top borer, Stalk Borer and White grub. Parasitoid: The efficacy of the parasitoid Encarsia flavoscutellum was established over the predator Dipha aphidivora for woolly aphid management.

Cultural practices: Wide row or pit method of planting and detrashing in fifth and seventh months enables monitoring and spot application of insecticides. Judicious use of fertilizers and irrigation minimizes intensity of aphid.
**Synthetic sex pheromones in sugarcane borer management**
The indigenous pheromones of shoot, internode and top borers have been found to be economical and effective in trapping moths under field conditions. A new water trap has been designed to trap moths using pheromone lures. This is now commercially available for large-scale use.

**Entomopathogenic nematodes (EPN) against sugarcane pests:** The entomopathogenic nematodes (EPN) for control of white grub has been established.

**d) The steps taken to ensure the benefits of successful experiments carried out at Agro research institutions in the country to reach the farmers at the grass root level?**

Research and Development Workers meetings are being organized every year in Tamil Nadu, South Karnataka and North Karnataka wherein the latest research findings are discussed with cane development personnel of the sugar factories by the scientists of the concerned state.

Under the Institute Village Linkage Programme implemented in a cluster of three villages in Coimbatore district during 2000-2005, 37 technological interventions in sugarcane, vegetable crops, coconut and livestock were made in farmers fields by conducting on-farm and adaptive trials.

Frontline demonstrations on recent technologies and varieties are being conducted in farmers fields with a control plot to accelerate the rate of adoption.

One day training programmes on ‘Sugarcane agriculture’ are conducted in the institute for the benefit of farmers based on their demand.

Kisan Mela of three days duration is being organized every year in the institute with the participation of cane growers from all over the country.

Awareness Campaigns, Field Days and On farm training programs are organized in the village to make the farmers know about the latest technologies.

Press releases are being given through AIR, Print media, Doordarshan etc.

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**Answer to Parliament Question Dy No S 2160**

**Subject:** Material for framing reply to Admitted Rajya Sabha Question No. S 2160 raised by Shri Vijay Jawahar Lal Darda regarding output of sugar from sugarcane for answer on 16.4.2010

a. **As the output of sugar from per quintal of sugar-cane depends upon the “Sucrose” content, whether any R&D has been done to increase “Sucrose” as any additional quantity of sugar from indigenous sources, would contribute in arresting the continuously price rising trends?**

R & D work is being done to increase the sucrose content in sugarcane varieties. Research on breeding is done and new varieties are developed at Sugarcane Breeding Institute, Coimbatore with increased sucrose content by hybridization and clonal selection for high sucrose content along with other desirable traits. The quantity of sugarcane used for manufacture of sugar also has to be sufficient to have required production of white sugar indigenously.
b. **What is the FAO/Internationally accepted sucrose content in the sugar-cane?**

   FAO has not prescribed any standards regarding sucrose content for sugar cane.

c. **Is any special quality of seeds available which ensure maximum sucrose content?**

   Quality of seed material is not likely to affect the sucrose content; rather sucrose content is a varietal character.

   The recently released sugarcane varieties Co 0118 and Co 0238 for North-west zone, Co 99004 for Peninsular zone and Co 94012 for Maharashtra and Karnataka states are with higher sucrose content and sugar yield compared to other existing varieties under cultivation.

d. **Whether a special awareness campaign be launched for sugar-cane growers for resorting to better seeds and adopting latest technologies to enhance sugar output qualitatively and quantitatively?**

   Use of good quality healthy seed ensures a better crop and thus improves productivity. Institute produces breeder seed of approved varieties at Coimbatore and Karnal centres for supply to farmers. Institute also produces tissue culture plants for supply to sugar factories and farmers to raise disease-free seed nurseries.

   The varieties that are released by the Institute are high sugared high yielding varieties. The Institute conducts Sugarcane R & D meetings in Tamil Nadu and Karnataka every year involving all the sugar factories in these two states, wherein the breeder seed production by different agencies is reviewed. The Sugarcane Research and Development workers meetings also serve as a forum in which information about the new sugarcane varieties and related technologies are given to the cane development personnel through whom the messages are trickled down to cane growers.

   Awareness campaigns are also being organized by the institute in villages to make the farmers realize the available sugarcane technologies. At least eight awareness campaigns were organized since 2008 in the districts of Erode (2 Nos.), Cuddalore (2 Nos.), Karur (1 No.), Dharmapuri (1 No.), Coimbatore (1 No) and Thiruchirapalli (1 No.).

   Kisan Melas organized in the institute as well as its Regional Centre also reiterate the importance of the latest technologies to boost the sugar productivity.

   Training programs for farmers on ‘Sugarcane production technology’ are being regularly conducted in the institute to impart information on the latest technologies.

   Farmers visiting the institute are also advised to grow sugar rich high yielding varieties for increased productivity and thereby higher sugar output.

**Information for supplementaries**

(ii) **National and international Importance of Sugarcane:**

   Eighty three countries produce sugar from sugarcane. Sugarcane is grown in tropical and subtropical countries of the southern hemisphere.

   Of the total sugar production, cane sugar constitutes around 75% and beet sugar 25%. The proportion of beet sugar in the world sugar production has been declining from a high of 46% in 1964-65 to the current level of 25%.
Sugar industry is the second largest in the country after cotton textiles and contributes around 6% of the national GDP. Indian sugar industry contributes substantially to the rural economy as the sugar mills are located in rural areas and employ rural folk to a large extent. Sugar industry by-products viz., molasses and bagasse support other industries. Molasses is the cheapest feedstock for the distilleries. The bagasse has been accepted as a viable alternative raw material to wood in the paper and pulp industry. During the recent past Government initiatives to encourage alternative renewable sources of energy have motivated most of the sugar mills to install cogeneration plants using bagasse as fuel with high-pressure boilers, efficient condensers and waste heat recovery systems. The installed capacity of cogeneration plants is around 1500 MW and the potential has been estimated to be 5000 MW.

Sugarcane is grown in 4.5 M ha - in both tropical and subtropical regions. Area went up to 5.15 M ha in 2006-07. Annual sugar production is about 20 M t. Highest sugar production in the country was in 2006-07 (28.4 M t). Provisional estimate for 2009-10 season is 18 M t (ISMA). Significant reduction in cane area has taken place in the last two years due to diversion to other crops which are more remunerative. Sugar production came down to 14.5 M tons in 2008-09. Annually 270-350 M t of cane produced. Average cane productivity is 65 t/ha. Average cane productivity in Tamil Nadu is the highest (110 t/ha). Average sugar recovery is 10.5%. UP, Maharashtra, Karnataka and Tamil Nadu account for nearly 85% of total sugar production. Current domestic consumption of sugar is about 23 M t. India is the largest consumer in the world.

Cane sugar is produced in South America, Asia, Oceania, Africa and Central America and southern part of North America. Out of 109 million tonnes of cane sugar produced during 2003-04, Brazil produced 26.4 million tonnes followed by India (15.2 million tonnes), China (10.3 million tonnes), Thailand (7.5 million tonnes), Mexico (5.3 million tonnes) and Australia (5.3 million tonnes). The other 78 countries produced a total of around 45 million tonnes, each producing less than 5 million tonnes.

The region-wise contribution to cane sugar is: North and Central America – 16.2 million tonnes (14.8%), Asia – 42.0 million tonnes (38.6%), Africa – 9.2 million tonnes (8.4%), South America – 35.7 million tonnes (32.7%) and Oceania – 5.9 million tonnes (5.4%). Cuba produced around 8 million tonnes of cane sugar till 1988-89, most of it being exported to the then USSR and the East European countries. With the breaking up of USSR, the production in Cuba declined to around 2.5 million tonnes. It is seen that the productivity of India compares favourably with that of major producers of equivalent size. Global sugar production during 2008-09 was 161.527 million tones.

(iii) Problem in sugarcane cultivation as identified by your institute / Scheme and strategies to manage them

Problems in sugarcane cultivation -
- Increasing cost of cultivation in sugarcane agriculture.
- Non availability of farm labourers for field operations
- Pest and disease problems
- Declining total factor productivity.
- Emerging problems of global warming and climate change scenarios.

Strategies to manage the problem

- Mechanisation of sugarcane agriculture is essential to reduce the cost of cultivation. Varieties and technologies have to be developed to suit mechanised harvest.
• Reduction in the cost of production of sugarcane through superior varieties with multiple ratooning capacity, biotic and abiotic stress tolerance and higher input use efficiency and mechanisation of the cultural operations need emphasis.
• Development of management practices for emerging pest and disease problems
• Natural resource conservation through integrated nutrient management, fertigation, biofertilisers, precision and organic farming. Development of varieties responsive to these approaches.
• Mitigation strategies to improve sugarcane productivity in the context of climate change scenarios.

iv) Research achievements in development of high sucrose varieties of sugarcane

The midlate varieties Co 0218 and Co 99006 were identified in AICRP trials in Peninsular zone as having high sucrose with 20.53 % and 20.41 % sucrose in juice, respectively compared to the popular current variety Co 86032 with 19.55 %. In the North-west zone the recently released early maturing variety Co 0118 is with higher sucrose % juice of 18.64 % than the standard CoJ 64 (18.16 %). Another promising variety for North-west zone, Co 0239 is with 18.58 % sucrose. These varieties have superior commercial cane sugar yield than the present varieties and also have higher cane yield. New genetic stocks are being developed by hybridization and selection for higher sucrose content which are to be used as parents in breeding programme.

v) Quality seed production

The breeder seed of recently released sugarcane varieties are being produced at Coimbatore and Karnal as per the prescribed seed standard. Tissue culture plants produced is also supplied as breeder seed. The facilities for genetic fidelity testing and virus indexing of tissue culture plants using molecular techniques was developed at Sugarcane Breeding Institute to test the quality of tissue culture plants to be used as breeder seed.

vi) Details of front line demonstrations in last three years

Frontline demonstrations

2006-07

Five Frontline Demonstrations were laid in farmers’ fields during 2006 and harvested during Apr-Jun 2007. The cane yield (t/ha) obtained are:
• Varietal demonstration in 90 cm spacing
  - Co 86032: 138.92, Co 94008: 141.25
• Performance of sugarcane in wide row spacing
  - Co 86032, 120 cm spacing: 172.6, 90 cm: 159.7
• Integrated weed management
  - Treatment: 112.25, Control: 106.25
• Bio-fertilizer application, variety Co 86032
  - Treatment: 134, Control: 125.68
• Integrated Nutrient Management,
  - Co 86032- Treatment: 161.13, Control: 151.15

2007-08

Six demonstrations were laid during Nov-Dec 2007 and harvested during Nov-Dec 2008. The cane yield (t/ha) obtained are
- Sugarcane varieties- Co 94012 & Co 86032 in Perur  
  o Treatment: 123.75, Control: 120
- Sugarcane varieties- Co 94012 & Co 86032 in Alathurai  
  o Treatment: 130, Control: 125
- Bio-fertilizer application in Avinashi  
  o Treatment: 102.50, Control: 100
- Pit method of planting with drip fertigation in Periyanaickenpalayam  
  o Treatment: 137.5, Control: 130
- Paired row planting with drip fertigation in Nambiyampalayam  
  o Treatment: 162.50, Control: 130
- Paired row planting with drip fertigation in Kurumbapalayam  
  o Treatment: 117.50, Control: 107.50

2008-09

Eight demonstrations were planted in Coimbatore & Tirupur districts in 1 ha each during Nov-Dec. 2008 and harvested during Dec 2009 and January 2010.

- Sugarcane varieties- Co 99004 & Co 86032 in Semmedu  
  - Co 99004: 109, Control: 104
- Sugarcane varieties- Co 99004 & Co 86032 in Sathy  
  - Co 99004: 135, Control: 129.5
- Bio-fertilizer application in Sathy  
  - Treatment: 146, Control: 136.55
- Bio-fertilizer application in Mettupalayam  
  - Treatment: 137.50, Control: 132.50
- Paired row planting with drip fertigation in Annur  
  - Treatment: 178, Control: 154.50
- Paired row planting with drip fertigation in Cheyur  
  - Treatment: 137.50, Control: 127.50
- Wider row spacing in Sathy West  
  - Treatment: 132, Control: 123.50
- Wider row spacing in Sathy East  
  - Treatment: 98, Control: 77

Other ongoing demonstrations

- Fifty demonstrations in TamilNadu (Dharmapuri district – 15 nos., Erode – 9, Cuddalore – 16 and Coimbatore – 10) on seven technologies viz., Pit method/paired row planting of sugarcane with drip fertigation, Integrated Nutrient Management, Biofertilizer application, Drought management, Trash mulching, In situ trash composting and Vermicompost are in progress.

vii) Training programs and Kishan Melas organized

2007-08

Eight National level training courses were organized as detailed below:

i. Training on 'Woolly aphid management in sugarcane‘: 12-14 December 2007 with 14 participants (Maharashtra-2, TamilNadu-7, Karnataka-3, Orissa-2)
ii. Training on ‘Use of appropriate sugarcane varieties for increasing sugar recovery‘: 18-20 December 2007 with 20 participants (Tamil Nadu-8, Gujarat-2, Karnataka-4, Kerala-2, Orissa-2, Maharashtra-1, Puducherry-1)
iii. Training on ‘Drought management in sugarcane’: 23-25 January 2008 with 16 participants (TamilNadu-13, Karnataka-1, Orissa-2)

iv. Training on ‘Ratoon management in sugarcane’: 6-8 February 2008 with 14 participants
   a. (Andhra Pradesh-1, TamilNadu-6, Karnataka-6, Gujarat-1)

v. Training on ‘Integrated nutrient management including bio-fertilizers in sugarcane’: 13-15 February 2008 with 11 participants (Gujarat-3, TamilNadu-7, Karnataka-1)

vi. Training on ‘Sugarcane cultivation in biotic and abiotic stress conditions’: 20-22 February 2008 with 11 participants (Kerala-1, TamilNadu-7, Gujarat-1, Orissa-2)

vii. Training on ‘Intercropping with sugarcane’: 5-7 March 2008 with 13 participants (TamilNadu-12, Karnataka-1)

viii. Training on ‘Low cost production technologies in sugarcane with sustaining productivity’: 12-14 March 2008 with 12 participants (TamilNadu-5, Karnataka-1, Gujarat-4, Kerala-1, Andhra Pradesh-1)

2008-09

Three National level training courses were organized as detailed below:

i. Sugarcane cultivation in biotic and abiotic stress conditions, Feb. 3-5, 2009 - 18 participants from Maharashtra (4), Karnataka (8), Gujarat (2) and TN (4).

ii. Use of appropriate sugarcane varieties for increasing sugar recovery, Feb. 17-19, 2009. - 19 participants from Karnataka (8), TN (4), Gujarat (3) and Maharashtra (4).

iii. Drought management in sugarcane, Feb. 24-26, 2009. - 15 participants from Karnataka (4), Maharashtra (7), Orissa (1) and TN (3).

Model training course:

Model training course on “Recent advances in sugarcane production technology” of eight days duration sponsored by Directorate of Extension, Department of Agriculture and Co-operation, Ministry of Agriculture, Govt. of India was conducted during 18-25 July 2007 and 22-29 July 2009 with 11 and 19 participants belonging to the state agricultural departments of Madhya Pradesh, Gujarat, Karnataka, Orissa, Kerala, Chattisgarh, Punjab and Tamil Nadu.

Kishan Melas

Kishan Melas were organized in the Institute during 2006, 2007, and 2009 for three days to highlight the ways and means to increase cane productivity. Various research institutions, banking and insurance firms, fertilizer and pesticide manufacturers, farm equipment manufacturers and other service providers in the agricultural sector had put up ~ 30 stalls. Visits to fields, seminars and interactive meetings between scientists and farmers were also arranged. Video films on sugarcane technologies were screened in the forenoon sessions. Interactive seminars on topics such as promising sugarcane varieties, advances in cane agronomy and current trends in integrated sugarcane pest and disease management were conducted by sugarcane experts in the afternoon sessions. Over 2000 farmers from the states of Orissa, Maharashtra, Karnataka, Andhra Pradesh, Puducherry, Chattisharh, Kerala and Tamil Nadu participated in the mela. Kishan Melas were also organized at SBI,RC Karnal during 2007, 2008
viii) Quantity of sugarcane seed including breeder seed produced and supplied during last three years

(Sugarcane Breeding Institute - at Karnal and Coimbatore)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Year</th>
<th>Production (Qtls)</th>
<th>Tissue culture plants</th>
<th>Budchip transplants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2007-08</td>
<td>3293</td>
<td>15000</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>2008-09</td>
<td>3464</td>
<td>32000</td>
<td>16000</td>
</tr>
<tr>
<td>3</td>
<td>2009-10</td>
<td>4026</td>
<td>13644</td>
<td>9300</td>
</tr>
</tbody>
</table>

ix) Budget allocation and expenditure during last three years

<table>
<thead>
<tr>
<th></th>
<th>2007-08 Outlay</th>
<th>2007-08 Expenditure</th>
<th>2008-09 Outlay</th>
<th>2008-09 Expenditure</th>
<th>2009-10 Outlay</th>
<th>2009-10 Expenditure</th>
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<tbody>
<tr>
<td>1. Non-Plan</td>
<td>883.75</td>
<td>856.36</td>
<td>1221.15</td>
<td>1207.04</td>
<td>1714.54</td>
<td>1714.53</td>
</tr>
<tr>
<td>2. Plan</td>
<td>165.00</td>
<td>164.01</td>
<td>289.33</td>
<td>289.27</td>
<td>350.00</td>
<td>349.99</td>
</tr>
</tbody>
</table>

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**Answer to Parliament Question Dy No. 4163**

**Subject:** Lok Sabha Un-starred question Dy.No.4163 raised by Shri A. Ganeshmurthi and Shri Sanjay Dhotre regarding sugarcane cultivation

**a. Whether several sugarcane farmers have shifted to cultivation of other crops**

The area under sugarcane cultivation has been reduced by 12.6% during the year 2008-09 compared to the previous year. This is due to the shifting of sugarcane farmers to other crops like rice, wheat, maize etc.

**b. If so, the details thereof, State-wise**

Statewise statistics of the details of farmers who have shifted to other crop is not available with the Institute.

**c. Whether the government has any programme to assist such farmers to revert back to sugarcane cultivation**

Not applicable

**d. If so, the details thereof; and**

Not applicable

**e. If not, the reasons thereof?**

Not applicable
Answer to Parliament Question Dy No.13492

Sub: Lok Sabha Starred question Dy.No.13492 regarding high yielding seeds

a. Whether various schemes for developing high yielding varieties seeds of crops have been launched

Yes. Sugarcane Breeding Institute is continuously developing improved high yielding sugarcane varieties with high sugar recovery potential suited for cultivation in different parts of the country.

b. If so, the achievement of those schemes in the matter of production and productivity percentage increase in production estimated due to use of such seeds in country

- The sugarcane variety Co 86032 released by the institute occupies 80-90% of the area of Tamil Nadu, 50% cane area in Maharashtra and sizeable areas in Karnataka, Gujarat, and interior Andhra Pradesh.
- Co 89003 released for the north western zone is occupying about 17000 hectares in Punjab and Haryana.
- Co 94012 is occupying nearly 20,000 hectares in Maharashtra and Karnataka.
- Co 92005 had been released in Karnataka in the year 2009. This variety produces the best quality jaggery which fetches a premium price.

The following new varieties have been released in recent years by the Central Varietal Committee

i. Peninsular zone (Gujarat, Maharashtra, Karnataka, Madhya Pradesh, Kerala and parts of Andhra Pradesh and Tamil Nadu): Co 99004, Co 2001-13, Co 2001-15
ii. North west zone (Rajasthan, Punjab, Haryana, Uttarkhand and Western U.P.): Co 94014, Co 0238, Co 0118
iii. North central zone (Eastern U.P. and Bihar): Co 0232 and Co 0233

The yield of these varieties and the improvement in yield over the standards recorded in the AICRP trials is given below.

<table>
<thead>
<tr>
<th>Name of the variety</th>
<th>Yield in AICRP trials (t/ha)</th>
<th>Increasing yield over the best standard (%)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co 99004</td>
<td>116.82</td>
<td>2.78</td>
<td>Suitable for cultivation under stress condition like red rot, drought and salinity</td>
</tr>
<tr>
<td>Co 2001-13</td>
<td>108.59</td>
<td>4.68</td>
<td>Moderately Resistant (MR) to red rot and smut and tolerant to drought. Good ratooning potential.</td>
</tr>
<tr>
<td>Co 2001-15</td>
<td>112.99</td>
<td>4.23</td>
<td>Non lodging, erect, high tillering, good ratooner and suited for saline, drought and red rot prone areas</td>
</tr>
</tbody>
</table>
Co 98014 74.92 12.16 Tolerant to water stress and water logging conditions. Resistant to red rot and smut.

Co 0238 81.08 19.96 Clone with winter sprouting potential and tolerant to low temperature, tolerant to drought and red rot resistance.

Co 0118 78.20 15.70 Red rot resistance and drought tolerant clone with high sucrose.

Co 0232 67.82 7.63 Tolerant to water logging and resistant to red rot, MR to top borer.

Co 0233 67.77 14.17 High yielding red rot resistant clone and tolerant to water logging.

c. Whether the Government has allocated any funds for dissemination of information to popularize new high yielding varieties of seeds and distribution of the same; and

No separate funds are allocated for the dissemination of information to popularize the new high yielding varieties. However, the Institute is popularising these varieties by conducting Front Line Demonstrations, and other extension activities.

The Institute is operating a Mega seed project for multiplication of the breeder seeds of newly released and popular varieties and distribute the seed to sugar factories for further multiplication and supply to farmers. Besides, the Institute is producing and supplying tissue culture plants to the sugar factories for further multiplication and supply to farmers. It is also distribute limited quantity of seed material to the farmers.

d. If so, the details thereof along the amount of funds allocated during each the last three years and current year, State-wise along with the steps taken for increasing the availability of such seeds in the country

The breeder seed of the recently released sugarcane varieties Co 86032, Co 94009, Co 94012, Co 99004, Co 98014, Co 2001-13, Co 2001-15, Co 0118 and Co 0238 are being produced and more than 1000 tons of breeder seed was distributed from Coimbatore and Karnal. Tissue culture seedlings of Co 86032 and Co 99004 were also produced and distributed.

The details of funds allocated and expenditure during the last three years for multiplication of sugarcane seed material under the Mega Seed Project on Seed production in agricultural crops are furnished below.

<table>
<thead>
<tr>
<th>Year</th>
<th>Funds allotted (Rs. Lakhs)</th>
<th>Expenditure (Rs. Lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-07</td>
<td>69.00</td>
<td>29.36</td>
</tr>
<tr>
<td>2007-08</td>
<td>18.90</td>
<td>12.28</td>
</tr>
<tr>
<td>2008-09</td>
<td>25.85</td>
<td>3.33</td>
</tr>
<tr>
<td>2009-10</td>
<td>27.16 (up to 20.11.2009)</td>
<td>0.85</td>
</tr>
</tbody>
</table>

Answer to Parliament Question Dy No 14025

Sub: Lok Sabha Starred question Dy.No.14025 regarding high yielding varieties of crops

a. The funds allocated for research and development of high yielding varieties of crops during each of the last three years and current year.

The total expenditure (Plan and Non Plan) of the Institute for the last three years and the current year is Rs.5.616 crores approx. 30% of the budget has been utilised for the crop improvement programmes which is Rs. 1.685 crores. The year wise allocation is given below.

Approximate allocation and expenditure on Crop Improvement Programme (Rs.in Crores)

<table>
<thead>
<tr>
<th>Year</th>
<th>Allocation</th>
<th>Expenditure</th>
<th>Allocation</th>
<th>Expenditure</th>
<th>Allocation</th>
<th>Expenditure up to Nov 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008-2009</td>
<td>4.531</td>
<td>4.489</td>
<td>5.712</td>
<td>4.453</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009-2010</td>
<td>5.712</td>
<td>4.453</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. The steps taken to promote public private partnership in the fields of livestock for sustainable development in agriculture

The Institute is not involved in any research on livestock.

c. Whether the government proposes to set up a special enterprise fund for biotechnology

Not applicable

Answer to Parliament Question Dy No 13538

Sub: Lok Sabha Starred question Dy.No.13538 regarding Crop production technology

a. Whether it is true that farmers in India need long term measures to improve crop technology, mechanism to make the produce competitive in global market: Give details

The production cost of sugar in India is in the medium range, costlier than Australia but cheaper than Mauritius and USA. The cost of production in African counties like Zimbabwe, Zambia, Malawi and South Africa is much less compared to India. In the international market the Indian sugar is not competitive because of the higher cost of production. The major component contributing to the relatively high cost of sugar produced in India is the higher cost of cultivation of sugarcane. Hence long term measures are needed to improve sugarcane productivity by way of improved crop production and protection technologies and development of high yielding high sugar varieties and to reduce the cost of cultivation of sugarcane.

b. Whether the ministry has taken up any measures in this direction

Yes. Sugarcane Breeding Institute is adopting a two pronged strategy of increasing productivity without any additional cost and reducing the cost of cultivation per unit area without out affecting the yield so as to reduce the cost of production per tonne of cane.
c. If so, the details thereof

The cost of cultivation of sugarcane has increased in recent years primarily due to the higher cost of inputs and labour. The steep increase in the cost of production, non availability of labour for harvesting and high cost of inputs are eroding the profits. The harvesting charges are increasing every year particularly in the southern states of the country and constitute nearly 30-40% of the total cultivation cost. Mechanization of agricultural operations is the only option under this situation to maintain the cost of cultivation at an acceptable level. Sugarcane Breeding Institute has intensified its research efforts to improve sugarcane productivity as well as to reduce the cost of sugarcane cultivation and the details are furnished below.

The Institute has developed a number of high yielding high sugar varieties which are recommended for cultivation in different agro climatic zones of the country. The variety Co 86032 released from the Institute in the year 2000 is the most popular variety in the Peninsular zone occupying nearly 90% area of Tamil Nadu and substantial areas in Karnataka, Maharashtra and Gujarat. It is suitable for wide row spacing and mechanical harvesting and retains quality upto 14 to 16 months. The details of other improved varieties released in the recent years are given below.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the variety</th>
<th>Year of release</th>
<th>Salient features</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>For Peninsular zone (Gujarat, Maharashtra, Karnataka, Madhya Pradesh, Kerala Parts of Andhra Pradesh and Tamil Nadu)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Co 99004 (Damodar)</td>
<td>2007</td>
<td>Cane yield 116.82 t/ha, sucrose % 19.21. MR to red rot, drought tolerant, golden yellow jaggery, thick, tall and erect canes with non flowering. Average sugar yield of 16.09 t/ha.</td>
<td>Replacement for Co 86032. Has potential to be cultivated throughout Peninsular zone</td>
</tr>
<tr>
<td>2</td>
<td>Co 94012 (Phule Savitri)</td>
<td>2005</td>
<td>High yielding high quality variety (Sucrose % 21.35) with drought, salinity and smut resistance. The variety has thick, greenish pink canes with heavy spines and flowers profusely. Highly susceptible to red rot..</td>
<td>Early variety with the highest sugar recovery. Released in Maharashtra and Karnataka. Good potential in red rot free areas of Maharashtra and N. Karnataka</td>
</tr>
<tr>
<td>3</td>
<td>Co 2001-13 (Sulabh)</td>
<td>2009</td>
<td>A midlate maturing, high yielding clone (108.59 t/ha) and with 19.03% sucrose with good ratooning potential, Moderately resistant to red rot and smut and tolerant to drought .</td>
<td>Red rot resistant variety with high cane yield and juice quality suited for Peninsular zone</td>
</tr>
<tr>
<td>4</td>
<td>Co 2001-15</td>
<td>2009</td>
<td>A midlate maturing, high yielding clone (103.74 t/ha) with good ratooning potential, Moderately resistant to red rot and smut and tolerant to drought. Sucrose % is 18.9, fibre 14.7 %.</td>
<td>A high yielding variety with good ratoonability and high fibre percentage.</td>
</tr>
<tr>
<td>For North-West zone (Punjab, Haryana, Uttarakhand, U.P., and Bihar)</td>
<td></td>
<td></td>
<td></td>
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<tr>
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</tr>
<tr>
<td>5</td>
<td>Co 98014 (Karan 1)</td>
<td>2007</td>
<td>Early maturing with 76.29 t/ha cane yield, sucrose 17.59%, tolerant to drought and waterlogging and resistant to red rot and smut.</td>
<td>Becoming popular in western UP and Haryana and Punjab. Having high fibre content suitable for cogeneration.</td>
</tr>
<tr>
<td>6</td>
<td>Co 0118 (Karan 2)</td>
<td>2009</td>
<td>Early maturing variety released recently combining high yield (78.20 t/ha) and quality (sucrose 18.88%). A red rot resistant and drought tolerant clone</td>
<td>High yielding variety with high sucrose. Becoming popular in the states of Punjab, Haryana, Utter Pradesh and Bihar.</td>
</tr>
<tr>
<td>7</td>
<td>Co 0238 (Karan 3)</td>
<td>2009</td>
<td>Early maturing variety released recently combining high yield (81.08 t/ha) and quality (sucrose 18.20%). Drought tolerant, red rot resistant clone with winter sprouting potential.</td>
<td>High yielding variety with good winter sprouting potential and gaining popularity in the entire North-west zone.</td>
</tr>
<tr>
<td>North Central Zone (Bihar, Eastern U.P, West Bengal and North Eastern states)</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>8</td>
<td>Co 0232</td>
<td>2009</td>
<td>It is an early maturing, water logging tolerant and red rot resistant clone with 67.82 t/ha of cane yield, 7.83 t/ha of CCS and 16.51 % of sucrose at 300 days. This variety is moderately tolerant to top borer.</td>
<td>Even after three months of water logging the leaf canopy is green with no leaf drying and reduction in number of green leaves. High tillering/sprouting ability of the Co 0232 compensates the tiller mortality during the early drought and late water logging condition.</td>
</tr>
<tr>
<td>9</td>
<td>Co 0233</td>
<td>2009</td>
<td>It is a midlate maturing, high yielding, water logging tolerant and red rot resistant with cane yield of 67.77 t/ha. It also recorded high sugar yield of 8.25 t/ha and sucrose % of 17.54.</td>
<td>It is resistant to smut and moderately tolerant to top borer. It is also non-lodging and non-flowering.</td>
</tr>
</tbody>
</table>

- Research projects are in progress to identify sugarcane varieties suitable for low input situations, especially fertilizer N.
- In India, generally only one ratoon is taken while in most of the other countries 4 to 6 ratoons are common. The cost of cultivation of the ratoon crop is substantially lower than that of the plant crop by way of reduced cost of land preparation and no seed cost. Hence increasing the number of ratoons will help to substantially reduce the cost of cultivation. Research is in progress to evolve/identify sugarcane varieties suitable for multiple ratooning. Agro techniques for multiple ratooning without any yield reduction are being standardised.
- Use of biofertilisers (Azospirillum, Azotobacter and Acetobacter) will help to save about 25% of the fertiliser nitrogen. Use of phosphobacteria will help to substitute 50% of the costly water soluble phosphotic fertilizers (single super phosphate, triple super phosphate etc.) with cheaper rock phosphate. The use of biofertilizers will result in considerable savings in the fertilizer cost.
Mechanization of cane cultivation especially planting, land preparation, inter cultivation and harvesting operations is indispensable for the survival of the sugarcane agriculture. In India sugarcane is generally grown at a row spacing of 75 to 100 cm as mostly human labour is used for the field operations. However for mechanisation of harvesting and of intercultivation operations it is necessary to increase the row spacing to 120 - 150 cm or more. The Institute has identified varieties suitable for cultivation at the wide row spacing of 150 cm. It has also evolved a package of practices for cultivation of sugarcane in wide rows to facilitate mechanization.

Sugarcane based intercropping systems have been developed to improve the total productivity and profitability per unit area under tropical and sub tropical conditions.

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**Answer to Parliament Question Dy No. 5801**

(a) Whether the Government proposes to bring changes in cropping pattern to promote climate resilient agricultural practices;

Yes

(b) If so, details thereof:

Climate change can eventually lead to drought as well as water-logging conditions in sugarcane cropping areas. Some of the practices that can be adapted are:

1. **Increasing tiller production/inducing hardiness by sett treatment:** In any production improvement practice under moisture stress conditions, it is essential to maintain a high population, especially in sugarcane where the economic product i.e. the millable cane. A closer spacing is advantageous under drought conditions compared to the normal spacing of 90 cm. Soaking setts in saturated lime water significantly increased the cane yield compared to the untreated setts.

2. Dual row planting in 45 cm deep and 75 cm wide trenches spaced at 120 cm and irrigation in trenches will reduce irrigation water requirement and with trash mulching will help in conserving soil moisture.

3. In drought conditions, it will not be possible to give irrigations at the desired schedule. With the available irrigation water, irrigations will be given at wider intervals. Regulating the urea-potash spray with irrigations, i.e., either just before the irrigation or a day or two after irrigation will be more beneficial to the crop.

4. At times of water scarcity, alternate furrow irrigation may be adopted. When water availability becomes favourable the farmer can switch back to normal furrow irrigation.

5. During the drought period, solution containing 2.5% urea and 2.5% potash can be sprayed on leaves combining with irrigation. Trash mulching can also be done wherever possible.

6. Deep trench system of planting for early drought and late water logged condition was developed. Microirrigation system – drip irrigation with fertigation have been developed to reduce the water requirement Pit method and paired row planting system with fertigation resulted in saving of 30 to 40 % water besides 25 % fertilizer nutrients.

(c) Whether the Government proposes to encourage the cultivation of environmentally suited crops in drought prone areas:

Suitable sugarcane varieties have been identified for adverse climate in the varietal screening programme:
Drought tolerant varieties:
Co 86032, Co 85019, Co 94008, Co 94012, Co 99004, Co 2001-13 and Co 2001-15 for Peninsular Zone and Co 98014, Co 0238, Co 0118 for Northwest Zone

Salinity tolerant varieties
Co 94008, Co 85019, Co 94012, Co 99004, Co 2001-13 and Co 2001-15

Water logging tolerant clones
Co 62175, CoSi 86071, Co 8371, 93 A4, BO 91, CT1 88322 & Co 99006

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**Answer to Parliament Question Dy No. S 5076, S 5134**

Sub: Rajya Sabha Provisional Starred Question Dy No. S 5076, S 5134 by Dr.T. Subbarami and Shri V. Hanumantha Rao regarding intercropping option to augment cane supply.

f). With crushing capacity for outstripping sugarcane availability and growers moving to more remunerative crops northern sugar mills are seeking to promote inter-cropping alternatives to retain farmers' interest in cane

It is true that the cane availability at present is much lower than the crushing capacity of the mills in the country. The sugarcane farmers have shifted to other crops which are more remunerative at present. Intercropping is an option which will fetch additional income to farmers and the research institutes have come-up with technologies for intercropping with sugarcane. Sugarcane-wheat intercropping has been found successful in North India.

Experiments conducted at Sugarcane Breeding Institute, Coimbatore shows that the resource use efficiency, yield advantage and economic benefit can be increased by adopting short duration sugarcane + soybean intercropping system compared to short duration sugarcane alone.

h). Whether sugar mills are also looking at intercropping options to augment cane supplies

**Subtropical India**

Intercropping with sugarcane is more common during autumn planting season in sub-tropical India. However the area under autumn planted sugarcane varied from 5–10 % of total area under sugarcane. In the last 2 seasons sugar mills in north India are giving emphasis on increasing the area of autumn planted sugarcane along with other short duration crops as inter crops. During last autumn farmers in sub-tropical India have grown wheat, potato, mustard, gram, red gram, garlic, coriander, lentil, green gram, peas, cabbage, radish, okra, chilli, cucumber, French bean, onion, tomato, apple gourd etc.

Autumn planted cane is expected to yield better than the spring planted cane which will benefit the sugar mills in getting more canes per unit area. Farmers income would also increase from both intercrops as well as better cane yield.

i). If so, whether farmers were urged to grow short duration crops with cane

We do not have exact details on this. However, sugar mills in sub-tropical India are known to promote autumn planting of sugarcane along with suitable intercrops by giving various incentives. Some of the sugar mills are providing seeds of intercrops free of cost to farmers along with other inputs.
j). The concrete steps and measures Government has taken to grow short duration crops with cane and to what extent it has given good results

No comments

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**Answer to Parliament Question Dy No. S 2080**

Sub: Lok Sabha Question Dy No. S 2080 by Shri Bhisma Shankar alias Kushal Tiwari regarding funds and list of varieties/hybrids developed during the last five years

The budget details of the Institute for the five years from 2004-05 to 2008-09 are furnished herewith.

**Statement showing the particulars of Budget and Expenditure for the years 2004-05 to 2008-09**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Plan</td>
<td>827.00</td>
<td>763.59</td>
<td>891.10</td>
<td>875.61</td>
<td>883.00</td>
<td>837.30</td>
<td>883.75</td>
<td>856.36</td>
<td>1221.15</td>
<td>1207.04</td>
</tr>
<tr>
<td>Plan</td>
<td>373.86</td>
<td>235.44</td>
<td>339.00</td>
<td>287.89</td>
<td>269.22</td>
<td>248.99</td>
<td>165.00</td>
<td>164.01</td>
<td>289.33</td>
<td>289.27</td>
</tr>
<tr>
<td>Total</td>
<td>1200.86</td>
<td>999.03</td>
<td>1230.10</td>
<td>1163.50</td>
<td>1152.22</td>
<td>1086.29</td>
<td>1048.75</td>
<td>1020.37</td>
<td>1510.48</td>
<td>1496.31</td>
</tr>
</tbody>
</table>

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**Answer to Supplementary points sought from Lok Sabha Secretariat**

Subject : Supplementary list of points sent by Lok Sabha Secretariat

This has reference to Council’s letter No.14-1/2009-CCI dated 26.10.09 on the subject mentioned above. As desired, the reply for the point Nos. 34 and 35 is furnished below.

34. Has the Sugarcane Breeding Institute ever studied the problems of farmers growing sugarcane in the country on agro-climatic zone basis? If so, please give details about findings thereof.

A study was conducted in Tamilnadu. The following constraints faced by the farmers were identified.

1. Non availability of required quantity of varieties seed material in time
2. Non availability of adequate organic manure
3. Non availability of required quantity of inorganic fertilizer in time.
5. Inadequate irrigation facility
6. Non availability of *Trichogramma* cards to control INB
7. Scarcity of irrigation water.
8. Gaps in plant crop to take up ratoon management practices.
10. Inadequate power supply.
11. Lack of availability of farm loan
The practices that needed technical guidance are

1. Sett treatment
2. Inorganic fertilizers application (pocket manuring)
3. Early shoot borer and internode borer control measures
4. Trash mulching

35. What efforts have been made by the Sugarcane Breeding Institute to increase the productivity of sugarcane in the country?

The following varieties developed by Sugarcane Breeding Institute, Coimbatore were released for commercial cultivation in different agro-climatic zones for improving the productivity of sugarcane in the country.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the variety developed by Sugarcane Breeding Institute</th>
<th>Year of release</th>
<th>Salient features</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>For Peninsular zone (Gujarat, Maharashtra, Karnataka, Madhya Pradesh, Kerala Parts of Andhra Pradesh and Tamil Nadu)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Co 86032 (Nayana)</td>
<td>2000</td>
<td>Cane yield 113.7 t/ha, sucrose % 18.38, Average sugar yield – 15 to 25 t/ha. Field tolerant to red rot, R to smut, MR to wilt, good ratooner, retains quality upto 14-16 months, suitable for wide row spacing and mechanical harvesting.</td>
<td>Most popular variety in Peninsular zone, occupying nearly 90 % area Tamil Nadu and Maharashtra.</td>
</tr>
<tr>
<td>2.</td>
<td>Co 99004 (Damodar)</td>
<td>2007</td>
<td>Cane yield 116.82 t/ha, sucrose % 19.21. MR to red rot, drought tolerant, golden yeollow jaggery, thick, tall and erect canes with non flowering. Average sugar yield of 16.09 t/ha.</td>
<td>Replacement for Co 86032. Has potential to be cultivated throughout Peninsular zone</td>
</tr>
<tr>
<td>3.</td>
<td>Co 94012 (Phule Savitri)</td>
<td>2005</td>
<td>High yielding high quality variety (Sucrose % 21.35) with drought, salinity and smut resistance. The variety has thick, greenish pink canes with heavy spines and flowers profusely. Highly susceptible to red rot.</td>
<td>Early variety with the highest sugar recovery Released in Maharashtra and Karnataka. Good potential in red rot free areas of Maharashtra and N. Karnataka</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Name of the variety developed by Sugarcane Breeding Institute</td>
<td>Year of release</td>
<td>Salient features</td>
<td>Remarks</td>
</tr>
<tr>
<td>--------</td>
<td>-------------------------------------------------------------</td>
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</tr>
<tr>
<td>4.</td>
<td>Co 94008 (Shyama)</td>
<td>2002</td>
<td>Cane yield 126 t/ha, Sucrose % 18.02, MR to red rot and smut, tolerant to drought and salinity. Early maturing, erect, non lodging canes, self detrashing, attractive dark purple canes, good ratooner.</td>
<td>High yielding variety tolerant to drought and salinity, suited for commercial cultivation throughout Peninsular zone.</td>
</tr>
<tr>
<td>5</td>
<td>Co 2001-13 (Sulabh)</td>
<td>2009</td>
<td>A midlate maturing, high yielding clone (108.59 t/ha) and with 19.03% sucrose with good ratooning potential, Moderately resistant to red rot and smut and tolerant to drought.</td>
<td>Red rot resistant variety with high cane yield and juice quality suited for Peninsular zone.</td>
</tr>
<tr>
<td>6</td>
<td>Co 2001-15</td>
<td>2009</td>
<td>A midlate maturing, high yielding clone (103.74t/ha) with good ratooning potential, Moderately resistant to red rot and smut and tolerant to drought. Sucrose % is 18.9, fibre 14.7 %.</td>
<td>A high yielding variety with good ratoonability and high fibre percentage.</td>
</tr>
<tr>
<td>7</td>
<td>Co 87025 (Kalyani)</td>
<td>2000</td>
<td>Very erect, canes suitable for mechanical harvesting, with sparse flowering, resistant to smut, tolerant to drought, susceptible to rd rot.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Co 87044 (Uttara)</td>
<td>2000</td>
<td>High yielding, midlate maturing variety with drought and smut resistance.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Co 91010 (Dhanush)</td>
<td>2000</td>
<td>Variety with high yield due to high cane population, drought tolerant and with good ratooning potential, popular in Karnataka and southern Maharashtra.</td>
<td></td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Name of the variety developed by Sugarcane Breeding Institute</td>
<td>Year of release</td>
<td>Salient features</td>
<td>Remarks</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------------------------------------------</td>
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<tr>
<td>10</td>
<td>Co 8371 (Bhima)</td>
<td>2001</td>
<td>Cane yield 117.7 t/ha, sucrose 18.62% CCS 15.22 t/ha. Tolerant to drought, salinity and waterlogging, resistant to smut.</td>
<td>High yielding and waterlogging resistant variety cultivated in a large area in Karnataka</td>
</tr>
<tr>
<td>11</td>
<td>Co 86249 (Bhavani)</td>
<td>2000</td>
<td>Cane yield 104.2 t/ha , sucrose % 18.2, MR to red rot and smut, tolerant to drought</td>
<td>It is being cultivated in red rot prone areas of East Coast Zone.</td>
</tr>
<tr>
<td>12</td>
<td>Co 89003</td>
<td>1998</td>
<td>Early maturing clone, high yielding with 70 t/ha under spring planting and 90 t/ha under autumn planting conditions. High quality with red rot resistance and wilt susceptibility.</td>
<td>Released for commercial cultivation in Punjab in 1998 and in Haryana in 2001 and are performing well in these states.</td>
</tr>
<tr>
<td>13</td>
<td>Co 98014 (Karan 1)</td>
<td>2007</td>
<td>Early maturing with 76.29 t/ha cane yield, sucrose 17.59%, tolerant to drought and waterlogging and resistant to red rot and smut.</td>
<td>Becoming popular in western UP and Haryana and Punjab. Having high fibre content suitable for cogeneration.</td>
</tr>
<tr>
<td>14</td>
<td>Co 89029</td>
<td>2001</td>
<td>A midlate maturing clone with 71.08 t/ha cane yield and 17.13 % sucrose with good tillering and non lodging nature, tolerant to drought, water-logging, moderately resistant to red rot, smut, top borer and shoot borer.</td>
<td>Midlate variety with high tillering and erect canes.</td>
</tr>
<tr>
<td>15</td>
<td>Co 0118 (Karan 2)</td>
<td>2009</td>
<td>Early maturing variety released recently combining high yield (78.20t/ha and quality (sucrose 18.88 %). A red rot resistant and drought tolerant clone</td>
<td>High yielding variety with high sucrose. Becoming popular in the states of Punjab, Haryana, Utter Pradesh and Bihar.</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Name of the variety developed by Sugarcane Breeding Institute</td>
<td>Year of release</td>
<td>Salient features</td>
<td>Remarks</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------------------------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>---------</td>
</tr>
<tr>
<td>16</td>
<td>Co 0238 (Karan 3)</td>
<td>2009</td>
<td>Early maturing variety released recently combining high yield (81.08 t/ha) and quality (sucrose 18.20%). Drought tolerant, red rot resistant clone with winter sprouting potential.</td>
<td>High yielding variety with good winter sprouting potential and gaining popularity in the entire North-west zone.</td>
</tr>
<tr>
<td>17</td>
<td>Co 0232</td>
<td>2009</td>
<td>It is an early maturing, water logging tolerant and red rot resistant clone with 67.82 t/ha of cane yield, 7.83 t/ha of CCS and 16.51% of sucrose at 300 days. This variety is moderately tolerant to top borer.</td>
<td>Even after three months of water logging the leaf canopy is green with no leaf drying and reduction in number of green leaves. High tillering/sprouting ability of the Co 0232 compensates the tiller mortality during the early drought and late water logging condition.</td>
</tr>
<tr>
<td>18</td>
<td>Co 0233</td>
<td>2009</td>
<td>It is a midlate maturing, high yielding, water logging tolerant and red rot resistant with cane yield of 67.77 t/ha. It also recorded high sugar yield of 8.25 t/ha and sucrose % of 17.54.</td>
<td>It is resistant to smut and moderately tolerant to top borer. It is also non-lodging and non-flowering.</td>
</tr>
</tbody>
</table>

- Micro irrigation system especially drip fertigation in paired row system of planting in tropical region (Coimbatore) saved 40 – 50% water and 25% recommended dose of fertilizers with a marginal increase in productivity.
- Varieties were identified and agrotechniques developed for wide row spacing to facilitate mechanical harvesting.
- The biofertilizers specific to sugarcane crop were developed. *Azospirillum* and *Gluconacetobacter* were found effective in fixing the atmospheric nitrogen while phosphobacter is useful for improving the availability of phosphorus in soil. Use of biofertilizers resulted in saving of 25% inorganic fertilizers.
- An integrated nutrient management involving chemical fertilizers, organics – enriched pressmud or biocompost or FYM and biofertilizers was developed for sugarcane which resulted in saving of 25% chemical fertilizers besides improving soil health for sustaining the higher productivity.
An integrated weed management of pre-plant application of glyphosate @ 2.0 l a.i./ha followed by in-crop weed control using ethoxysulfuron @ 8 g a.i./ha effectively checked the persistent weeds like Cynodon and nutgrass in sugarcane.

Drought management practice to improve the productivity comprising of trash mulching, foliar spray of urea + potash @ 2.5% each during formative phase and additional potash application @ 60 kg/ha at the onset of the drought was found suitable for mitigating the drought and improving the productivity.

Developed a method to alleviate iron deficiency by soil application of gypsum (7.5 t/ha) + organic manure (10 t/ha) + iron and zinc fortified organic manure (2.5 t/ha - 2.5 t organic manure + 125 kg ferrous sulphate + 25 kg zinc sulphate) + sulphur (500 kg/ha). Application of this treatment improved the productivity to the tune of 35% and sucrose content of 15% in iron deficient calcareous soils.

Technology for suppression of flowering in commercial plantations by spraying ethrel was standardized. Flowering was suppressed by 70 to 85% at 750 ppm ethrel applied in profuse flowering areas besides improving the yield and quality.

In sub-tropical region (Karnal), the technology for improving the productivity of winter initiated ratoon crop was developed by application of pressmud @ 20 t/ha.

Three tier seed nursery programme developed to continuously provide disease free seed canes to improve productivity.

Red rot resistant varieties with high yield & quality viz. Co 99004, Co 2001-13, 2001-15 and Co 0238 were identified for commercial cultivation.

Technologies to manage red rot and smut such as roguing, seed sanitation, Irrigation, ratoon management and crop rotation etc. have been constantly transferred to farmers' community.

Sett treatment with 0.1% carbendizim is recommended for the management of sett rot disease.

Cultural practices like trash mulching, earthing-up and detrashing for suppression of borers and sucking pests

Mechanical methods like collection of egg masses and larvae of borers, and beetles of white grubs

Mass multiplication and field colonization of biological control agents such as egg and larval parasitoids, and entomopathogenic viruses and fungi

Behavioral control methods like the use of sex pheromone lures in water traps for the control of borers

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**Answers to Parliament Question No.S273, S286**

**Sub: Rajya Sabha Provisional Starred Question Dy No. S 273, S 286 regarding need of help to Cane Farmers by Shri Subbarami Reddy and Shri V. Hanumata Rao**

1. Sugarcane production was maximum during the year 2006-07 (355.5 million tonnes) and 2007-08 (340.5 million tonnes), which resulted in the stagnation of sugar price during the last 3 years in the wholesale market. The whole sale market price of sugar Rs.2060 in April 2005 was the maximum up to December 2008 in the wholesale market of sugar. This peculiar situation clearly indicates sugar factory profit too eroded in the recent past. The Statutory Minimum Price (SMP) of the sugarcane remained almost static around Rs.81/q during the years 2006-07 to 2008-09. On the other hand the cost of cultivation increased steadily over this period of time.

2. The comprehensive picture created stagnation in the sugarcane and sugar production. On the other hand, the Minimum support Price (MSP) of the wheat and rice has been hiked more than sugarcane in 2008-09. All the said above factors created vacuum in the farmers mind in Utter Pradesh, Maharashtra, Karnataka and Tamil Nadu where about 70% of the sugarcane production accounted. Excess rainfall in UP during planting...
season, delay in harvesting and delay in cane payment in UP and Maharashtra, led to 
reduction in cane area (about 40%) in all major sugarcane producing states in 2008-09. 
Hence, the sugarcane production has come down from 340.5MT in 2007-08 to 289.6 MT in 
2008-09. Subsequently there was sharp decline in the sugar production at 2008-09 
(14.7MT) compare to 26.5 MT in 2007-08.

3. In addition with, the diversion sugarcane to Gur, khandasari production due to huge 
demand for this product ultimately brought down white sugar production in the country 
in 2008-09.

4. All these factors led to increase in sugar price up to Rs. 25-28/kg in recent months

c. Measures and steps government consider to improve its output.

- Encouraging farmers to take up location specific varieties adapted to the local 
environment factors.
- Spraying atrazine as pre-emergence herbicide to control weeds for the first 40 days 
of planting in places where labour availability is the problem.
- Post emergence application of Ethoxy sulfuron to control the nut sedge (Cyprus 
rotundus) problem areas.
- Wide row spacing with mechanization of intercultural operations using appropriate 
tractor drawn implements.
- Wherever water shortage and availability of labour problem, drip/ fertigation could be 
adopted
- To improve the productivity of sugarcane.
- Better ratoon management

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Answer to Parliament Question : Notice of Motion under Rule 184 regarding problems 
being faced by sugarcane growers and sugar mills in the country

Sub: Lok Sabha - Notice of Motion under Rule 184 regarding problems being faced by sugarcane 
growers and sugar mills in the country

- As per the available information the area under sugarcane cultivation was less in 2008-09 
  compared to previous two years and it affected the sugar production due to less 
cane availability.
- Untimely rains in parts of the country affected the sugar recovery percentage. The low 
  rainfall and inadequate water availability at the grand growth phase in some other 
  areas reduced the cane yield.
- High cost of production
- Non availability of labourer
- High cost and shortage of labour for harvest and other intercultural operation
- Drought and lack of irrigation water
- Non availability of organic manures
- Lack of mechanisation due to small holdings of land
- Cost of cane is not matching with the cost of production i.e. not much remunerative
Problems faced by the cane growers

- The input costs like seed, fertilizers, transport charges etc. had gone up over the years
- Non availability of required quantity of seed material in time * Non availability of adequate organic manure
- Non-availability of required quantity of inorganic fertilizers in time.
- Problem of water logging, salinity and alkalinity.
- Lack of support from credit and insurance agencies
- Farmers feel that the MSP fixed by the Government is low as against the high cost of production. This is also one of the reasons for them switching over to alternative and profitable crops
- Lack of quality seed material
- Lack of strong extension support
- Shortage of water for irrigation
- Lack of knowledge in irrigation management practices
- Delayed Payment
- Lack of timely information on sugarcane production technologies
- Increasing labour charges and labour scarcity
- Exorbitant harvesting charges
- Red rot & wilt disease in sub tropical India. Smut disease in Peninsular zone.

Problems faced by the Sugar Industry

- Shortfall of about 25-35 % in cane supply
- Threat from competitive crops such as maize, rice, casuarina, oil palm, turmeric, banana etc in view of factors such as higher market prices, shorter duration etc Increasing labour charges and labour scarcity
- Fragmented land holdings restricting to go for complete mechanization
- Lack of modernized plants
- Problems in diversification of sugar factories
- Non-viability of sugar mills in the co-operative/public sector
- Problems in convincing cane growers to go for improved technologies

Answer to Parliament Question Dy No. 4846

Sub: Rajya Sabha Provisional Starred Question Dy No.4846 raised by Shri N.R. Gonvindarajar regarding survey on Agricultural land productivity

Answer:

(a & b): Sugarcane Breeding Institute, Coimbatore does not conduct any survey on the productivity of agricultural land. However, details of sugarcane productivity is available through the publications of ISMA and NFCSF is collected by the Institute.

(c): During the last 10 year period (1999-2000 to 20008-09) the sugarcane productivity declined from 100.7 t/ha to 82.7 t/ha in Karnataka and from 90.1 t/ha to 74.1 t/ha in Maharasthra. However, in case of Orissa the productivity increased from 52.4 t/ha to 62.1
t/ha and for Haryana the productivity increased from 55.8 t/ha to 70 t/ha during the above period. For other states there was no significant changes except for yearly fluctuations in productivity which is normally expected.

(d) Deficit rainfall, inadequate irrigation facilities, frequent power cuts which affects irrigation, high cost of farm labour, insufficient labour for sugarcane harvest, incidence of pest and diseases, stress situations like waterlogging, salinity and drought contribute to decrease in productivity in certain states.

(e&f) Improved agronomic practices such as drip irrigation, wide row spacing, integrated nutrient management, use of biofertilizers and organic manures, trash mulching, organic recycling, amendments to reclaim alkali soils and deep trench system of planting for early, drought and late waterlogged conditions, chemical weed control, mechanisation of farm operations besides integrated pest and disease management and growing of high sugar high yielding sugarcane varieties are being recommended to check the decline in sugarcane productivity.

Answer to Parliament Question Dy No. S 5572

Sub: Notice for Rajya Sabha Prov. Starred Ques Dy. No. S 5572 raised by Shri Amir Alam Khan regarding Need for encouragement to sugarcane farmers

Questions:

a. Whether country’s sugarcane farmers, particularly in Uttar Pradesh, are facing losses in their production;

b. If so, the details thereof; and

c. The steps taken by the government to make sugarcane cultivation lucrative; encourage sugarcane farmers?

Answers:

a. There was reduction in cane yield in Uttar Pradesh during 2008-09 season.

b. Early continuous rain from May to July affected intercultural operations and application of fertilizer in time, leading to reduced cane growth and yield. There also was reported shortage of P & K fertilizers.

c. High yielding sugarcane varieties can be cultivated. The newly released varieties like Co 0238 and Co 0118 are high yielding, tolerant to drought and resistant to red rot disease. Co 98014 is tolerant to water logging.

Answer to Parliament Question Dy No. 3275

Sub: Lok Sabha Provisionally Starred Question Dy. No. 3275 raised by Shri Dhruva Narayana regarding Sugarcane Production

Questions:

a) Whether the Government proposes to develop high yielding varieties of sugarcane; I

b) If so, the details and the outcome achieved thereof;

c) Whether any request has been received by the Government to increase the procurement price of sugarcane; and

d) If so, the details thereof and the reaction of the Government thereto?
Answers:

a) Sugarcane Breeding Institute is continuously developing improved high yielding sugarcane varieties with high sugar recovery potential suited for cultivation in different parts of the country.

b) The major achievements are:

- Co 86032 a variety released by the institute occupies 80-90% cane area in Tamil Nadu, 50% cane area in Maharashtra and sizeable areas in Karnataka, Gujarat and interior Andhra Pradesh.
- Co 89003 is occupying nearly 17000 ha in Punjab and Haryana.
- Co 94012 is occupying nearly 10,000 ha in Maharashtra and Karnataka

The following new varieties have been released in the recent years by the Central Varietal Release Committee.

**Peninsular India**: Co 99004, Co 2001-13, Co 2001-15

**North West India** (Rajasthan, Punjab, Haryana, Uttranchal, Western U.P.): Co 98014, Co 0238, Co 0118

**North central India** (Eastern U.P., Bihar): Co 0232, Co 0233

c. Not applicable

d. Not applicable

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**Answer to Parliament Question Dy No S 4229**

Sub: Rajya Sabha Provisional Starred Question Dy No. S 4229 raised by Shri Sabir Ali regarding Rainfed Farming

No sugarcane variety was specifically developed/identified from this Institute for rainfed farming.

The following sugarcane varieties developed at Sugarcane Breeding Institute and released for cultivation in the last five years are drought tolerant.

a. Co 94008 – Peninsular zone (Maharashtra, Gujarat, Madya Pradesh, Karnataka, Andhra Pradesh, Tamil Nadu and Kerala)
b. Co 99004 - Do-
c. Co 2001-13 - Do-
d. Co 2001-14 - Do-
e. Co 98014 -North West Zone (Haryana, Punjab, Uttar Pradesh and Rajasthan)
f. Co 0118 - Do-
g. Co 0238 - Do-
**Answer to Parliament Question Dy No. 246 regarding Seed of Medium and Short duration varieties**

Sub: Rajya Sabha Provisional Starred Question Dy No.246 raised by Shri Rajiv Ranjan Singh Alia Lalan Singh MP regarding seeds of Medium and Short duration crop varieties

**Questions:**

1. Whether in view of the delayed monsoon in the country, seeds of medium and short duration crop varieties have been made available to the farmers;
2. If so, the details thereof,
3. The percentage of the total Kharif crops likely to be met from such seeds; and
4. The measures being taken to enhance the availability of such seeds in the country?

**Reply:**

The date of planting of sugarcane is generally not dependant on the date of onset of monsoon. We are not supplying sugarcane seed for commercial cultivation. At Sugarcane Breeding Institute, Coimbatore sugarcane seed of the recently released varieties Co 99004, Co 2001-13, Co 2001-15, Co 98014, Co 0118, Co 0238 and Co 86032 is being produced as breeder seed and supplied to progressive farmers and sugar factories for further multiplication. The breeder seed production is also augmented with tissue culture for multiplication.

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**Answer to Parliament Question Dy No. 4793- regarding Genetically modified seeds**

Sub: Lok Sabha Provisional Starred Question Dy No.4793 raised by Shri.. Prabodh Panda regarding Genetically modified seeds

No genetically modified varieties of sugarcane are under cultivation and no genetically modified variety had been released from SBI

a. Not applicable
b. Not applicable
c. Not applicable
d. Not applicable

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**Answer to Parliament Question Dy No. 6869 - on impact of drought**

Sub: Lok Sabha Provisional Starred Question Dy No.6869 raised Shri Ahir Vikrambhai Maadam regarding Impact of Drought and Flood on Khariff crop

**c. Whether the prevailing drought and flood situations is likely hamper the Khariff crop production**

Sugarcane is generally not planted in the Khariff season and it is generally planted during the spring/autumn seasons. Sugarcane is a one year crop and its water requirement is also high. During the drought years, the area planted with sugarcane is reduced and the cane yield per ha.
is also reduced. Thus during drought years there is substantial reduction in sugarcane production.
Sugarcane can withstand waterlogging/floods for short periods of time, but prolonged waterlogging/flooding may result in lower cane yield.

d. If, so the details thereof and the steps taken by the Government in this regard?

Drought:

The following agro techniques are recommended to mitigate the adverse effects of drought.

I. Growing of the following sugarcane varieties which are tolerant to drought: Co 99004, Co 86010, Co 97008, Co 91010, Co 98017, Co C 90063, Co 86032, Co 99013, Co 98014, Co TI 88322, Co V 92102, Co 2001-13, Co 2001-15, Co 0238 and Co 1118. Research on development of drought and waterlogging tolerant varieties has been further intensified during the XI Plan period.

II. Provision of drip irrigation: Drip irrigation helps to save about 30-40% of the irrigation water requirement of sugarcane. Therefore with the same quantity of irrigation water about 50-60% more area can be brought under drip irrigation compared to conventional methods of irrigation. The benefit of drip irrigation is greater during the periods of drought and in water scarcity areas.

III. Trash mulching: The trash which is periodically removed during sugarcane cultivation can be used for mulching alternate furrows and irrigation can be restricted to the unmulched furrows. Mulching helps to reduce the loss of moisture from the soil surface, moderates the soil temperature and helps to prolong the period of water availability to the crop.

IV. Sett treatment with lime water: Soaking sugarcane setts in 10% lime water solution for one hour before planting is a useful drought hardening mechanism.

V. Foliar spray of muriate of potash and urea: Foliar application of urea and muriate of potash @ 2.5% each at 60, 90 and 120 days after planting helps to mitigate the drought effect to certain extent.

VI. Application of an additional dose of 60 kg K₂O per ha during February-March (i.e. two irrigations before the stress period) is recommended when drought situation is anticipated.

VII. Application of organic manures like farmyard manure are composed will help to improve the water holding capacity of the soil.

VIII. Deep trench system of planting sugarcane is recommended for areas affected by early drought and late waterlogged conditions.

Waterlogging:

For waterlogged conditions growing of resistant varieties and provision of drainage facilities is recommended.

Answer to Parliament Question No. PQ Dy. No. 2717

Sub: Lok Sabha Provisional Starred Admitted Question Dy No. 2717 posted by Sri. Ashok Kumar Rawat and other MPs regarding Research Centres

a. the details of the Agricultural Research Centres / Projects / Universities being run by the Government / ICAR in the country particularly in backward and rural areas, separately, state-wise

b) Sugarcane Breeding Institute has one research centre at Agali, which is located in a backward area in Kerala State.
c) the funds allocated by the Government to each Centre / project / University along with the expenditure incurred thereon during each of the last three years, separately and state-wise;

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Budget Head</th>
<th>2006-07</th>
<th>2007-08</th>
<th>2008-09</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Outlay</td>
<td>Exp.</td>
<td>Outlay</td>
<td>Exp.</td>
</tr>
<tr>
<td>1.</td>
<td>Non Plan</td>
<td>883.00</td>
<td>837.30</td>
<td>883.75</td>
</tr>
<tr>
<td>2.</td>
<td>Plan</td>
<td>269.22</td>
<td>248.99</td>
<td>165.00</td>
</tr>
<tr>
<td>4.</td>
<td>External aided projects</td>
<td>171.97</td>
<td>72.91</td>
<td>162.12</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1349.50</td>
<td>1185.82</td>
<td>1226.62</td>
</tr>
</tbody>
</table>

c) the number of research projects currently being implemented under ICAR run Institutes;

Research projects in operation at Sugarcane Breeding Institute, Coimbatore

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Details</th>
<th>No. of Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Institute projects</td>
<td>93</td>
</tr>
<tr>
<td>2.</td>
<td>DBT Projects</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>SDF Projects</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>Government of India projects</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

d) the details of the success achieved by these centres / projects / universities and their impact on agricultural production; and

- The variety Co 86032 developed by this Institute is the ruling variety in Tamil Nadu occupying nearly 90% of the cane area. This variety also occupies 40-50% area in Maharashtra and Karnataka and substantial areas in Gujarat and interior Andhra Pradesh. This variety has helped the farmers to realize higher cane yields.
- Co 99004 an improved high sugar variety with vigorous growth, red rot resistance as well as drought and salinity tolerance was released during 2006. It is becoming popular and the area is increasing in the tropical states.
- Co 94012 was released in Maharashtra and Karnataka states and the sugar recovery is reported to be the highest with this clone in the region. This variety has spread to nearly 12,000 ha in northern Karnataka.
- Co 91010 a recently released variety is becoming popular in northern Karnataka, in view of its high sugar content and high yield potential.
- Two new varieties Co 2001-13 and 2001-15 were released during 2009. These varieties have performed better than the current varieties in the AICRP trials conducted in the Peninsular Zone and are expected to be potential varieties in future.
- Co 89003 developed by the Karnal Centre of the Institute occupies around 18000 ha in Punjab and Haryana states.
- A newly released variety Co 98014 has spread in nearly 8000 ha in the states of Haryana, Punjab and Uttar Pradesh.
- Two more new varieties viz., Co 0238 and Co 0118 have been released during 2009 and have performed better in the AICRP trials conducted in the northwest zone. These varieties also are becoming popular in north western zone.
- Another two new varieties viz., Co 0232 and Co 0233 were released by the Institute for the north central zone during 2009.
The varieties released by the Institute have helped in improving the productivity and sugar recovery of the sugar factories in the different states. Besides the better adaptability and growth of these varieties have helped the farmers in obtaining higher yield and income.

- Institute has supplied 1544 t of breeder seed during X Plan period and 680 t of breeder seed during the last two years to the farmers, sugar factories etc. In addition, a total of 45000 tissue culture plants were also produced and supplied.
- A total of 150.44 kg of fluff from over 5000 crosses was produced at the National Hybridization Garden of the Institute and supplied to over 20 sugarcane research centres of the country for developing location specific varieties.
- Transgenics incorporating disease and pest resistant genes have been produced and are under evaluation.
- Micro irrigation studies have shown that 40% saving in irrigation water could be achieved besides 25% saving in fertilizers through drip fertigation.
- New and efficient strains of biofertilizers have been identified which could save upto 25% of N&P fertilizers.
- A wild species of sugarcane with more than 25% fibre was identified and introduced as a source for fibre for Tamil Nadu Newsprint and Paper Limited (TNPL).
- Molecular diagnostic methods were developed for identifying important viral diseases of sugarcane.
- Integrated weed management package was developed for effectively controlling sugarcane weeds as well as difficult to control weeds like cyonodon and nut grass.
- A systemic fungicide thiophenate methyl was identified which could prevent the primary infection of red rot.

e) The details of centres / projects / universities in which ICAR is partnering with other agencies viz., private sector, NGO’s and farmers’ associations; and

- The Institute is collaborating with the sugar factories to identify location specific sugarcane varieties suited to specific agroclimatic conditions.
- The Institute is collaborating with TNPL to develop wild sugarcane types with high fibre as a source of raw material for paper making.

f) The number of Agricultural Scientists produced during the said period?

NA

**Answer to Parliament Question No. PQ Dy. No 9885**

Sub: Lok Sabha Provisional Starred Admitted Question Dy No. 9885 due for answer on 19.3.2007 by Shri E. Ponnuswamy regarding Agriculture Research Infrastructure

a. Yes
b. Details of number of Scientists, Research Fellows and other assistants (Technical) deployed for scientific work at SBI, is furnished below.

(i) Scientists – 58 (including RMP)
(ii) Research Fellows – 12
(iii) Technical – 73
c. No. of research papers presented in Symposia, seminars, workshops etc. – 43 Nos.
d. No. of new varieties discovered – 37 ‘Co’ canes (Co 06001 to Co 06037) were selected based on the evaluation made at Coimbatore, Jamkhandi, Chagallu and Karnal.

Two varieties viz., Co 99004 (Damodar) and Co 98014 (Karan 1) have been notified by GoI for commercial cultivation. 24 Co canes have entered AICRP (Sugarcane) trials.

a. Yes.
b. Sugarcane being an annual crop few scientists could not publish scientific articles and develop sugarcane varieties but contribute immensely for scientific activities in sugarcane agriculture. Further, for developing a commercial sugarcane variety it takes at least 10 to 13 years.
c. As it is a policy decision of ICAR information on this aspect is not available.
d. Not applicable

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**Answer to Parliament Question Dy.No. 25871**

Sub: Lok Sabha admitted provisional starred Question Dy.No. 25871 due for answer on 9.5.05 regarding research centres and projects in tribal dominated areas in the country

a. Details of research centres and projects

**Research Centres**

1. Sugarcane Breeding Institute, Coimbatore 641 007 (Tamil Nadu)
2. Sugarcane Breeding Institute Regional Centre, Karnal 132 001(Haryana)
3. Sugarcane Breeding Institute Research Centre, Kannur 670 002 (Kerala)
4. Sugarcane Breeding Institute Research Centre, Agali 678 541 (Kerala) (Tribal area)
5. Sugarcane Breeding Institute Research Centre, Motipur 843 111 (Bihar)
6. Sugarcane Breeding Institute Research Centre, Jamkhandi 587 302 (Karnataka)
7. Sugarcane Breeding Institute Research Centre, Chagallu 534 342 (Andhra Pradesh)
   This has no permanent infrastructural facilities. Activities are being monitored from Coimbatore.

**List of projects**

1. Breeding of superior sugarcane varieties / genotypes with improved cane yield, quality and resistance to biotic and abiotic stresses, nutrient uptake and ratoonability.
2. Basic and strategic researches for sugarcane varietal improvement
3. Sugarcane germplasm: collection, maintenance, evaluation, documentation and utilisation
4. Improving productivity of promising sugarcane varieties by integrated, cost effective and sustainable crop management technologies
5. Physiological investigations on growth productivity and flowering in sugarcane
6. Studies on sugarcane chemistry, maturity, juice and jaggery quality, pre / post harvest technology and technological parameters
7. Studies on the effect of certain soil conditions & fertilisers on nutrient uptake, yield and quality of sugarcane
8. Studies on host pathogen relationship and management of red rot disease of sugarcane
9. Detection and diagnosis of sugarcane pathogens
10. Host plant resistance and behavioural studies of sugarcane pests
11. Biological and chemical control of sugarcane pests
12. Development of technologies to evolve IPM packages for sugarcane nematodes
13. Development of statistical models / methods by way of Utilising the information technologies viz. Computers and communication facilities

14. Transfer of technologies

b. Expenditure incurred in each centres during the last 3 years (Rs. in Lakhs)

<table>
<thead>
<tr>
<th>Year</th>
<th>Coimbatore</th>
<th>Karnal</th>
<th>Kannur</th>
<th>Motipur</th>
<th>Jamkhandi</th>
<th>Agali</th>
<th>Chagallu</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-03</td>
<td>648.06</td>
<td>55.90</td>
<td>21.08</td>
<td>17.46</td>
<td>5.83</td>
<td>4.14</td>
<td>1.13</td>
</tr>
<tr>
<td>2003-04</td>
<td>677.16</td>
<td>61.84</td>
<td>25.08</td>
<td>16.10</td>
<td>7.10</td>
<td>5.38</td>
<td>0</td>
</tr>
<tr>
<td>2004-05</td>
<td>885.96</td>
<td>93.16</td>
<td>35.41</td>
<td>17.43</td>
<td>6.94</td>
<td>5.13</td>
<td>0</td>
</tr>
</tbody>
</table>

c. Achievements

Coimbatore

- Co 94008 has been notified by GoI
- Ninety six elite clones have been evolved and assigned Co numbers.
- Micropropagation technique for mass multiplication of sugarcane varieties
- Herbicide resistant transgenics developed.
- Wide row spacing with dual row planting for higher productivity
- Varieties suitable for wide row spacing
- Sustainability of sugarcane production through organics
- Application of Azospirillum and Phosphobacteria for economizing chemical fertilizers
- Induction of flowering in non-flowering varieties and synchronization of flowering in early flowering varieties for hybridization
- Varieties tolerant to iron deficiency
- Sett treatment in hot water at 50°C for one hour for effective control of smut, grassy shoot disease and ratoon stunting disease.
- Use of synthetic sex attractants including pheromones for effective monitoring of stalk borer, internode borer and shoot borer.
- Use of Beauveria brongniartii to control white grub
- Granulosis virus (GV) application for shoot borer control

Karnal

- 103 species clones, 61 intra-species improved clones, 93 ISH clones, 87 CD clones and 20 inter-generic hybrid (IGH) clones were evaluated. Elite donors were identified. A database has been published.
- A total of 888 tonnes of breeder seed was produced and supplied to farmers and sugar mills of Punjab, Haryana, Rajasthan and U.P.
- Simultaneous planting of wheat + Sugarcane in December gave 24.5% higher value than sequential plantings in May.
- Sett treatment with boric acid 0.2 % plus Trichoderma viride or C. Globosum showed significant reduction in wilt incidence.
- Salinity reduced tillering in June by 54% whereas water stress reduced it slightly (15.3%).
- Co 89003 showed incidence of wilt borer at Karnal, Yamunagar (Haraya), Simbhoalai and Daurala Sugar Mills (U.P.)

Kannur

- The germplasm assembly at SBI Research Centre, Kannur consists of 3340 accessions were maintained.
- Imported clones from Brazil (8), China(2) and USA(6) were quarantined and planted in field.
• A random survey was conducted on the incidence of internode borer in the germplasm accessions and pheromone traps were fixed to study its impact on INB population.

Agali

• Core germplasm and interspecific and intergeneric hybrids were maintained.
• Off season nursery facility has been extended to mandated crops.
• Distant Hybridisation facility created and extended to all breeders from states.

Motipur

• One hundred and thirty two elite genotypes were selected from ground nursery based on HR Brix (> 20), NMC, cane appearance, field reaction to pests and diseases
• Breeder seeds of varieties Co 87263, Co 87268 and Co 89029 were multiplied and supplied to the sugar factories and progressive farmers.

Jamkhandi

• Co 0315 and Co 0309 recorded higher sucrose (20.30 %) compared to the best standard CoC 671 (19.24%).
• Co 0328 was the best entry for yield. Co 0329 recorded the highest sucrose of 20.10% and was superior to Co 7219

Chagallu

• Two pre zonal varietal trials conducted during 2002-03 have showed that in trial I Co 85019 was the best standard for sugar yield. Four clones viz., 2000-43, 2000-46, 2000-69 and 2000-74 recorded significantly superior sugar yield over the standard.
• 23 clones from pairs I and II were selected and planted for further evaluation

d. Performance of centres

The various centres located in tropical and sub tropical regions have strengthened the capability of the Institute. The centres have developed many sugarcane varieties and technologies which in turn has led to increased productivity (4.36 million hectares) and production (300 million tonnes) of sugarcane. Varieties and technologies evolved at the Institute were instrumental in increasing production and productivity of sugarcane and as a result India is the second largest producer.

Answer to Parliament Question Dy.No 7099

Sub : Lok Sabha admitted original unstarred Question D.No. 7099 for 9.5.05 raised by Shri Dalpat Singh Parste regarding varieties released by ICAR

Part (a) Varieties released / notified in the last three years (2002, 2003 and 2004)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of group</th>
<th>Name of crop</th>
<th>Name of Variety/ Hybrid</th>
<th>Year of notification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Commercial crop</td>
<td>Sugarcane</td>
<td>Co 94008 (Shyama)</td>
<td>2003</td>
</tr>
</tbody>
</table>
Part (b) Recently identified varieties

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of Institute / AICRPs</th>
<th>X Plan budget allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ninety six elite clones have been evolved and assigned ‘Co’ numbers by SBI. 2002(41), 2003(31), 2004(24)</td>
<td>Sugarcane Breeding Institute, Coimbatore</td>
</tr>
</tbody>
</table>

Part (c)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of Institute/ AICRPs</th>
<th>Name of disciplines</th>
<th>Number of Scientists</th>
<th>Total</th>
<th>X Plan expenditure (Rs. in lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sugarcane Breeding Institute, Coimbatore</td>
<td>Seed Technology</td>
<td>2</td>
<td>2</td>
<td>2002-03 – Rs. 84.60 2003-04 – Rs. 89.57 2004-05 – Rs. 235.44</td>
</tr>
</tbody>
</table>

Answer to Parliament Question Dy.No. 1043

Sub: Lok Sabha unstarred Question Dy.No. 1043 - No. of Institutions offering Doctoral (Ph.D) course in Biotechnology and Funds ear-marked under Xth Plan for BioTechnology education

a. Ph.D. programme in Biotechnology is being offered at (i) TNAU (ii) Bharathiyar University (iii) G.R. Damodaran College of Science (iv) Dalmia centre for Research and Development (iv) Kongunadu Arts and Science College in Coimbatore. The details on the number of colleges in the country where the biotechnology programme in Ph.D. level offered is not available with us.

b. Not available.

Answer to Parliament Question Dy.No. 3793

Sub: Lok Sabha Original unstarred Question Dy.No. 3793 regarding Development of high yield sugarcane variety suitable for problem soil and drought by SRS, Cuddalore

a. Yes.

b. Sugarcane Research Station, Cuddalore has released CoC (Sc) 22 recently for the state of Tamil Nadu during 2004. The performance details of the variety furnished by TNAU is enclosed. The variety is being tested for suitability in the east coast region in the states of Andhra Pradesh, Orissa and Tamil Nadu through AICRP(S).

c. The variety is reported by TNAU to be suited to problem soils and to do well in drought.

d. The details are provided in the enclosure.
### Answer to Parliament Question Dy.No. 10806

Sub: Lok Sabha Provisional Starred Question Dy.No. 10806 regarding production of sugarcane and cotton

I. The estimated production of sugarcane for the years
   a. 2003-04 - 236 Million Tonnes
   b. 2004-05 - 235.5 Million Tonnes
   c. Sugar is being imported on Open General Licence (OGL)
   d. Details are not available
   e. Following measures are taken by the Institute to increase yield per hectare
II. Improved varieties with higher yield, better juice quality, red rot resistance and better ratoonability.
III. Drought management techniques to reduce damage to drought
IV. Biocontrol of insect pests to reduce the cost of cultivation
V. Recent development in sugarcane research
   - Wide row spacing
   - Biocontrol of pests & Intensification of biotechnology research for pests and disease resistance

### Answer to Rajya Sabha Question on Women Scientists

Sub: Information sought from DST on Provisional admitted question for Rajya Sabha raised by Smt.Kum Kum Rai regarding funds for women scientists

- No
- Not applicable

### Answer to Parliament Question Dy.No. U 18

Sub: Rajya Sabha Provisional starred Question Dy.No. U 18 by Sh.Pyarelal Khandelwal, M.P. (Rajya Sabha) regarding sugarcane Farmers concerns

- Information is not available.
- No.
- The area for growing sugarcane has declined by 20% due to severe drought and non availability of adequate irrigation water.
- Does not come in the purview of the Institute.
Answer to Parliament Question Dy.No.3453

Sub: Rajya Sabha Provisional starred Question Dy.No.3453 for 7.3.2005 raised by Shri Mahboob Zaidi regarding Genetically Modified crops

a. There is no proof to show that because of the inherent instability of the transgenes the exchange of gene between GM crop species and their wild relatives is in anyway enhanced. If the transgene is unstable it would get eliminated or silenced leading to the non-expression of the transgene.

b. This is entirely depending on the transgene. Some foreign genes may not be expressed as expected due to difference in biochemical pathways as glycolysis. Depending on the function of the genes (gene products) it may or may not disrupt the physiological or ecological functions. Such transgenics with transgenes that would disrupt physiological or ecological functions would be eliminated in the initial selection cycle of the development of transgenics for a particular trait.

c. As such, genes which disrupt the physiological or ecological functions would be affecting the quality or yield of the crop also. Hence, these transgenics would not reach the final level of selection and would not be released for cultivation. So the question of exchange of such genes jeopardizing the existing crop genetic diversity to an unpredictable extent is very remote.

d. Based on some studies there are some apprehensions on the use of herbicide resistant genes in some crop plants. There is a fear that the herbicide resistant gene may be passed on to the weedy relative of the crop and this particular species would become a super weed which in turn will be difficult to control with the specific herbicides. Again this need not be true for all the crop plants. This sort of gene exchanges is possible only between close relatives of cross-pollinated crop species. Hence, utility of the gene has to be assessed based on the situation i.e., the nature of the crop, the trait we are dealing with etc.

e. With the current level of knowledge, GM crops is not the panacea for all the problems. It is one of the tools for the crop improvement to be used as an adjunct to the conventional breeding. With the cloning of newer genes and improved understanding on transgene expression, transgenic technology holds great promise for crop improvement which otherwise is not possible through conventional breeding. Hence, transgenic technology might play a vital role in solving world hunger and malnutrition.

Answer to Parliament Question Dy.No. 4950

Sub: Question Dy.No. 4950 by Sh.K.C.Palanisamy, M.P. regarding activities of ICAR in Tamil Nadu

Para-wise reply in respect of SBI (ICAR) is furnished below.

a. Sugarcane Breeding Institute was established during the year 1912 with the prime objective of improving sugarcane productivity through varietal improvement and its management in the country.

b. Yes
Important research and development activities conducted at SBI (ICAR) for the benefit of the state of Tamil Nadu during the last three years (2001-02 to 2003-04) is furnished below.

- 96 Co canes were identified /evolved and provided for multi-location testing.
- SBI a constituent unit of ICAR contributes varieties in two modes to Tamil Nadu and other states (i) By providing Co varieties directly to the Research Stations for testing (ii) By providing facilities for making crosses under AICRP system and providing hybrid for raising seedlings and selecting for location specificity.
- Varieties Co 85004, Co 86032, Co 86249, Co 87025, Co 87044, Co 91010 and Co 94008 notified by GoI have been recommended for commercial cultivation in Tamil Nadu. Other varieties developed through ICAR collaboration and recommended for commercial cultivation in Tamil Nadu is given below.
  - Early ripening : CoC 671, CoC 8001, CoC 85061, Co 7704, Co 8208, Co 92061, Co 90063.
  - Midseason and late ripening : Co 6304, CoSi 776, CoSi 86071, Co 8021, Co 85019, Co 86010, CoSi 95071, CoSi 96071, CoSi 98071, CoG 93076, CoC 22, Co 92020, Co 93009, Co 94005 and Co 94008
  - 134.60 tonnes of seed material of promising varieties (21 Nos.) were supplied to 15 sugar factories in Tamil Nadu.
  - 52 flasks of tissue culture (shoot tip) of Co 86032 and Co 91010 supplied for the benefit of sugarcane entrepreneurs.
  - Under the Institute Industry Interface programme, SBI has undertaken a trial on "Evaluation and identification of varieties suited to specific locations" in six sugar factories of Tamil Nadu.
  - A joint project on "Identification of a superior wild cane for use as an alternate raw material for pulping and paper making" with TNPL (Tamil Nadu Newsprint and Papers Limited), a Govt. of Tamil Nadu Enterprises, has been taken up for evaluation of available variants in *Erianthus arundinaceus* for yield of cane and bio-mass, quality of juice, fibre content and rate of multiplication.
  - Mass multiplication technology and successful field evaluation of the fungus *Beauveria brongniartii* was demonstrated in a factory at Tamil Nadu.
  - The Institute’s Participatory Technology Transfer approach in M/s M.R.K. Cooperative Sugar Mill area of Tamil Nadu was found effective in the management of red rot disease of sugarcane. A similar approach was followed to introduce the variety Co 86032 in this factory area to improve the sugar recovery. This has been appreciated by the Commissioner of Sugar, Govt. of Tamil Nadu and other factories in the cooperative sector are following the approach.
  - Important production/protection technologies in the form of extension folders / publications (18 Nos.) were published and circulated to all users in Tamil Nadu and other states.
  - Under IVLP, 30 technological interventions were introduced and regular training programme organised in 3 villages in Tamil Nadu.
  - Scientists from SBI are regularly conducting seminar on cane cultivation in the factory areas for the benefit of industry and growers.
  - Regular Farmers Day/Field Days are being conducted for the benefit of farmers.
  - Institute is participating annual AGRI INTEX Fairs for the benefit of farming community by displaying production/protection technologies.
Because of the involvement of ICAR, Tamil Nadu is one of the highest producers of cane with the highest productivity in the country.

d. Following major steps have been taken by SBI (ICAR) for the improvement of sugarcane production.

i. At the instance of ICAR, a convergence of research programme in agricultural sector was initiated. The Institute has proposed to undertake a project on the development of wasteland into fibre gardens with the use of wild species of sugarcane in collaboration with TNPL, as the Govt. of Tamil Nadu has given focus on the wasteland development during X Five Year Plan. The proposal for allotment of the area for the project is under the consideration of Agricultural Production Commissioner, Govt. of Tamil Nadu

ii. Under the CSS on "Sustainable development of sugarcane based cropping systems" 17 national level training programmes on Sugarcane Production Technologies were organized at SBI for the sugarcane development personnel of the state department.

iii. Front line demonstrations (16 Nos.) on important production technologies are being arranged with the active support of the state line department.

iv. The Institute is organizing regularly Sugarcane Research and Development Workers Meeting of Tamilnadu in collaboration with SAU/Department of Agriculture and Commissionerate of Sugar to discuss various production/protection technologies where State Govt. officials took active participation. Following meetings have been organized.

- 32nd R&D meeting of Sugarcane Workers' of Tamil Nadu at Trichy during Sept. 25-26, 2001
- 33rd R&D meeting of Sugarcane Workers' of Tamil Nadu at Erode during October 5-6, 2001.
- 34th R&D meeting of Sugarcane Workers' of Tamil Nadu at Erode during June 4-5, 2002
- 35th R&D meeting of Sugarcane Workers' of Tamil Nadu at Vellore during Sept. 8-9, 2003

e. As a result of these programmes the yield and recovery of sugarcane in Tamilnadu is stable and is sound scientific footing. The major area in Tamilnadu is covered by varieties from this institute.

f. The institute is also collaborating and supporting the project on multilocation testing of red rot resistant varieties for Tamilnadu being run by the Cuddalore Research Station.

g. The NHG facility is available to the research stations of Tamil Nadu for generation of requisite variability for the states varietal needs.

h. In addition ICAR conducts the Regional Committee meetings once in two years to assess and prioritise the agricultural and horticultural research and educational needs of the region. Tamil Nadu is a constituent member of Region No.VIII of ICAR.

i. SBI (ICAR) has been receiving sufficient funds for its activities.

j. Details enclosed as Annexure.
### Answer to Parliament Question Dy.No. 3188

Sub: Lok Sabha Provisional Starred Question Dy.No. 3188 by Shivaji Adhalrao Patil regarding disease in sugarcane

a. In the recent past no reports on shoot borer menace in sugarcane areas of Maharashtra has been received by SBI. However the current regional scenario on this issue may be available with CSRS, Padegaon; VSI, Pune and MPKV, Rahuri. The studies conducted at SBI for suppression of shoot borer has made the following recommendations.

   i. Avoiding late planting i.e. beyond January so as to avoid the vulnerable stage of the crop coinciding with the hot summer months favouring pest infestation

   ii. Need based application of lindane 20 EC / chlorpyriphos 20 EC at 1 Kg. a.i. /ha over the furrows in areas known to be endemic to the pest especially when the incidence is heavy.

   iii. Earthing up at 45th and 90th day after planting

   iv. Trash mulching during summer months in areas devoid of termite problem.

b. Yes.

c. SBI has the following three projects in operation

   • Evaluation and utilisation of *Trichogramma chilonis* against shoot and internode borers

   • Management of shoot borer through augmentative releases of *Sturmiopsis inferens*

   • Development of artificial diet for shoot borer

d. ICAR may decide to provide financial assistance to sugar producers of Maharashtra for control of shoot borer disease

e. Not applicable

f. Not applicable

### Answer to Parliament Question No. 2450

Sub: Lok Sabha Starred Question No. 2450 for 7.8.2003 by the then MoS (Information and Broadcasting)

Para-wise reply regarding expenditure on media and publicity viz., Printing of Annual reports, Newsletters, Pamphlets, Booklets, Charges for website hosting and advertisement charges for Recruitment / Tenders for the years 2000-01 to 2003-04 and up to July 2004.

a. Expenditure incurred on media and publicity by SBI

<table>
<thead>
<tr>
<th>Year</th>
<th>Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-01</td>
<td>Nil</td>
</tr>
<tr>
<td>2001-02</td>
<td>Rs.210162/-</td>
</tr>
<tr>
<td>2002-03</td>
<td>Rs. 204607/-</td>
</tr>
<tr>
<td>2003-04</td>
<td>Rs. 181724/-</td>
</tr>
<tr>
<td>2004-05</td>
<td>Rs. 276500/-</td>
</tr>
</tbody>
</table>

   (Upto July 2004)

b. No

c. Not applicable

d. No

e. Not applicable
### Answer to Question provisionally admitted in Rajya Sabha- Plan for Diversification

Sub: Provisionally admitted Rajya Sabha Question regarding Plan for diversification to cash crops for paddy cultivated areas

a. No. The Institute has not drawn up any national plan for diversification and introduction of new cash crops in areas mainly devoted to traditional paddy cultivation.

b. Not applicable

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### Answer to Parliament Question PQ Dy.No. 71

Sub: Provisionally unstarred question Dy. No. 71 (5-7-2004) by Sri. S.P.Y. Reddy regarding production of Ethanol

a. **Question:** Whether the Government has any proposal to carry out intensive research on sugarcane with a view to maximizing the production of Ethanol out of sugarcane so that it would be used as a substitute for petroleum and or diesel?

   **Answer:** No

b. **Question:** If so, the details thereof and if not, the reasons thereof.

   **Answer:** ICAR proposes to carry out intensive research on sugarcane with a view to maximizing the production of Ethanol out of sugarcane so that it would be used as a substitute for petroleum and / or diesel. Sugarcane Breeding Institute, Coimbatore in collaboration with Sakthi Sugars carried out a research project during 1981-86 on identification of varieties, which give high yield of ethanol when the juice is directly used as a raw material. It was found that sugarcane varieties with high juice volume and high total sugars are suitable for this purpose. The yield of alcohol per tonne of cane ranged from 75 to 125 litres . Under Xth Five Year Plan, this research is one of the priority thrust areas of SBI, Coimbatore.

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### Answer to Parliament Question-PQ Dy No.1909

Sub: Lok Sabha Unstarred Admitted Question No. 1909 by Shri E.G. Sugavanam, Sri Jai Prakash regarding Area under Kharif cultivation and the contingency plan in view of weak phase of monsoon

a. Sugarcane is an annual crop. Sugarcane planting seasons do not strictly conform to kharif /rabi seasons. Major planting of sugarcane is done during December to April. Second season is during June-July which may be about 10% of the total area under sugarcane, particularly in Maharashtra and parts of Karnataka. Besides, some area also is under autumn planting (September/October) in sub tropical India which may be 10% of the total area.

b. Delayed monsoon has not affected the December-April planted crops. There was some delay in taking up June-July planting due to delayed monsoon.

c. Not applicable.
d. ICAR has asked us to prepare a contingency plan in view of weak phase of monsoon.

e. A contingency plan to manage the standing sugarcane crop (region-wise) was sent to ADG(CC), ICAR on 23.6.2006

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**Answer to Parliament Question PQ Dy. No. 1896**

Sub: Lok Sabha Provisional Unstarred Admitted Question No. 1896 by Shri Magunta Sreenivasulu Reddy regarding Regional disparities in agricultural development and the measures being taken by Govt

a. As far sugarcane productivity is concerned, western regions have performed well (Maharashtra and Gujarat). Northern region have relatively moderate productivity only. Sugarcane cultivation is limited in North Eastern India. Barring Assam, the cultivation of sugarcane on North Eastern India is negligible. Sugarcane productivity in Orissa and Bengal is moderate.

b. In North Eastern India sugarcane is not a traditional crop. The hilly and mountainous nature of the region, seasonal flooding and preference for traditional crops like rice, maize, tubers etc. required for the subsistence agriculture are reasons for poor adoption of sugarcane as a major crop. Except Assam, there are no sugar industries in the region to support sugarcane agriculture.

c. Institute does not have any specific programme for the North Eastern region since it is a non traditional area. However, we provide the National Hybridization facility for the Assam Agricultural University centre located at Buralikson to make crosses at Coimbatore and develop varieties suited for Assam. The centre is also participating in the AICRP (Sugarcane) for the evaluation of elite sugarcane clones.

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**Answer to Parliament Question PQ Dy. No.S2622**

Sub: Rajya Sabha Provisional Admitted Question Diary No. S2622 regarding research activities on agricultural production by Shir N.R. Govindarajar

a. Yes

b. Sugarcane Breeding Institute, Coimbatore in Tamil Nadu set up by ICAR is aiming at improving sugarcane productivity through varietal improvement and its management in the country. The Institute has the following mandate.

   - Breeding of superior sugarcane varieties / genotypes having high sugar productivity as well as sustainability and to assist State Sugarcane breeding programmes.
   - To conduct basic and strategic researches, on crop improvement, production and protection aspects of sugarcane cultivation.
   - Collection, maintenance, evaluation, documentation and conservation of sugarcane genetic resources.
   - Effecting technology transfer, consultancy and human resource development in the areas of sugarcane agricultural research.
   - The Institute has made significant contributions in identification of superior clones. During the past three years the institute had made the following achievements in varietal improvement programme.

   - Co 94008 (Shyama) developed by SBI has been notified by GoI for cultivation in Peninsular zone.
   - Co 94012 was released for Maharashtra state.
   - Promising Co canes (82 Nos.) were identified for yield and quality.
Co 99004, Co 99006, Co 99012 and Co 98013 have been identified as superior clones from AVT midlate and are being proposed for release.

Breeder seed of different varieties have been produced and supplied to sugar industry and farmers.

c. Following are the thrust areas and research priorities identified by the Institute and approved by ICAR for increasing agricultural production.

- Evolution of need based varieties
- Conservation and utilisation of genetic resources
- Genomic research and transgenics
- Seed technology
- Residue recycling and utilisation
- Integrated crop management
- Integrated pest and disease management
- Experimental techniques and statistical designs and analysis
- Technology assessment, refinement and dissemination
- Human resources development

d. Through the concerted efforts of sugarcane research in Tamilnadu the area under sugarcane, productivity and yield have been considerably increased except during the year 2003-04 where the tropical region had experienced severe drought.

<table>
<thead>
<tr>
<th>Year</th>
<th>Area (000ha)</th>
<th>Production ('000 tonnes)</th>
<th>Yield (tonnes/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004-05*</td>
<td>232</td>
<td>23396</td>
<td>100.8</td>
</tr>
<tr>
<td>2003-04</td>
<td>192</td>
<td>17656</td>
<td>91.9</td>
</tr>
<tr>
<td>2002-03</td>
<td>261</td>
<td>24165</td>
<td>92.4</td>
</tr>
</tbody>
</table>

- Provisional

**Answer to Parliament Question PQ. No 991 Dy.No.1330**

Sub: Admitted Lok Sabha Unstarred Question No.991,Dy.No. 1330 on Agriculture Training Centres raised by Shri Ganesh Singh

a. The Extension Section of Sugarcane Breeding Institute is conducting regular training programmes on various aspects of Sugarcane Production Technology for the benefit of sugarcane farmers and sugar industry.

b. As it is a policy decision of ICAR, the position may be ascertained from DDG (Ag. Extn.), ICAR, Krishi Anusandhan Bhavan, New Delhi 110 012

c. Not applicable.
Sub: Parliament Assurance on Rajya Sabha Question No. U9 on the Training Programmes for small and marginal farmers by Shri Rama Muni Reddy Sirigireddy

a. Details of ten programmes conducted by Sugarcane Breeding Institute under different programmes during the years 2000-01 to 2004-05 is given below, as per the format.

<table>
<thead>
<tr>
<th>Name of the scheme</th>
<th>Number of Farmers trained during</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Institute Village Linkage Programme under NATP</td>
<td>90</td>
</tr>
<tr>
<td>IFFCO Farmers</td>
<td>60</td>
</tr>
<tr>
<td>Farmers sponsored by Sugar factories and State Department of Agriculture</td>
<td>110</td>
</tr>
</tbody>
</table>

S=small farmers; M=Medium farmers; T= Total

b. No. of small and marginal farmers benefited from the training programme on Sugarcane Production Technology conducted by the Institute is furnished below.

- 2000-01 = 280 Nos.
- 2001-02 = 390 Nos.
- 2002-03 = 345 Nos.
- 2003-04 = 360 Nos.
- 2004-05 = 250 Nos.

c. As it is a policy decision, of ICAR, the position may be ascertained from DDG (Ag. Extn.), ICAR, Krishi Anusandhan Bhavan, New Delhi 110 012

d. Not applicable.
Sub: Provisional Admitted Question for Rajya Sabha - Starred/Unstarred Diary No. S 883 - Funds allocation for ICAR.

a. Funds allocation in the ICAR research projects

**Allotment/Expenditure (Rs. In lakhs)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Plan Allotment</th>
<th>Plan Expenditure</th>
<th>Non-Plan Allotment</th>
<th>Non-Plan Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995-96</td>
<td>130.50</td>
<td>130.41</td>
<td>249.00</td>
<td>248.49</td>
</tr>
<tr>
<td>1996-97</td>
<td>70.00</td>
<td>69.88</td>
<td>320.10</td>
<td>320.08</td>
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<td>1997-98</td>
<td>117.00</td>
<td>116.85</td>
<td>360.00</td>
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<td>1998-99</td>
<td>213.50</td>
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<td>200.00</td>
<td>200.00</td>
<td>527.50</td>
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<td>2000-2001</td>
<td>200.00</td>
<td>199.90</td>
<td>583.00</td>
<td>578.27</td>
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<tr>
<td>2001-2002</td>
<td>190.00</td>
<td>189.98</td>
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<td>647.31</td>
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<td>2002-2003</td>
<td>90.00</td>
<td>84.60</td>
<td>627.00</td>
<td>626.83</td>
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<tr>
<td>2003-2004</td>
<td>86.00</td>
<td>89.57</td>
<td>659.00</td>
<td>659.00</td>
</tr>
<tr>
<td>2004-2005</td>
<td>250.00</td>
<td>235.44</td>
<td>766.00</td>
<td>763.59</td>
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<tr>
<td>2005-2006</td>
<td>288.00</td>
<td>287.89</td>
<td>883.00</td>
<td>875.61</td>
</tr>
<tr>
<td>2006-2007</td>
<td>295.79</td>
<td>-</td>
<td>758.95</td>
<td>-</td>
</tr>
</tbody>
</table>

b. Following expert committees constituted by ICAR have reviewed the benefits yielded by the farming community.

- Quinquennial Review Team of SBI (for the period 1995 to 2003)
- Research Advisory Committee (for the period 1995 to 2006 - on an annual basis)
- Staff Research Council of SBI (for the period 1995 to 2006 - on six monthly basis)
- Divisional level review for the period 1995 to 2006 at regular intervals.
c. Salient findings

- Following promising Co canes (295 Nos.) were identified for yield and quality.

<table>
<thead>
<tr>
<th>Year</th>
<th>Co canes</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>Co 95001- Co 95023</td>
<td>23</td>
</tr>
<tr>
<td>1996</td>
<td>Co 96001- Co 96024</td>
<td>24</td>
</tr>
<tr>
<td>1997</td>
<td>Co 97001- Co 97020</td>
<td>20</td>
</tr>
<tr>
<td>1998</td>
<td>Co 98001- Co 98021</td>
<td>21</td>
</tr>
<tr>
<td>1999</td>
<td>Co 99001- Co 99016</td>
<td>16</td>
</tr>
<tr>
<td>2000</td>
<td>Co 200001- Co 200012</td>
<td>12</td>
</tr>
<tr>
<td>2001</td>
<td>Co 0101- Co 0125</td>
<td>25</td>
</tr>
<tr>
<td>2002</td>
<td>Co 0201- Co 0241</td>
<td>41</td>
</tr>
<tr>
<td>2003</td>
<td>Co 0301- Co 0331</td>
<td>31</td>
</tr>
<tr>
<td>2004</td>
<td>Co 0401 - Co 0424</td>
<td>24</td>
</tr>
<tr>
<td>2005</td>
<td>Co 0501 - Co 0521</td>
<td>21</td>
</tr>
<tr>
<td>2006</td>
<td>Co 0601 - Co 0637</td>
<td>37</td>
</tr>
</tbody>
</table>
The Varietal Identification Committee of AICRP(S) which met at Pantnagar during October 2006 has identified the following sugarcane varieties for the respective zones. These varieties are being proposed to Central Varietal Release Committee for notification:

<table>
<thead>
<tr>
<th>Variety</th>
<th>Zone</th>
<th>Date of notification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co 98014 (Karan 1)</td>
<td>North West Zone</td>
<td></td>
</tr>
<tr>
<td>Co 99004 (Damodar)</td>
<td>Peninsular Zone</td>
<td></td>
</tr>
<tr>
<td>Co 99006 (Neeraj)</td>
<td>Peninsular Zone</td>
<td></td>
</tr>
</tbody>
</table>

The Central Sub Committee on Crop Standard, Notification and Release of varieties for Agricultural Crops has notified the following sugarcane varieties developed by SBI for the respective zones:

<table>
<thead>
<tr>
<th>Variety</th>
<th>Zone</th>
<th>Date of notification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co 8371 (Bhima)</td>
<td>Peninsular Zone</td>
<td>June 2000</td>
</tr>
<tr>
<td>Co 85004 (Prabha)</td>
<td>Peninsular Zone</td>
<td>June 2000</td>
</tr>
<tr>
<td>Co 86032 (Nayana)</td>
<td>Peninsular Zone</td>
<td>June 2000</td>
</tr>
<tr>
<td>Co 86249 (Bhavani)</td>
<td>East Coast Zone</td>
<td>June 2000</td>
</tr>
<tr>
<td>Co 87025 (Kalyani)</td>
<td>Peninsular Zone</td>
<td>June 2000</td>
</tr>
<tr>
<td>Co 87044 (Uttara)</td>
<td>Peninsular Zone</td>
<td>June 2000</td>
</tr>
<tr>
<td>Co 87263 (Sarayu)</td>
<td>North Central Zone</td>
<td>June 2000</td>
</tr>
<tr>
<td>Co 87268 (Moti)</td>
<td>North Central Zone</td>
<td>June 2000</td>
</tr>
<tr>
<td>Co 89029 (Gandak)</td>
<td>North Central Zone</td>
<td>June 2000</td>
</tr>
<tr>
<td>Co 91010 (Damodar)</td>
<td>Peninsular Zone</td>
<td>June 2000</td>
</tr>
<tr>
<td>Co 94008 (Shyama)</td>
<td>Peninsular Zone</td>
<td>Nov. 2003</td>
</tr>
</tbody>
</table>

Several production and protection technologies have been perfected for the benefit of farming community and sugar industry.
Subject: Tie up with institution resolving crisis in agriculture-

a. Institute has been developing improved varieties and technologies to make sugarcane agriculture profitable and susceptible.

b. The research results emanating from the Institute are made available to the farmers through extension agencies and sugar factories. During 2006 Institute has identified 37 new 'Co' canes with better production potential. Three clones viz., Co 98014, Co 99004 and Co 99006 with better yield and quality potential has been proposed for release. Control measures for some of the important pest problems like Sugarcane White Woolly Aphid also have been developed. Institute is also engaged in breeder seed production to make available healthy planting material for the farmers. Institute is constantly addressing the problems that are faced by the farmers in the country.

c. Not applicable

d. Not applicable