"THE DEVELOPMENT OF THE SUGAR INDUSTRY

IN NIZAMABAD, ANDHRA PRADESH"

By

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A Thesis submitted for the degree of Doctor of Philosophy in the University of London

1969
Abstract.

This thesis attempts to analyse the conditions of the sugar industry in part of Andhra Pradesh and it is hoped that the results of these studies indirectly show the possibility of improving the efficiency of sugar production in the country.

The discussion is divided into seven parts. In the first Chapter, as an introduction, a brief history of Indian sugar Industry has been outlined. The same section further deals with economic factors such as general position of sugar-cane area, production and yield, utilisation of sugarcane, world trend of sugar consumption and production, export of sugar and India's share in the venture. The gradual rise of the sugar industry in the 20th century is discussed and a brief mention of Government programmes to develop the industry through Five Year Plans.

A study of the development of the sugar industry in Andhra Pradesh is concentrated into the Second Chapter. Here the discussion goes further to trace the situation prior to the three Plan periods - and subsequent developments - increase in sugarcane acreage, production and yield, condition of the factories and the intensive cane development drives.

The field of research narrows down in the Third and Fourth Chapters to the district of Nizamabad in Andhra Pradesh, which is the main subject of this work. The causes of the localisation of the sugar industry in this particular district along with a brief description of the Nizam Sugar Factory and cultivation of sugarcane and price fluctuation have been assessed.

In the subsequent parts every endeavour has been made to throw light upon the cultural, economic and social problems, along with the working and localisation, planning and by-products
of the sugar industry in the district.

Though the whole discussion is based on the facts available in official and unofficial publications, the conclusions reached in the last Chapter are interpretations of the existing facts, in which some possible suggestions have been made to avert the adverse forces jeopardising the expansion and growth of this important national industry, and will contribute towards increasing production of the sugar industry and placing it on a sounder footing.
In Indian life and economy sugar occupies an important position. In fact sugarcane is India's sweat gift to the world. In undertaking research on this subject I am fulfilling obligations towards my motherland. Recently, the country experienced what can be described as a sugar crisis. Sugar mills associations published in the columns of the local press to educate public opinion in their favour and to absolve themselves of any responsibility in the crisis and also enlist support of formal opinion. The Government, seeing that all was not well with the sugar industry, and also, indeed with textile and other industries, appointed the Sen Commission to enquire into the state of affairs in the sugar industry. Following the Sen Commission's recommendations Mr. Gundo Rao, a private sector expert, was invited to Chair a Committee which further enquired into the existing inadequacies. This Committee covered in its scope of enquiry all the interests involved with the sugar industry, in a systematic State-wise manner. It will not be out of place if we try to see the above descriptions in the light of actual figures of production. The total sugar production in the world in 1965-66 was

\[ 63.5 \text{ million metric tons} \]

with main contribution, viz. Cuba 4,555,000, Mexico 2,176,208, Brazil 4,557,051, U.S.A. 1,000,284 metric tons. In the same year India produced 3,900,000 tons of sugar and 280,000 tons khandsari. Further, the States below produced:

\[
\begin{align*}
(\text{A.P.}) & \quad 298,548 \text{ tonnes} \\
(\text{M.P.}) & \quad 780,784 \text{ tonnes} \\
(\text{U.P.}) & \quad 1,374,595 \text{ tonnes}
\end{align*}
\]

Nizamabad's contribution amounts to 56,250 tonnes.
Taking the matter from here the Sen Commission remarked:-

A) Exports of sugar should not only be continued but also augmented and efforts should be made to obtain as large a quota as possible.

B) The need for reducing the cost of production of sugar in India, in order to improve her comparative position in the world market, is urgent.

C) Every effort should be made to ensure proper supply of the required amount of input factors and, at the same time, develop a proper extension agency for the purpose of ensuring healthy and clean cultivation.

D) The State Government, sugar factories and cane societies should create the necessary climate for the growers to take to improve methods in their agricultural practices. It is necessary to augment the credit facilities to the cultivator by providing the necessary credit to the co-operative banks and instructions in the respective areas.

E) Even within the regions where there is greater scope for the development of sugarcane cultivation, there are some districts which need to be given special attention for sugarcane development.

Mr. Gundo Rao recommended

A) Production of sugarcane for gur manufacture should be planned separately. As far as possible no large scale manufacture of gur and khandsari should be permitted
factory areas.

B) The sugarcane growers should be educated to align their interests with those of the factory and the factory in turn should see to it that the interest of the growers are not allowed to suffer. As much direct contact should be established between the two as possible.

C) Fluctuations in yield and recovery can to a large extent be minimised by providing adequate irrigation, manuring and sowing the most suitable varieties for the tract, based on soil surveys and varietal trials. Provision of good, healthy seed would also go a long way in improving yield and recovery.

D) The Committee recommends the factories should have adequate capacities to enable them to crush the available cane in a reasonable duration of season. The most important key to improve and maintain a high level of productivity in sugarcane production is a vigorous and dynamic breeding programme.

E) It is necessary to augment the credit facilities to the cultivator by providing the necessary credit to the cooperative banks and institutions in the areas.

F) The State Governments, sugar factories and cane societies should create the necessary climate for the growers to take to improved methods in their agricultural practices.

G) In the context of supplying fresh cane at minimum cost to the factory, development of communications assumes great importance. It will not only help the transport of cane, but of other agricultural products as well.

H) Efficiency in production is also dependent on the man behind the machine. If the technical personnel
engaged in production understand the principles of processing and are as aware of the latest techniques, much of the time and material lost can be avoided and high efficiency achieved, thus, contributing to reduction in the cost of production. The Committee has observed that the situation obtaining at present in the industry is not entirely satisfactory.

1) The price of sugar should be fixed on a sub-regional basis.

In the treatise, I have sought to deal with the problems connected with sugar production, transport and marketing with special reference to the State of Andhra Pradesh to which I belong and whose problems and difficulties are symptomatic of the problems of the sugarcane industry all over the country. With a view to making the study more specific and the investigation more detailed I narrowed down the grounds to the performance evaluation in perspective of a single factory taken as a case study. The Nizam Sugar Factory at Shakkarhager, Bodhan in the Nizamabad district of Andhra Pradesh is both a major industrial undertaking and an old establishment to serve as an illustration of all the aspects of the problems of industry. It has two units, a very large intake, large production, vast acreage, and an elaborate distribution and marketing apparatus involving agro-economic, socio-economic and techno-economic problems over a wide area and vast population. Hence, this investigation almost assumes the dimensions of an economic survey of an entire community of people involved with the process of change and development under the stress of modernisation and in the context of the growing requirements of a slowly metamorphosing society of an under-developed country. It is hoped that the observations made in this publication will be found
useful by all concerned in respect of the sugar industry of Nizamabad, and must, therefore, equally be valid and interesting for other units in the Country.

It gives me great pleasure to acknowledge my deep sense of gratitude to Mr. A.B. Mountjoy, Reader in Geography, Bedford College (University of London), for his constant guidance and encouragement and valuable suggestions in the preparation of this thesis. Without his wise and discriminating help it could never have been written.

My thanks are also due to Mr. Ansell for his assistance in the preparation of photo reduction.

I am grateful to the Council of Bedford College who has offered Scholarships during the period of my studies.

I would also like to take this opportunity in thanking the Central Research fund, University of London for the financial assistance provided.

Bedford College,
London University.  (Miss) Ayesha Humaira Farooqui.
## VIII

**WEIGHTS AND MEASUREMENTS.**

<table>
<thead>
<tr>
<th>TONS TO LBS.</th>
<th>ONE TON MEANS</th>
<th>EASTERN WEIGHTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>METRIC TON = 2,204.6 lbs.</td>
<td>1 Long ton = 2,240 lbs.</td>
<td>1 tonne = 27.22</td>
</tr>
<tr>
<td>Long tons = 2,204 lbs.</td>
<td>1 Long ton = 10 bags</td>
<td>maund = 82 2/7 lbs</td>
</tr>
<tr>
<td>Short tons = 2,000 lbs.</td>
<td>1 Long ton = 27.5 maunds.</td>
<td>1 bag = 2 maund</td>
</tr>
<tr>
<td>One sack (India)</td>
<td>1 Long ton = 1.016 kg.</td>
<td>1 seer = 2 lbs</td>
</tr>
<tr>
<td>of raw sugar = 222 lbs.</td>
<td></td>
<td>1 lb = 0.45 kg.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 maund = 82.284 lbs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 &quot; = 32.324 kg</td>
</tr>
</tbody>
</table>

### RATE OF CURRENCY

- **Uptill 12.1.1964:** 13 rupees = one pound.
- **Uptill 6.6.1966:** 21 rupees 12 annas = one pound.
- **From Nov. 1967:** 18 rupees 9 annas = one pound.

100,000 = one lakh

1,000,000 = ten lakh

10,000,000 = one crore

100,000,000 = ten crore

Ten lakh = one million
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Continued...
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Sources:- Map No. 1, 2 and 12 are from the Nizam Sugar Factory, Map No. 3,4,5,6,7,8,9,10 & 11 and Chart No. 1,2,3, and Diagram 1 are taken from the State Atlas, Andhra Pradesh, Census of India 1961. vol. II, part IX.
First Chapter.
India is the second largest producer, the second largest consumer and until recently the largest importer of sugar in the world. Next only to the textile industry, the Indian sugar industry produces more sugar than any other Country in the world, i.e., less than one quarter of the world's cane sugar, and possesses nearly half the world's sugarcane area.

As a cash crop, sugarcane ranks amongst the highest producers of national wealth. The total value of the crop produced annually is about 350 crore rupees. It plays an important role in the industrial economy of the Country. Investment in the industry is about 8% of the total working capital of the Country. The crop and its processing provide employment to about 20 million or more cultivators, about 170,000 skilled and unskilled workers and about 45,000 technicians. Besides these, a considerable number of persons are employed in the sugar trade and transport, connected with cane and sugar. The annual wage and salary bill of the sugar industry is of the order of Rs. 25 crores. Above all the fiscal contribution of the sugar industry both to the Exchequers of the Central and State Governments, is of singular dimensions. This contribution in the form of excise duty, cane cess, income tax and surtax, is estimated at about Rs. 130 crores a year.

In recent years, the sugar industry has also come to occupy an important place among the foreign exchange earners of the Country. Since 1957, the industry has been making export sales, the peak of which was reached in 1963 with a sale volume of 470,000 tons, and with the foreign exchange earning of Rs. 32.2 crores. This export sale was handled entirely by the Indian Sugar Mills Association working as an export agency of the Government of India. Actual exports in 1966 were about 220,000 tons in view of the shortfall in production.
In short, from the position of a major importer of white sugar India has now become not only self-sufficient, but also entered the world market as an exporter. The production of raw sugar for export was undertaken by the sugar factories for the first time in season 1962-63. In 1965-66 some 51 factories produced about 428,000 tons of sugar for the purpose of export. The extension of sugarcane culture in the Country for the modern white sugar industry has led to an improvement of many rural areas. In many places where sugarcane production and utilisation have been conducted on rational lines, there has been a sharp improvement in the economic well-being of the local people. Today, out of 200 sugar factories in the Country, as many as 57 factories are co-operatives owned by cane growers. Andhra Pradesh is the first State which pressed for the establishment of the co-operative factories, and it is now amongst the leading States of the Country, where the co-operative scheme is functioning successfully.

Table No. 1 indicates the working of the Indian factories from 1950-51 to 1966-67.

Though in the world of sugar, India occupies a very important position (it produces some three million tons of sugar a year), there are circumstances which prevent one from comparing it with other sugar producing Countries. No doubt the area under sugarcane cultivation represents half of the cane area of the world, yet the yield of the cane and raw sugar, and the percentage of the available sugar extracted from the cane, are low. Up to 1901-1902 the average yield per acre was only 8 tons. In 1948-49 it rose to 15 tons and more recently has reached a target of about 30 tons per acre; whereas the maximum yield believed to be possible theoretically is 157 tons of millable cane, and this has been approached in Hawaii. From the beginning, the area and the yield of cane
# Table 1

## Production of Sugar Directly from Cane During the Seasons


<table>
<thead>
<tr>
<th>Seasons</th>
<th>Number of Factories</th>
<th>Average Number of Working Days @ 22 hours</th>
<th>Total Cane Crushed ('000 Tonnes)</th>
<th>Total Sugar Made November to October (1000 Tonnes)</th>
<th>Recovery of Sugar % Cane</th>
<th>Cane %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950-51</td>
<td>139</td>
<td>101</td>
<td>11,349</td>
<td>1,134</td>
<td>9.99</td>
<td></td>
</tr>
<tr>
<td>1951-52</td>
<td>140</td>
<td>132</td>
<td>15,891</td>
<td>1,521</td>
<td>9.57</td>
<td></td>
</tr>
<tr>
<td>1952-53</td>
<td>134</td>
<td>113</td>
<td>13,219</td>
<td>1,318</td>
<td>9.97</td>
<td></td>
</tr>
<tr>
<td>1953-54</td>
<td>134</td>
<td>86</td>
<td>10,092</td>
<td>1,017</td>
<td>10.07</td>
<td></td>
</tr>
<tr>
<td>1954-55</td>
<td>136</td>
<td>132</td>
<td>16,269</td>
<td>1,616</td>
<td>9.93</td>
<td></td>
</tr>
<tr>
<td>1955-56</td>
<td>143</td>
<td>145</td>
<td>19,234</td>
<td>1,892</td>
<td>9.83</td>
<td></td>
</tr>
<tr>
<td>1956-57</td>
<td>147</td>
<td>150</td>
<td>21,197</td>
<td>2,062</td>
<td>9.73</td>
<td></td>
</tr>
<tr>
<td>1957-58</td>
<td>158</td>
<td>129</td>
<td>20,065</td>
<td>2,010</td>
<td>10.01</td>
<td></td>
</tr>
<tr>
<td>1958-59</td>
<td>164</td>
<td>118</td>
<td>19,804</td>
<td>1,950</td>
<td>9.84</td>
<td></td>
</tr>
<tr>
<td>1959-60</td>
<td>168</td>
<td>138</td>
<td>24,812</td>
<td>2,461</td>
<td>9.92</td>
<td></td>
</tr>
<tr>
<td>1960-61</td>
<td>174</td>
<td>166</td>
<td>31,113</td>
<td>3,030</td>
<td>9.74</td>
<td></td>
</tr>
<tr>
<td>1961-62</td>
<td>180</td>
<td>148</td>
<td>27,948</td>
<td>2,730</td>
<td>9.77</td>
<td></td>
</tr>
<tr>
<td>1962-63</td>
<td>186</td>
<td>106</td>
<td>20,743</td>
<td>2,132</td>
<td>10.28</td>
<td></td>
</tr>
<tr>
<td>1963-64</td>
<td>194</td>
<td>122</td>
<td>25,761</td>
<td>2,577</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td>1964-65</td>
<td>198</td>
<td>153</td>
<td>33,420</td>
<td>3,229</td>
<td>9.66</td>
<td></td>
</tr>
<tr>
<td>1965-66*</td>
<td>200*</td>
<td>159*</td>
<td>36,642</td>
<td>3,555</td>
<td>9.70</td>
<td></td>
</tr>
<tr>
<td>1966-67*</td>
<td>200*</td>
<td>97*</td>
<td>21,595</td>
<td>2,150</td>
<td>9.96</td>
<td></td>
</tr>
</tbody>
</table>

* Does not include one experimental factory at National Sugar Institute, Kanpur (U.P.). Taking Nizam I & II Plant in Andhra Pradesh as one unit. Includes Gauribidnaur Sahakari Sakhar Karkhana, Mysore which worked for a very short period.

/ Relates to crushing season i.e. from the commencement of the crushing time of a factory for the season irrespective of the fact whether the commencement date was prior to 1st November or after 1st November and up to the close of crushing operation for that season.

@ Excluding Shriguonds, Gauribidnaur, Allanganallur, Kallakurichi and Chittur factories.
has fluctuated with the change of fortune of the sugar industry, and for a long time it was irregular in India.

Although India is usually found at the bottom of the list of Countries in regard to the average yield of sugarcane, in many areas in India the yield of cane compares favourably with that of the most advanced sugarcane growing Countries of the world. In India, the cane season is much shorter than in some of the Countries which top the list in the yield. If the production per acre per month is considered, India would probably rank amongst the highest. Thus, in the Deccan Canal (particularly the Nizamabad district) and parts of Andhra Pradesh the yield per acre per month is as high as 3.3 tons (Table 2) as against 3.5 tons in Hawaii, 3 tons in Java, 1.8 tons in Australia and 4.2 tons in Egypt. Similarly, though the average recovery for the whole Country is low, there are areas in India that give the highest recovery from cane, next only to that of Queensland.

With an area of 3,268,090 sq. km. and a population of about 511 million (1967 estimate), India is the world's seventh largest and second most populous Country. It lies entirely to the North of the equator. From North to South it spreads from 8 to 37 North latitude with the Tropic of Cancer cutting it roughly in two halves. West to East it stretches from about 68 to 97 East longitude.

Sugarcane is grown in nearly all parts of India. The sugarcane areas can, however, be broadly divided into typical regions; the sub-tropical and the tropical. The sub-tropical belt mainly comprises the States of Punjab, Rajasthan, Uttar Pradesh, Bihar, Madhya Pradesh, Orissa, Assam and West Bengal. The tropical belt covers the States of Maharashtra, Gujrat, Andhra Pradesh, Madras, Mysore and Kerala. The two belts are
Characterised by marked differences in climate and agricultural conditions. The sub-tropical cane area is a flat plain of alluvial soil with an elevation between 300 and 900 feet above the sea level. Cane herein grows under a climate of extremes. More than three quarters of the area under sugarcane in the country has always been in this belt. Moreover, most irrigation facilities are inadequate generally and the sugarcane survives the dry spells largely due to a sub-soil moisture. Although in the tropical belt the climatic variations are not so wide, the sugarcane crop has to be grown under well-assured irrigation. The yield per acre in the sub-tropical belt is much more than that of the tropical belt as Table 2 indicates, and the sucrose content of the sub-tropical cane is on an average lower than that of the tropical cane.

Provinces and States of India such as Madras, Bombay, Bengal and Punjab enjoy exceptional natural advantages for the cultivation of sugarcane. Madras and Bombay being entirely tropical are climatically suited for the cultivation of superior varieties of sugarcane. Coupled with natural advantages, the availability of irrigation facilities, the proximity of consumer's markets and the excellent transport relations which the ports of Bombay and Madras command in relation to export markets, have placed these provinces in a very advantageous position for the further expansion of the industry. But despite these natural and economic advantages, the industry has not been able to make rapid strides in these two provinces. In Madras, the progress of cane cultivation has been hindered by the availability of wide range alternative cash crops such as groundnuts, cotton, plantains, chillies and tobacco in addition to food crops, which are commercially more paying. Further, the over-all cost of cane cultivation
Table 2.
STATEMENT SHOWING STATEWISE FIGURES OF YIELD PER ACRE, RECOVERY OF CANE AND SUGAR PER ACRE FOR THE SEASON 1965-66.

<table>
<thead>
<tr>
<th>STATE</th>
<th>Yield per Acre (tonnes)</th>
<th>Recovery % cane</th>
<th>Sugar per Acre (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>32.24</td>
<td>9.29</td>
<td>3.00</td>
</tr>
<tr>
<td>West Bengal</td>
<td>18.45</td>
<td>9.89</td>
<td>1.82</td>
</tr>
<tr>
<td>Assam</td>
<td>13.22</td>
<td>9.10</td>
<td>1.20</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>15.51</td>
<td>9.47</td>
<td>1.47</td>
</tr>
<tr>
<td>Bihar</td>
<td>14.40</td>
<td>9.27</td>
<td>1.33</td>
</tr>
<tr>
<td>Punjab</td>
<td>14.83</td>
<td>8.58</td>
<td>1.27</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>5.23</td>
<td>8.91</td>
<td>0.47</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>9.53</td>
<td>9.10</td>
<td>0.87</td>
</tr>
<tr>
<td>Orissa</td>
<td>19.95</td>
<td>8.61</td>
<td>1.72</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>26.14</td>
<td>11.32</td>
<td>2.96</td>
</tr>
<tr>
<td>Gujarat</td>
<td>22.44</td>
<td>10.26</td>
<td>2.30</td>
</tr>
<tr>
<td>Madras</td>
<td>31.04</td>
<td>8.46</td>
<td>2.63</td>
</tr>
<tr>
<td>Mysore</td>
<td>28.07</td>
<td>10.29</td>
<td>2.89</td>
</tr>
<tr>
<td>Kerala</td>
<td>18.04</td>
<td>8.74</td>
<td>1.58</td>
</tr>
<tr>
<td>All-India</td>
<td>17.32</td>
<td>9.68</td>
<td>1.68</td>
</tr>
</tbody>
</table>

Source:— I.S.M.A.'s Statistical Division.

Table 3.
PERCENTAGE UTILISATION OF CANE CROP FOR VARIOUS PURPOSES FROM 1955 - 56 to 1965 - 66.

<table>
<thead>
<tr>
<th>SEASON</th>
<th>Percentage of Cane utilised for</th>
<th>Gur manufact</th>
<th>Khandarsi</th>
<th>White sugar</th>
<th>Chewing &amp; Planting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955-56</td>
<td></td>
<td>47.62</td>
<td>2.85</td>
<td>31.93</td>
<td>17.60</td>
</tr>
<tr>
<td>1956-57</td>
<td></td>
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<td>2.54</td>
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<td>4.74</td>
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<td>6.09</td>
<td>21.96</td>
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<td>1963-64</td>
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<td>59.33</td>
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<td>1964-65</td>
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<td>56.63</td>
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<td>1965-66*</td>
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<td>54.22</td>
<td>5.00</td>
<td>30.78</td>
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*Estimated.

Source:— Indian Sugar Manual.
is much higher in Bombay. The cost of cultivation is particularly high because of the cost of irrigation and the practice of manuring. Moreover, in these provinces, sugarcane is not grown in such concentrated and compact blocks as in Andhra Pradesh. The mills therefore experience considerable difficulty in procuring fresh supplies of sugarcane in required quantities within the economic distance. These difficulties have tended to retard further growth and expansion of the industry. Similarly, in Punjab, where the industry has a larger cultivation, the industry could not develop rapidly because of the unfavourable climatic conditions. The Province is liable to frost which is sometimes severe enough to destroy the crop or adversely affect the sucrose content of the cane. Apart from this, the quality of cane is much inferior and the cost of cultivation much higher as compared to those of U.P. or Bihar. In general, the industry is making slow but steady progress. Although some districts like Dinajpur, Rangpur, Mald, Bogra, Rajshahi and Pahna possess ideal conditions for cane cultivation, the severe competition from alternative crops like jute, rice and indigo has prevented the expansion of area under cane cultivation. The United Provinces and Bihar still continue to occupy the dominant position as far as sugarcane cultivation is concerned, but Andhra Pradesh is best suited for the cultivation of superior varieties of sugarcane. The quality of cane grown in this province is much superior to the other States. Its sucrose content being on the average 13.5 per cent when compared with 11.5 per cent of the cane produced in the United Provinces or Bihar. Moreover, the crushing season of sugarcane in Bombay is of much longer duration than that of U.P. or Bihar. Among other States that have attracted the sugar industry, the
most prominent is Mysore.

Though recent years have, however, witnessed a gradual but unmistakable tendency for the dispersal of the industry in newer and new regions, it is interesting to note that this dispersal has not been accompanied by a decline in the places of original allocations.

AREA, PRODUCTION AND YIELD:

In India, about five million acres are under sugarcane cultivation. The area under cultivation, on the whole, has shown an upward trend over the past decade. The rate of increase under sugarcane has been higher than that for the competing crops viz. rice, wheat and cotton. During the decade 1952-53 to 1961-62, the index of area under all crops, registered a linear growth rate of 1.31 per cent per annum. Over the same period, the index of area under sugarcane showed a growth rate of 6.16 per cent. The corresponding rates of growth for rice, wheat and cotton were 1.49, 3.07 and 0.72 respectively. There was thus a relative shift of area in favour of sugarcane. The sub-tropical belt showed a relatively lower growth rate for area under sugarcane than the tropical. On the whole, the area under sugarcane has increased by about a million acres in both the belts. Like area, the production of sugarcane also increased in the plan period, by about 20 million.

The production of sugarcane increased much more than that of any other crop. The all-India linear rate of growth of production of all crops during the decade ending 1961-62 was 3.23 per cent per annum. The growth rate for all food grains was 2.66, whereas that for non-food grains was 4.40 per cent. The growth rate for sugarcane was substantially higher at 8.56
per cent. Over the period, the growth rate varied considerably from State to State. The sub-tropical belt recorded a lower rate of growth than the tropical belt. In general, the amplitude of fluctuations of area as well as production was less in the tropical belt than the sub-tropical belt. Of all the States, Andhra Pradesh and Maharashtra achieved comparatively stable rates of growth and production and Bihar was the most unstable in its performance.

As regards yield, it is about 12 tonnes in the sub-tropical tract, whereas in the tropical tract the average is as high as 27 tonnes. The all-India average has increased by about one tonne per acre during the last ten years, but on the whole, the yield per acre of sugarcane has not shown any increase. The increase in production has been achieved largely as a result of expansion in the area. The average yield per acre of sugarcane during 1963-64, for the Country as a whole, was in the order of 17.6 tonnes. Over the same period, the yield per acre of sugarcane in Uttar Pradesh averaged 15 tonnes, in Bihar 13 tonnes and in Punjab 14 tonnes. The yield per acre in Maharashtra was 32 tonnes and in Andhra Pradesh 31 tonnes. Thus, the yield per acre of sugarcane in the tropical belt was more than double that of the sub-tropical belt. The following Table No. 4A shows the area under sugarcane, production and yield per acre from 1950-51 to 1965-66.

**UTILISATION OF SUGARCANE:**

Besides the manufacture of sugar, gur and khandsari, sugarcane is utilised for planting, chewing and juice drinking.

@ Crude form of sugar called gur. ◊ Centrifugal sugar made by the open pan system called khandsari gur also known as jaggery, is clarified, cane juice boiled to a temperature of...
### Table 4a
ALL-INDIA ACREAGE, PRODUCTION AND YIELD PER ACRE OF SUGAR CANE

<table>
<thead>
<tr>
<th>Year</th>
<th>Area in 000 acres</th>
<th>Percent increase or decrease in (2) over proceeding season</th>
<th>Production (000 tons)</th>
<th>Percent increase or decrease in (4) over preceding season</th>
<th>Yield per acre (tonnes)</th>
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</thead>
<tbody>
<tr>
<td>1950-51</td>
<td>4,214</td>
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<td>57,079</td>
<td>+ 8.00</td>
<td>13.54</td>
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<tr>
<td>1951-52</td>
<td>4,792</td>
<td>-8.68</td>
<td>61,651</td>
<td>-13.33</td>
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<td>-20.06</td>
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<tr>
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<td>+14.27</td>
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<td>72,030</td>
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<td>76,104</td>
<td>+6.04</td>
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<tr>
<td>1958-59</td>
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<td>104,122</td>
<td>+36.27</td>
<td>17.91</td>
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<tr>
<td>1959-60</td>
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<td>-4.10</td>
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<tr>
<td>1960-61</td>
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<td>94,646</td>
<td>-5.40</td>
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<tr>
<td>1961-62</td>
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<td>+7.32</td>
<td>117,606</td>
<td>-1.67</td>
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</table>

Source: Agricultural Situation in India.

### Table 4b
REGION-WISE NUMBER OF WORKING FACTORIES FOR THE SEASONS 1955-56 to 1965-66

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<td>18 19</td>
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<td>69 70</td>
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<td>72 72</td>
<td>72 71</td>
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<td>28 29</td>
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<td>12 13</td>
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<td></td>
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</table>

Source: Agricultural Situation in India.
On an average about 13% of the total production of sugarcane is for the purpose of planting and chewing etc. About 25% is utilised for the manufacture of gur and the remaining 5% for the manufacture of khandsari. Whereas no substantial change is noted in the proportion of cane utilised for planting and chewing, appreciable fluctuations are observed in the sugarcane availability to the users viz. sugar, gur and khandsari. The minimum cane price paid by sugar factories and the relevant prices of gur and khandsari have a direct impact on the inflow of sugarcane supplies to these users. Table No. 3 shows the figures of sugarcane utilisation from 1955-56 to 1965-66. Whereas the overall output of sugarcane

* @

116°c to 118°c and solidified. Gur is made from the sucrose content of the cane. The two products are different in chemical and nutritive content. Gur is a moist and has a greater proportion of invert sugar than white sugar, and white sugar is pure carbohydrate. Gur contains, in addition to carbohydrates, protein and minerals. Its manufacturing process is quite simple, the cane is crushed in small three-roller vertical crushers, usually driven by bullocks. The out-turn of gur from cane is about 10 to 11% by weight. Gur generally contains 65 to 75% sucrose, 10-15% invert sugar, 2 to 3% ash and 3 to 6% moisture. Some cane is used for making an indigenous non-crystalline sugar known as khandsari which is a highly refined form of gur. Khandsari is a soft brown mass which is very sweet and although not always very clean is thoroughly wholesome. The polarisation in khandsari ranging between 92 and 98% with 0.2 to 2% of invert sugar and 1 to 5% moisture. Among other things it contains vitamins which are absent from white sugar, and it is eminently suited to the native methods of cooking food and consumption. O*
ha\$ a bearing on the utilisation of sugarcane for sugar manufacture, it is the demand of sugarcane for gur and khand\$\$ri manufacture that influences considerably the availability of sugarcane to vacuum pan factories.

In fact, the manufacture of gur and khand\$\$ri occupies a very important place in the rural economy of the Country. Whereas the manufacture of gur is undertaken in almost all the sugarcane producing States, it is largely concentrated in U.P., Punjab and Andhra Pradesh. Normally about five eighths of the production of sugarcane in the country goes to the manufacture of gur and khand\$\$ri. The present average annual production of gur and khand\$\$ri is around 6.5 million to 6.5 million tons.

Since the industry belongs to the unorganised sector, accurate statistics of production are not available. However, some estimates of the production of these commodities have been framed on the basis of information regarding quantities of sugarcane utilised for gur and khand\$\$ri for the period 1956-57 to 1965-66.

**World Production and Consumption Trends:**

Table No. 5 refers to the figures of Indian Sugar production from 1948-57 and 1958-65. Throughout the table it seems that India is the second largest sugar producing Country in the world, second to Cuba. In 1965 the production of sugar in India was 3,493 thousand tons only, compared with 1,601 thousand tons in Phillipines, 2,761 thousand tons in U. S. A., 1,074 thousand tons in the United Kingdom, and 6082 tons in Cuba.

* There are many economic difficulties in this industry, the chief of which is the low yield per acre of the local canes.
Table 5.  
STATISTICS OF WORLD SUGAR PRODUCTION AND CONSUMPTION FROM (1948-37 to 1964-65).*  

<table>
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<tbody>
<tr>
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<tr>
<td>India</td>
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<td>24144</td>
<td>46135</td>
<td>48529</td>
<td>51045</td>
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<td>2286</td>
<td>2166</td>
<td>2303</td>
<td>2814</td>
<td>3095</td>
<td>3036</td>
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<td>3493</td>
</tr>
<tr>
<td>U.S.A. cane beet</td>
<td>575</td>
<td>718</td>
<td>623</td>
<td>930</td>
<td>860</td>
<td>1015</td>
<td>810</td>
<td>785</td>
<td>889</td>
<td>973</td>
</tr>
<tr>
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<td>1836</td>
<td>2033</td>
<td>2025</td>
<td>2213</td>
<td>2157</td>
<td>2282</td>
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</tr>
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<td>5862</td>
<td>6767</td>
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<td>1398</td>
<td>1530</td>
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<td>1501</td>
<td>1733</td>
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<tr>
<td>Hawaii</td>
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<td>984</td>
<td>884</td>
<td>949</td>
<td>991</td>
<td>1016</td>
<td>998</td>
<td>1067</td>
<td>1074</td>
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<tbody>
<tr>
<td>Sugar Consumption per capita in Kilograms (Sugar refined)</td>
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<tr>
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<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>31</td>
</tr>
</tbody>
</table>

(N.A. not available).
The position of India is much worse than these figures indicated because the largest part of the sugar produced is in the form of gur, which is, in reality, merely concentrated cane-juice and contains all the molasses that exist in the juice, whereas the statistics for other Countries refer only to refined sugar (gur does not yield more than 50% of refined sugar, the rest being molasses and waste). In fact, India's production of sugar per acre is less than one third of Cuba, one sixth of Java, one seventh of Hawaii and one fifth of Australia.

Likewise, Table No. 6 serves the purpose of showing the average yield per acre of sugarcane and sugar in India is in fact about the lowest when compared with other important sugar producing Countries. The same Table also indicates the yield rate of cane recovery per cent and sugar per acre in different Countries.

Exports

In spite of the poor yielding of cane and the lower recovery percentage of sugar, India is not only the second largest sugar producer of the world, producing and consuming about one eighth of the world's production but also the largest cane grower of the world, growing over 30 percent of the world's sugarcane (nearly five million acres are under the crop), yet until recently it was an importing Country. Whereas it should be in a position, as it was, to produce a surplus of sugar continuously for export. As a matter of fact, during 1839-47 India exported to England on an average sum 59,373 tonnes of sugar. Half a century later, from an exporting Country India became an importing one and the total import of sugar was 212,000 tonnes.
Table 6.
SUGARCANE PER ACRE YIELD AND SUGAR RECOVERY IN IMPORTANT SUGAR PRODUCING COUNTRIES.

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>Yield per acre (tons)</th>
<th>Recovery per cent cane</th>
<th>Sugar per acre (tons)</th>
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<td>80.4</td>
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<tr>
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<td>39.2</td>
<td>10.9</td>
<td>4.27</td>
</tr>
<tr>
<td>Br. Guiana</td>
<td>33.4</td>
<td>9.3</td>
<td>3.11</td>
</tr>
<tr>
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<td>30.7</td>
<td>11.2</td>
<td>3.44</td>
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<td>29.7</td>
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<td>2.83</td>
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<td>24.9</td>
<td>14.7</td>
<td>3.67</td>
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<td>9.4</td>
<td>2.34</td>
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<tr>
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<td>24.2</td>
<td>11.4</td>
<td>2.76</td>
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<td>9.8</td>
<td>1.68</td>
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<tr>
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<td>13.1</td>
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<td>1.58</td>
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<td>Cuba</td>
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<td>12.3</td>
<td>2.04</td>
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<td>Pakistan</td>
<td>12.7</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
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</table>

Source:-- Report of the Sugar Enquiry Commission
The lack of export trade from India is accounted for partly by dense population, and partly by primitive methods of production. Moreover the kind of sugar made is of such inferior grade that it cannot be sent abroad or locally refined economically. It is entirely used up by the people and there is none to spare.

Even prior to the grant of fiscal protection to the Indian sugar industry, India was still in an anomalous position of being at the same time the world's second largest grower of cane and one of the greatest importers of manufactured sugar, anxiously awaiting for her sugar supplied from Java. In 1929-30 India imported 940,000 tons of sugar valued at Rs. 15 crores from Java.

Protection changed all that. Sheltered behind the protection tariff, the industry increased its production with considerable success and foreign sugar was rapidly displaced by indigenous sugar. There was a considerable reduction of imports, and now India is able to export a considerable and regular quantity of production every year to earn foreign exchange.

No doubt the sugar industry in India has reached a secure position. It is doing very well with the material that is available. Although fair progress has been made in this sphere, i.e., India has entered in the world market of sugar, but much still remains to be achieved to bring India into line with the other sugar producing Countries of the world and much has to be done for developing her exports. The most important problem, therefore, at present, is the export problem, which needs utmost care, because the existing gap, between the estimated target and the existing production, is to be bridged up by increased production. This can be possible if the cost
of production is reduced, which can be achieved by an increase in efficiency of mills, larger recovery of sugar, cheaper supplies of cane and by increasing the yield of cane per acre throughout India.

Significant exports of sugar have occurred only from the year 1957 and the level of export, as Table No. 7 indicates, in the last few years has fluctuated between 0.3 to 5.14 lakh tonnes (30,000 to 514,000 tonnes), depending mainly upon the internal availability of sugar in a particular year and the possibility of getting a higher or lower quota in the world preferential markets.

The total quantity of sugar exported in 1966 was 441,188 tonnes, comprising of 418,905 tonnes of raw sugar and 22,283 tonnes of white sugar. Of this, 9,724 tonnes of white sugar was against the sales made in 1965. In addition to the principle markets, i.e., Malaysia, Singapore, U.K., U.S.A. and Canada, exports were also effected to Iraq, Iran, Lebanon, Zambia, France and South Vietnam.

Shipments were effected from major ports of India viz. Calcutta, Bombay, Vishkapatnam (A.P.) and Kandla.

The foreign exchange earnings from the export of sugar amounted to Rs. 17.99 crores in 1966.

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THE SUGAR INDUSTRY IN THE TWENTIETH CENTURY

The sugar industry in India has seen many ups and downs in the twentieth Century. In reality, efforts to establish a modern sugar industry in India, however, date back only to the beginning of the present Century. Little headway could be made in the early years as the varieties of cane grown did not possess good milling qualities and the yields per acre were low on account of which the cost of production of sugar
<table>
<thead>
<tr>
<th>Sugar Year</th>
<th>Carry-over As on 1st November</th>
<th>Production</th>
<th>Imports</th>
<th>Total Availability</th>
<th>Consumption</th>
<th>Export</th>
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<tr>
<td>1950-51</td>
<td>0.91</td>
<td>11.34</td>
<td>0.57</td>
<td>12.82</td>
<td>10.98</td>
<td>-</td>
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<tr>
<td>1951-52</td>
<td>1.84</td>
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<td>0.08</td>
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<tr>
<td>1952-53</td>
<td>5.14</td>
<td>13.18</td>
<td>0.60</td>
<td>18.92</td>
<td>16.79</td>
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<td>1953-54</td>
<td>2.06</td>
<td>10.30</td>
<td>7.29</td>
<td>19.65</td>
<td>18.36</td>
<td>-</td>
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<tr>
<td>1954-55</td>
<td>1.29</td>
<td>16.22</td>
<td>5.74</td>
<td>23.25</td>
<td>17.51</td>
<td>-</td>
</tr>
<tr>
<td>1955-56</td>
<td>5.74</td>
<td>18.90</td>
<td>0.69</td>
<td>25.33</td>
<td>19.72</td>
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<td>-</td>
<td>26.35</td>
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<td>1957-58</td>
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<td>20.09</td>
<td>-</td>
<td>24.79</td>
<td>20.75</td>
<td>0.36</td>
</tr>
<tr>
<td>1958-59</td>
<td>3.68</td>
<td>19.51</td>
<td>-</td>
<td>23.19</td>
<td>21.13</td>
<td>0.30</td>
</tr>
<tr>
<td>1959-60</td>
<td>1.76</td>
<td>24.82</td>
<td>-</td>
<td>26.58</td>
<td>20.53</td>
<td>-</td>
</tr>
<tr>
<td>1960-61</td>
<td>6.05</td>
<td>30.29</td>
<td>-</td>
<td>36.34</td>
<td>21.27</td>
<td>2.47</td>
</tr>
<tr>
<td>1962-63</td>
<td>10.26</td>
<td>21.52</td>
<td>-</td>
<td>31.78</td>
<td>24.88</td>
<td>5.14</td>
</tr>
<tr>
<td>1963-64</td>
<td>1.76</td>
<td>25.69</td>
<td>-</td>
<td>27.45</td>
<td>23.36</td>
<td>2.50</td>
</tr>
<tr>
<td>1964-65</td>
<td>1.59</td>
<td>32.60</td>
<td>-</td>
<td>34.19</td>
<td>24.70</td>
<td>2.75</td>
</tr>
<tr>
<td>1965-66</td>
<td>6.74</td>
<td>34.37</td>
<td>-</td>
<td>42.11</td>
<td>28.10</td>
<td>4.32</td>
</tr>
</tbody>
</table>

Source: I.S.M.A.'s Statistical Division.
was high.

The landmarks in the history of the sugar industry in the past quarter of a Century or so can be described as follows:

For the establishment of a modern sugar industry, the first step taken was the establishment of the Sugarcane Breeding Institute at Coimbatore in 1912. At this Institute, work on breeding and hybridization was also taken up. In 1919, when this work was in progress, a Committee, called the Indian Sugar Committee, was appointed under the Chairmanship of Mr. J. Mackenna, Agricultural Advisor to the Government of India, to examine the various sugarcane growing tracts of India with a view to determine the nature of the expansion possible in such areas either by the development of a factory industry or by improvement in the existing methods to review the position of India with regards to the world's sugar supply and formulate recommendations. The Committee has submitted a very favourable report laying great stress on the importance in the National economy of India, but they were pigeon-holed for a few years.

The second step taken was the appointment, in 1930, of an ad hoc Tariff Board to investigate and report on the conditions of the sugar industry in India with special reference to the question of giving tariff protection to the industry. The Board submitted its report to the Government in 1932.
recommended that the Indian Sugar Industry satisfied the necessary condition for the grant of protection. Thus, the establishment of this Committee may well be regarded as an epoch-making event in the history of the agricultural improvement in India. The Government of India accepted the recommendations of the Board, and the Sugar Industry (Protection) Act 1932 was passed by the Legislator. This produced immediate results. Acreage under sugarcane increased from about 2.8 million acres in 1929-30 to over 4.5 million acres in 1936-37. The number of factories rose from 31 in 1931-32 to 137 in 1936-37. Production of direct consumption of white sugar increased from 0.16 million tonnes to 1.11 million tonnes and the imports of sugar into India decreased to a mere trickle. This rate of expansion over so short a period constitutes almost a world record. At any rate, if judged by the number of producing units, there is no parallel for it in the history of Indian Industries, nor did the rate of growth halt after 1936-37. By 1938-39, the production of sugar touched 1.2 million tonnes. During the five war years 1939-40 to 1943-44, a reverse trend manifested itself, the volume of production tending to decline from 1.2 million tonnes level excepting for the year 1942-43. During the next seven years, i.e., until 1950-51 the industry has to pass through a difficult time for various reasons when the output fluctuated erratically between 900,000 to 1.1 million tonnes mainly on account of the instability of cane supply caused by the Government's preference to food crops during the war years.

CRITICISM ON THE PROTECTION POLICY:

From the beginning, since the protection was granted to the sugar industry in India, it has been subjected to heavy criticism. Some were of the opinion that the effect of the
protection was not remarkable, but one can see that until 1925 the sugar industry in real sense could not make any headway, because India was importing almost the whole of her requirement from foreign Countries, especially Java, with about a million tonnes of sugar valued at about Rs. 15 to 16 crores was being imported into this Country every year. By 1931-32 however, these imports came down to about 56,000 tonnes and with the further development of the home sugar industry, it has dwindled down to almost nothing during the last decades. Since 1957 India has started supplying sugar to other Countries of the world.

Now the Enquiry Commission which was set up in 1962, has recommended that the stage has been reached in India where it has become necessary to take positive steps for building up a regular export trade. In view of this, the Commission recommends that the target for annual export of sugar should be set at 700,000 tonnes by 1970-71 and one million tonnes by the end of 1975-76.

Some think that the protection to the indigenous industry had been a source of financial burden to India.

A careful examination of the facts would however show that this is incorrect and the country had, on the other hand, greatly benefitted as a consequence of this policy of protection. This is not all, the consumer has also benefitted as he had cheaper and cheaper sugar since the grant of protection, with the exception of some years when abnormal conditions prevailed. The Government revenues (both Central and Provincial) have similarly benefitted very considerably.

In fact, if one takes into consideration the aggregate results, e.g., the magnificent progress of the industry; the reduction in the price of sugar; the self-sufficiency, the
country has achieved in the sugar supply; the great improvement in the economic conditions of millions of cultivators as a consequence of their realising better prices; an increase in the area of cane cultivation; the employment of Indian capital within the industry (giving the lie to the proverbial shyness of Indian money), one cannot say that the Indian sugar has not fully vindicated the policy of protection so hesitantly adopted by the Central Government.

The Indian Council of Agricultural Research.

Another notable progress has been made in the sugar industry in India by the establishment of the Indian Council of Agricultural Research in 1944. This step has also made tremendous effects in the development of the industry. The breeding work of sugarcane through this direction has saved the Country the annual drain of over Rs. 15 to 20 crores and as a result 95% of the area in the Country is grown with the improved varieties of sugarcane.

The Role of the Five Year Plans:-

For an important crop like sugarcane, it is essential that research and development should go hand-in-hand. With this view point, five year plans of sugarcane development have been undertaken by the Indian Central Sugarcane Committee (Planning Commission) of the Government of India.

These schemes have been started in most of the Provinces with effect from 1950. Almost all the Provinces have agreed to undertake an expenditure of an equal or higher amount that has been allocated by the Committee. Special stress has been given in these schemes for the provision of adequate irrigation facilities, manures and fertilizers of the right type,
qualified and properly trained technical personnel, efficient watch and ward service for the protection of crops from pests and diseases and for soil extension service for giving advice to growers for the maximum utilisation of their land and regarding the nature of the manures and fertilisers needed by it, along with other matters relating to modern methods of development of the sugar industry.

A target of 63 million tonnes of sugarcane was fixed by the Government of India to be achieved by the end of the First Five Year Plan (1955-56) against the base figure of 51 million tonnes in 1950-51 obtained from 4.20 million acres. The additional production of 7 million tonnes was expected to be obtained partly through an increase in the area under cane by 300,000 acres and partly through intensification of cane cultivation. At the end of the First Plan, a production of 59.6 million tonnes of cane was achieved, the acreage increasing by about 8 per cent.

During the Second Five Year Plan, taking into consideration, the actual achievement of the First Plan and requirements of sugar during the next five years, a target of 78 million tons of cane was fixed. The actual production for 1960-61 went up to 102 million tonnes of cane, markedly surpassing the target, but this was exceptional being largely due to favourable weather conditions and also due to increase in area from 4.500,000 acres at the end of the First Plan to 5.79 million acres. That this was so, is indicated by the fact that the production for 1959-60, the penultimate year of the Second Plan, was 75.2 million tonnes. In general, it was a fair indication of the fulfilment of the target.

Taking into consideration the requirement of sugar for domestic consumption and exports, a target of 30.5 lakh tons (3.05 million), of sugar was fixed for the Third Plan and this
Table 8a.

Targets and Achievements of Area, Production & Yield of Sugarcane

<table>
<thead>
<tr>
<th></th>
<th>Area (000 Hectares)</th>
<th>% Increase over previous Plan</th>
<th>Sugarcane Production (000 tonnes)</th>
<th>% Increase over previous Plan</th>
<th>Yield of S’cane (T/ha)</th>
<th>% Increase over previous Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Target Achievement</td>
<td></td>
<td>Target Achievement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>During 1950-51 - before the starting of the First Five Year Plan</td>
<td>1,707</td>
<td>4,217</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>57,052</td>
</tr>
<tr>
<td>First-Five Year Plan - 1951-52 to 1955-56</td>
<td>-</td>
<td>1,847</td>
<td>8</td>
<td>64,200</td>
<td>6</td>
<td>60,544</td>
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<tr>
<td>Second Five Year Plan 1956-57 to 1960-61</td>
<td>-</td>
<td>2,343</td>
<td>27</td>
<td>79,300</td>
<td>72</td>
<td>104,127</td>
</tr>
<tr>
<td>Third Five Year Plan - 1961-62 to 1965-66</td>
<td>2,428</td>
<td>5,789</td>
<td>-</td>
<td>111,777</td>
<td>13</td>
<td>117,606</td>
</tr>
</tbody>
</table>

Figures in brackets in column Nos. (2) and (3) are in 000 acres. Figures in brackets in Col. Nos. (5) and (6) are in 000 tons. Figures in brackets in Col. Nos. (8) and (9) are in Tons/Acre.

<table>
<thead>
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<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Acres</td>
<td>Tons</td>
<td>Acres</td>
<td>Tons</td>
<td>Acres</td>
<td>Tons</td>
</tr>
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<td>150</td>
<td>34.5</td>
<td>150</td>
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<td>121</td>
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<td></td>
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<td>(240)</td>
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<td>(228)</td>
<td>(30.07)</td>
<td>(225)</td>
<td>(31.30)</td>
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<td>17</td>
<td>22.5</td>
<td>15</td>
<td>20.60</td>
<td>9</td>
<td>20.67</td>
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<td></td>
<td></td>
<td>(80)</td>
<td>(15.8)</td>
<td>(67)</td>
<td>(15.94)</td>
<td>(70)</td>
<td>(14.03)</td>
</tr>
<tr>
<td>3</td>
<td>Bihar</td>
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<td>18.97</td>
<td>182</td>
<td>15.88</td>
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<td>(425)</td>
<td>(17.2)</td>
<td>(487)</td>
<td>(12.79)</td>
<td>(400)</td>
<td>(12.00)</td>
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<td>25.0</td>
<td>3</td>
<td>21.25</td>
<td>5</td>
<td>22.50</td>
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<td>5</td>
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<td>7</td>
<td>23.62</td>
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<td>(20.0)</td>
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<td>(16.13)</td>
<td>(23)</td>
<td>(17.83)</td>
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<td>Madhya Pradesh</td>
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<td>16.80</td>
<td>64</td>
<td>16.73</td>
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<td></td>
<td></td>
<td>(134)</td>
<td>(12.8)</td>
<td>(136)</td>
<td>(10.29)</td>
<td>(139)</td>
<td>(10.23)</td>
</tr>
<tr>
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<td>Madras</td>
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<td>44.8</td>
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<td>88</td>
<td>33.74</td>
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<td>8</td>
<td>Maharashtra</td>
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<td>39.0</td>
<td>164</td>
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<td>172</td>
<td>47.70</td>
</tr>
<tr>
<td>9</td>
<td>Mysore</td>
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<td>38.0</td>
<td>100</td>
<td>34.40</td>
<td>100</td>
<td>37.70</td>
</tr>
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<td>(370)</td>
<td>(31.0)</td>
<td>(349)</td>
<td>(23.15)</td>
<td>(349)</td>
<td>(32.31)</td>
</tr>
<tr>
<td>10</td>
<td>Orissa</td>
<td>35</td>
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<td>28.30</td>
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<td>29.00</td>
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<td>182</td>
<td>17.45</td>
<td>140</td>
<td>16.33</td>
</tr>
<tr>
<td>12</td>
<td>Rajasthan</td>
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<td>12.0</td>
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<td>...</td>
<td>90</td>
<td>...</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(90)</td>
<td>(12.0)</td>
<td>(84)</td>
<td>(9.26)</td>
<td>(81)</td>
<td>(10.05)</td>
</tr>
<tr>
<td>13</td>
<td>U.P.</td>
<td>2,200</td>
<td>16.1</td>
<td>2,431</td>
<td>15.01</td>
<td>2,136</td>
<td>14.00</td>
</tr>
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<td>23.5</td>
<td>46</td>
<td>24.13</td>
<td>50</td>
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<td>(90)</td>
<td>(22.0)</td>
<td>(85)</td>
<td>(21.05)</td>
<td>(77)</td>
<td>(17.31)</td>
</tr>
</tbody>
</table>

**Table 8b.**

**Targets and Achievements of Area and Yield/Acre in Development Zones and in the Whole State for the Different States During the Third Five Year Plan Period**

1. Figures in brackets relate to the whole state.
2. Figures in brackets relate to the Development area.

Note: In Rajasthan there is no separate development zone.
was later revised to 35.6 lakh tons (3.56 million tonnes).
Correspondingly, the target of sugarcane production originally fixed at about 1,000 lakh tonnes was later raised to 1100 lakh tonnes. In 1962-63, the production of cane rose to 970 lakh tonnes. The area under sugarcane was expected to reach 60 lakh acres (6 million acres) at the end of the Third Plan and the overall trend indicates that the production of cane may have reached the target of 1100 lakh tons. Tables 8a and 8b indicate the details of the Plans.

By 1970-71, the population of the Country is expected to be around 555 million and the total demand for internal consumption would be about 400 lakh tons (40 million) for sugar, 670 lakh tons (6.7 million) for gur and 70 lakh tons for Khand sari. After allowing for a provision of 50 lakh tons of sugar for exports, the total requirement of sugar would be 490 lakh tons (4.9 million) and further allowing about 12 percent of production for seed and other uses, the total requirements of sugarcane by the end of the Fourth Five Year Plan would be 1,350 lakh tonnes as given below:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Million tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>For internal consumption of white sugar</td>
<td>40</td>
</tr>
<tr>
<td>For internal consumption of gur</td>
<td>67</td>
</tr>
<tr>
<td>For internal consumption of Khand sari</td>
<td>7</td>
</tr>
<tr>
<td>For export of sugar</td>
<td>5</td>
</tr>
<tr>
<td>For seed and other uses</td>
<td>16</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>135</strong></td>
</tr>
</tbody>
</table>

Similarly, by the end of the Fifth Plan, the per capita consumption of sugar, gur and Khand sari are expected to be 18 lbs, 20 lbs. and 1.8 lbs. respectively, as against 16.9 lbs. 27.6 lbs. and 1.5 lbs. in the previous Plan. Taking into
consideration the improvement in the conditions of the people and the consequent rise in living standards, accompanied by a tendency to shift from the use of gur and khandsari to white sugar as sweetening agents, the per capita consumption by the end of the Fourth Plan is expected to be about 16.9 lbs., 27 lbs. of gur and 1.5 lbs. of khandsari.

The population is expected to be about 625 million* so that the total requirement of sugarcane is expected to be 160 million tonnes in 1975-76, as given below:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>(million tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>For internal consumption of white sugar</td>
<td>50</td>
</tr>
<tr>
<td>For internal consumption of gur</td>
<td>78</td>
</tr>
<tr>
<td>For internal consumption of Khandsari</td>
<td>8</td>
</tr>
<tr>
<td>For export of sugar</td>
<td>5</td>
</tr>
<tr>
<td>For seed and other uses</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>160</strong></td>
</tr>
</tbody>
</table>

The above estimation of requirements is made at the current rate of consumption, that the population of 1960-61 (end of Second Plan Period) was 439 million, (as against 430 million estimated earlier). The population in 1965-66, (end of Third Plan) would be 492 million. The population estimated by 1970-71 and 1975-76 (end of Fourth and Fifth Plans) are 555 million and 625 million respectively. In 1965-66, 492 million would consume 3 million tons of white sugar. Therefore at this rate of consumption, the requirement

* Based on the estimation of the Planning Commission.
of 555 million in 1970-71 would work out at 3.38 million tons (i.e., $30 \times 555$).

The Total Consumption of Sugar in India:

It has been estimated by the nutrition experts that for a well balanced diet, India will have to provide 2 ozs. of sugar per adult per day. Whereas adult consumption per day in India was 39.9 grams before the First Plan, which rose to 41.2 grams at the end of the First Plan (1956) and 59.9 grams at the end of the Second Plan (1961) and rose to 60.3 grams by the end of the Third Plan (1966). There have of course, been lean years when the increasing trend was revised. Thus, the consumption, which was substantially below the minimum nutritional standard up to the end of First Plan, reached the minimum in 1961 and 1966, and is expected to go up gradually by the end of the Fourth and subsequent Plans.

Table No. 9 shows the per capita consumption of sugar, gur and khandsari from 1950-51 to 1965-66. According to the table per capita consumption of centrifugal sugar in India was around 6 kgs. However, if the consumption of gur and khandsari is also taken into account, the actual per capita consumption of sugar was approximately 18.6 kgs. in 1965, whereas the world per capita consumption of sugar improved slightly in 1965, it was more or less 18.1 kgs. In almost all the Countries of the world, the per capita consumption of sugar has improved but the improvement has been much more marked in the advanced Countries. The per capita consumption of sugar in India, as already mentioned, has steadily increased during the last 15 years, rising from 3.0 kgs. in 1950-51 to 5.7 kgs. per annum in 1965-66. This increase is due to the rise in the living standard. The position in the Second and
<table>
<thead>
<tr>
<th>Season</th>
<th>Sugar (Estimates)</th>
<th>Gur (Estimates)</th>
<th>KhandSari (Estimates)</th>
<th>Total (In Kilogram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950-51</td>
<td>3.0</td>
<td>9.1</td>
<td>0.4</td>
<td>12.5</td>
</tr>
<tr>
<td>1951-52</td>
<td>3.2</td>
<td>9.0</td>
<td>0.3</td>
<td>12.5</td>
</tr>
<tr>
<td>1952-53</td>
<td>4.5</td>
<td>7.8</td>
<td>0.3</td>
<td>12.6</td>
</tr>
<tr>
<td>1953-54</td>
<td>4.9</td>
<td>6.8</td>
<td>0.3</td>
<td>12.0</td>
</tr>
<tr>
<td>1954-55</td>
<td>4.5</td>
<td>7.8</td>
<td>0.4</td>
<td>12.7</td>
</tr>
<tr>
<td>1955-56</td>
<td>5.0</td>
<td>7.5</td>
<td>0.4</td>
<td>12.0</td>
</tr>
<tr>
<td>1956-57</td>
<td>5.0</td>
<td>8.3</td>
<td>0.5</td>
<td>13.8</td>
</tr>
<tr>
<td>1957-58</td>
<td>5.1</td>
<td>12.4</td>
<td>0.6</td>
<td>18.1</td>
</tr>
<tr>
<td>1958-59</td>
<td>5.0</td>
<td>12.7</td>
<td>0.6</td>
<td>18.3</td>
</tr>
<tr>
<td>1959-60</td>
<td>4.8</td>
<td>12.0</td>
<td>0.8</td>
<td>17.6</td>
</tr>
<tr>
<td>1960-61</td>
<td>4.8</td>
<td>13.1</td>
<td>0.7</td>
<td>18.6</td>
</tr>
<tr>
<td>1961-62</td>
<td>5.8</td>
<td>12.7</td>
<td>0.7</td>
<td>19.2</td>
</tr>
<tr>
<td>1962-63</td>
<td>5.4</td>
<td>12.5</td>
<td>0.7</td>
<td>18.6</td>
</tr>
<tr>
<td>1963-64</td>
<td>5.0</td>
<td>12.0</td>
<td>0.7</td>
<td>18.0</td>
</tr>
<tr>
<td>1964-65</td>
<td>5.1</td>
<td>12.2</td>
<td>0.7</td>
<td>18.0</td>
</tr>
<tr>
<td>1965-66</td>
<td>5.7</td>
<td>12.2</td>
<td>0.7</td>
<td>18.6</td>
</tr>
</tbody>
</table>

Source: Development for Council for Sugar Industry. Sugar consumption figures have been calculated by I.S.M.A.'s Statistical Division.
Third Plans, however, show a larger per capita consumption of gur and khandsari due partly to a short fall in sugar production in the two Plans and diversion of cane to gur and khandsari manufacture.

While there was control over price and distribution of white sugar during a major part of Second and Third Plan periods, there was practically none over gur and khandsari. The above position, therefore, represents a picture of rather restrictive consumption of white sugar; had there been a free market of conditions throughout this period, the white sugar consumption would have been considerably higher, and that of gur and khandsari proportionately lower. When the normal equilibrium of supply and demand of all the three sweetening agents, white sugar, gur and khandsari, is expected to be established during the next few years, i.e., by the end of the current Plan period due to various long term measures being adopted, it is reasonable to expect that the increase in per capita consumption, during the Fourth Plan, will be at least as much as it happened during the Third Plan. The consumption of white sugar is estimated to rise to about 7.3 kg. by the end of the Fourth Plan, i.e., 1.2 kg. during the periods of five years. Improvement in economic conditions of the people and consequent rise in the living standard, is bound to be accompanied by a shift from gur and khandsari to white sugar, and therefore, the increase in per capita consumption of gur and khandsari, is not likely to materially rise during this period. For the present, it may be safe to assume that the rise during this period per capita consumption of gur and khandsari will more or less remain at the same level.

The requirements of white sugar, gur and khandsari for meeting the domestic conditions by the end of the Fourth Plan
1970-71, is estimated by the Planning Commission as follows:

1) White sugar $3.8 \times 6.7 = 405$ lakh tons (40.5 million tonnes).
2) Gur $67.5 \times 6.75$ (6.75 million tonnes).
3) Khandsari $4.8 \times 6.8$ (48,000 tonnes).

There are differences between the States in the consumption of sugar in India as Table 10 indicates. Though the latest trends in consumption are such that the Country will have to plan for a much higher level of output, especially in the regions where the present consumption level is relatively low, and for this purpose the per capita consumption of gur and sugar combined was estimated to be placed at 29 lbs. for all-India, whereas in the Southern region as 23 lbs. The production of sugar in Andhra Pradesh has still been lagging far behind the consumers demand. It is a matter of surprise that the State of Andhra Pradesh where the per acre yield averages 40 to 60 tons and is much more than 60 tonnes in some of the selected plots, competing not only the all-India but the world figures, even though the average consumption per head is very low. At the end of the First Plan it was 4.8 lbs., in 1956-57 the figures were 4.9 lbs., and it stood at the same level until the end of the Second Plan, but from 1960-61 and 1964-65, there is a slight increase being 5.5 lbs. and 5.9 lbs. respectively. Even then it is the lowest per capita consumption of the world. This State, being the fourth largest sugar producing area of the Country, requires utmost care and attention.

1 Refer to The Role of Five Year Plan Section.
Table 10.

PRODUCTION, CONSUMPTION AND PER CAPITA CONSUMPTION OF SUGAR IN DIFFERENT STATES IN INDIA (1959-60)

<table>
<thead>
<tr>
<th>STATE</th>
<th>Production (Thousand tonnes)</th>
<th>Consumption (Thousand tonnes)</th>
<th>Per capita consumption Kgms.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANDHRA PRADESH</td>
<td>137</td>
<td>86</td>
<td>2.5</td>
</tr>
<tr>
<td>ASSAM</td>
<td>4</td>
<td>60</td>
<td>5.0</td>
</tr>
<tr>
<td>BIHAR</td>
<td>325</td>
<td>140</td>
<td>2.9</td>
</tr>
<tr>
<td>BOMBAY (MAHARASHTRA AND GUJARAT)</td>
<td>401</td>
<td>545</td>
<td>10.0</td>
</tr>
<tr>
<td>DELHI</td>
<td>-</td>
<td>62</td>
<td>-</td>
</tr>
<tr>
<td>KERALA</td>
<td>10</td>
<td>61</td>
<td>2.4</td>
</tr>
<tr>
<td>MADHYA PRADESH</td>
<td>28</td>
<td>132</td>
<td>4.5</td>
</tr>
<tr>
<td>MADRAS</td>
<td>84</td>
<td>126</td>
<td>3.2</td>
</tr>
<tr>
<td>MYSORE</td>
<td>86</td>
<td>89</td>
<td>4.4</td>
</tr>
<tr>
<td>ORISSA</td>
<td>3</td>
<td>33</td>
<td>1.7</td>
</tr>
<tr>
<td>PUNJAB</td>
<td>101</td>
<td>148</td>
<td>7.9</td>
</tr>
<tr>
<td>RAJASTHAN</td>
<td>12</td>
<td>75</td>
<td>4.3</td>
</tr>
<tr>
<td>UTTAR PRADESH</td>
<td>1,221</td>
<td>244</td>
<td>4.2</td>
</tr>
<tr>
<td>WEST BENGAL</td>
<td>9</td>
<td>202</td>
<td>7.7</td>
</tr>
<tr>
<td>OTHERS</td>
<td>-</td>
<td>17</td>
<td>-</td>
</tr>
</tbody>
</table>

* A. part of report on Housing and establishments, A.P. Census 1961.

Changes in Gur and Sugar Consumption:

The annual consumption of gur is very nearly equal to the amount annually produced in India. Gur, being moist, deteriorates quickly and it is difficult to store even for 12 months, so that hardly any stocks of gur are held over from one year to the next. The supply of crystal sugar consisted largely of imports in 1932-33; from then on, the production of sugar in India developed rapidly under the tariff protection and imports have become much less important.

On the whole, there was a tendency for sugar consumption to increase every year. On the other hand, gur production — and therefore gur consumption — showed several short term tendencies. Changes in gur production depends on changes in total cane production, and in the proportions of cane used for making sugar and other cane products. The annual per capita sugar consumption was between 6 and 7.5 lbs. in most years before 1948-49, but ranged from 10.1 to 12.3 lbs (4.6 to 5.6 killograms) from 1952-53 to 1955-56, 11.12 to 12 lbs between 1956-57 to 1960-61 and (5.0 to 5.8 killograms) and more than 14 lbs. at the end of the Third Five Year Plan and so on. Per capita gur consumption showed wide changes, but generally varied from 15 to 20 lbs. (6.8 to 9.1 killograms) from 1940-41 to 1955-56 and 15 to 28 lbs (6.8 killograms to 13.1 killograms) from 1957-58 to 1964-65 and 1966-67.

Since gur is considered to be an inferior substance for sugar for many uses, the price of sugar usually exceeds the price of gur by a considerable margin. From the middle of 1942 to 1949-52, the Government controlled the price of sugar so as to mitigate the effects of inflation. (Hence, price changes during this period reflects changes in the Government policy).

1. During the war and post war inflation, the prices of
In 1947–48, the price of gur was decontrolled, and most of the restrictions on trade were removed, but again in 1951–52 maximum prices were fixed in many States because the price of gur showed a tendency to rise during the years from 1949–52. However, in 1952, as in the case of sugar, all the control over gur trade was finally withdrawn.

Between June, 1952 and March, 1963, there was no control on gur and khandsari. In order to prevent over-production of sugar, a 10% cut in production was imposed during the 1961–62 season. Simultaneously, some of the State Governments encouraged installation of more "kholo" in order to facilitate diversion of surplus cane from factories to gur producers. These factors led to a shrinkage in the area under sugarcane in the subsequent season and also to a large-scale diversion of cane to gur manufacture. The result was a substantial fall in the production of sugar during the seasons 1961–62 and 1963–64 and ultimate imposition of controls and prices and distribution of sugar with effect from April 1963. As a consequence of imposition of controls on one of the three sweetening agents i.e., sugar, prices of the other two sweetening agents, i.e., gur and khandsari, began to rise resulting in diversion of cane from the former to the latter. Therefore, with a view to augment the production of sugar, the Government of India started the system of linking the cane price with the recovery. This policy was continued from 1963–1966. The minimum cane price presently fixed is Rs. 2 per maund linked to a recovery of 10.4 per cent. The ultimate object of the scheme is to pay cane price to individual growers on the basis of quality of their cane.

Under the 1966–67 Budget proposals, excise duty on sugar has been further increased. With the recent increase, the consumer goods rose less, on the average, than the general
cost of production would go up further. Consequently, the problem of large diversion of cane from factory is likely to be aggravated in season of cane shortage, and sugar output is bound to suffer. If appropriate relief from the heavy tax burden is not provided, the precarious balance, between divergent forces of supply and demand, will never be able to get out of the recurring cycle of over-production and shortages.

Organisation and Research:-

(a) Sugar Organisation:— Almost all the different interests constituting the sugar industry in India have their own organisations. The sugar mills association is called the Indian Sugar Mills Association.

(b) All-India Federation of sugarcane Growers.

(c) The Deccan sugar Technologists Association.

(d) The Development Council for Sugar Industry.

(e) The Federation of All-India Sugar Merchants.

(f) Indian National Trade Union Congress and the Chini Mill Mazdoor Federation.

II Sugarcane and Sugar Research.

(b) A Sugarcane Breeding Institute at Cimbatore.

(c) The National Sugar Institute, Kanpore.

1 level of wholesale prices (since the prices of many consumer goods were controlled). As a result, the price of sugar was lower in relation to the general price-level than in the price-level of consumer goods.
2nd Chapter.
Andhra Pradesh, on the Eastern Coast of the peninsula of India, as Map No. 1 indicates, is a new State situated in the tropical zone between Latitude 12.6' to 19.8' (N) and Longitude 76.8' to 84.8' (E), that came into being as a result of State Re-organisation in 1956. It covers an area of about 106,286 square miles and is inhabited by nearly 35.8 million people. It is composed of nine districts of the former Hyderabad State, i.e., Nizamabad, Medak, Adilabad, Warangal, Khammam, Karimnagar, Nalgonda and Hyderabad (which is called Talengana) and 11 districts of the composite Madras State that were formed into the Andhra State in 1953.

Andhra Pradesh is centrally placed and serves as a link between the Northern and Southern parts of India. Further, it includes an extensive territory where the commercial value is bound to increase in the course of time. There are 10 ports in all, with a major port at Vishakapatnam. Thus, the State is accessible both by land and sea.

The climatic condition being midway between sub-tropical north and humid south, has made this State quite suitable for sugarcane cultivation. Mercury level during Summer remains between 27'C-32'C whereas Winter temperatures range from 21'C-27'C. A rich variety of soils is also noteworthy, the alluvial eastern sands of the coastal area merge in the middle with red/yellow or dark reddish brown. In the west it is black clayey or loamy type. The rainfall is 51-102 CMS, in the southern part of the State rising to 102-172 CMS, in the northern districts.

Andhra Pradesh is one of the biggest States in India. It occupies the fourth place in the Indian Union from the point of view of the population, and the fifth place in terms of area. The State has a population density of 131 per sq. km.
POLITICAL MAP OF INDIA (1951)

SOURCE: Nizam Sugar Factory
and the per capita income, according to 1960-61 Census, was estimated at Rs. 287.01 at current prices.

Agriculture is the principal industry of the State. About 7.23 million acres or 41.4 per cent of the geographical area are cultivated. Out of this cultivated area 26 per cent is under irrigation. Agriculture accounts for 56 per cent of the National Income of the State, which is estimated at Rs. 981.13 crores (1959-60).

Andhra Pradesh ranks fifth among the sugarcane States in the Country, having about 0.23 million acres under sugarcane cultivation. This is roughly four per cent of the total cane area in the Indian Union. The major cane growing areas are in the districts of Nizamabad, Srikakulam, Vishakhapatnam, East Godavari, West Godavari, Krishna and Chittoor. Ninety per cent of the State total cane area is in these districts. Sugar Mills are also located in these areas.

According to a survey conducted by N.C.A.E.R., sugar cane cultivation in the State yields a net profit of Rs. 890 per acre, the highest of all crops grown in the State. About 45,000 cultivators and nearly 10,000 factory workers, besides a large number of those engaged in small trades in the vicinity of the factories, depend directly and entirely on the sugar industry. In terms of their average family size (say five), the industry supports around 3 million persons. Cane growers realise Rs. 100 million from their produce annually, and the return to Central and State Exchequers by way of excise duty and Cess, are Rs. 54 million respectively. This data established the significance of the sugar industry in the socio-economic life of the State.

Sugarcane is grown under irrigated conditions throughout the State, the frequency of watering depending upon the irrigation facilities available. In the Andhra area, the crop
SUGAR CANE IN ANDHRA PRADESH (1961)

SOURCE: Nizam Sugar Factory

MAP 2
is reaped at the age of twelve months (Eksali) whereas in the Telengana region it is a 16 to 20 month crop (Adsali or Eksali). Ratoon (Madhav) of cane is the usual practice and normally one or two Ratoon crops are taken.

The area that grows sugarcane in the State is only about 6% of the cane area in the Indian Union and the State ranks fifth among sugarcane growing States, but average per acre yield of cane and sugar in the State is nearly double the Country's average. Thus, in the year 1963-64, the average per acre of cane production for the State was 31.70 tonnes, whereas that of the Indian Union was only 18.28 tonnes. Similarly the average per acre production of sugar in the State was 3.07 tons as against 1.38 tons in the Country. This amply brings forth the development potential of the State for increased sugarcane production. It is significant that whereas sugarcane is one of the important commercial crops, sugar production is the only major agro-industry in the State. Due to the fillip given to this industry in recent years, the area under cane has increased considerably.
Andhra Pradesh, eminently suited for cane culture and has made rapid strides within the last 15 years in increasing the acre yields and cane areas, commensurates with the existing facilities. The per acre yield in the sugarcane development zones is sought to be raised from 26.5 tonnes in 1950-51 to 34.34 tonnes by the end of the Third Plan Period representing an increase of 29%. The area covered by intensive development has increased from 62 thousand acres in the First Plan Period to 140 thousand acres in the Second Plan Period, and by the end of the Third Plan Period over 168 thousand acres were covered by the Development Scheme. The increase in per acre yield, estimated at 29% over the base year yield (1950-51) was achieved without any material aids to cane growers but by persuasive propaganda and field demonstrations. In the Fourth Plan Period the Government of India has fixed for the State a total production of 9.12 million tonnes of cane assuming a production trend of 7.68 million tonnes by the end of the Third Plan. Hence, the additional production fixed for Andhra Pradesh is (9.12 - 7.68 million tonnes) 1.44 million tonnes.

Due to the prevailing trend in increasing cane areas in recent years, it was assumed that the area under cane would be about 270,000 acres by 1965-66, the base of the Fourth Plan. On this basis, the base year production in 1965-66 at 31.16 tonnes per acre (the per acre average yield for the State) over 270,000 acres, was expected to be 8.413 million tonnes. An additional production of 1.5 million tonnes is targetted for attainment by intensifying the Sugarcane Development Scheme in the Fourth Plan Period. Accordingly, a total production of 9.91 million tonnes of cane, is expected to be attained by 1970-71.
This is sought to be achieved by covering an area of about 20,000 acres under intensive development, where the average yield of cane will be stepped up to 38.66 tonnes per acre (from 34.34 tonnes) to produce 7.73 million tonnes of cane and the balance of 2.18 million tonnes is expected to be obtained from an area of 70,000 acres outside the intensive development zone where the yield is anticipated at 31.16 tonnes per acre. This means that the average yield of cane in the entire area of 270,000 acres in the State, has to be raised from the present 31.16 tonnes to 36.72 tonnes at the end of the Fourth Plan Period.

It has to be noted that it took the cumulative effort to three Five Year Plan Periods to raise the State base yield of 26.53 tonnes in 1950-51 to 31.16 tonnes by 1965-66, resulting in an increased production of about five tonnes per acre or an increase of 17.5% in the cane yield, and this is no mean achievement considering that it was brought about by persuasive propaganda and intensive field demonstrations undertaken through the Special Extension Staff. A further increase in the per acre yield of cane by 5.5 tonnes is sought to be achieved in the next plan period. This is indeed an ambitious programme and given the wherewithal to tap the yield potential, it is possible to attain the level targeted. The progress increase in the per acre yield of sugarcane in the areas covered by intensive development schemes during the Three Plan periods and the target achieved at the Fourth Plan period, are given in the following Table No. 11.
Table 11.

SUGARCANE DEVELOPMENT IN ANDHRA PRADESH.

<table>
<thead>
<tr>
<th>Period:</th>
<th>Area of operation in acres</th>
<th>Yield per acre in tonnes (from)</th>
<th>Yield per acre at the end of the plan period in tonnes (to)</th>
<th>Yield per acre obtained at end of plan period (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Plan Period (1950-51 to 1955-56)</td>
<td>62,318</td>
<td>26.530</td>
<td>31.830</td>
<td>32.320</td>
</tr>
<tr>
<td>Second Plan Period (1956-57 to 1960-61)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Old Centres in Andhra area:</td>
<td>62,318</td>
<td>32.320</td>
<td>35.550</td>
<td>35.560</td>
</tr>
<tr>
<td>2. New Centres in Andhra area:</td>
<td>43,605</td>
<td>27.300</td>
<td>32.685</td>
<td>32.810</td>
</tr>
<tr>
<td>3. Telengana Region:</td>
<td>35,000</td>
<td>20.830</td>
<td>25.014</td>
<td>28.130</td>
</tr>
<tr>
<td>Total/average</td>
<td>140,923</td>
<td>26.840</td>
<td>31.720</td>
<td>32.240</td>
</tr>
<tr>
<td>Third Plan Period (1961-62 to 1965-66)</td>
<td>150,000</td>
<td>31.720</td>
<td>34.340</td>
<td>32.70</td>
</tr>
<tr>
<td>Fourth Plan Period: (1966-67 to 1970-71)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Non-Development area:</td>
<td>70,000</td>
<td></td>
<td>31.160</td>
<td></td>
</tr>
<tr>
<td>(b) Development area:</td>
<td>200,000</td>
<td></td>
<td>38.660</td>
<td></td>
</tr>
<tr>
<td>Total/Average</td>
<td>270,000</td>
<td></td>
<td>36.715</td>
<td></td>
</tr>
</tbody>
</table>

Attained so far by the end of 64-65 over 2.68 lakh acre.

FINANCIAL ARRANGEMENTS:—

The nature of ownership, the share capital, the reserves and net value of the 17 Andhra Pradesh Sugar Factories as given in their Balance Sheets for 1961-62, are given in Table 12.

It will be seen that out of the share capital of Rs. 67.5 million, Rs. 7.4 million has been subscribed as Bonus Shares. The remaining amount of 60.1 million being the originally paid up capital. At the close of 1961-62 a sum of Rs. 39 million was also available in reserves bringing the total net value to Rs. 106.4 million. Thus, the profits, so far retained by Andhra Pradesh Sugar Industry in the form of bonus shares and reserves, aggregate Rs. 46.3 million, which means an addition of 77.1% to the initially paid up capital.

These analysis show that, on the whole, there has been a good effort on the part of Andhra Pradesh Sugar Industry towards its development.
**Table 12**

FINANCIAL ARRANGEMENT (Amounts in Million Rs.)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Unit</th>
<th>Original Capital</th>
<th>Bonus Issues</th>
<th>Total</th>
<th>Reserve</th>
<th>Total net worth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Seethanagram</td>
<td>3.3</td>
<td>.350</td>
<td>3.65</td>
<td>1.711</td>
<td>5.361</td>
</tr>
<tr>
<td>2</td>
<td>Bobbili</td>
<td>6.62</td>
<td>-</td>
<td>6.62</td>
<td>.663</td>
<td>7.283</td>
</tr>
<tr>
<td>3</td>
<td>Challapalli</td>
<td>5.00</td>
<td>-</td>
<td>5.00</td>
<td>-</td>
<td>5.020</td>
</tr>
<tr>
<td>4</td>
<td>Chelluru</td>
<td>2.297</td>
<td>-</td>
<td>2.297</td>
<td>.819</td>
<td>3.116</td>
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<tr>
<td>5</td>
<td>Pithapuram</td>
<td>6.997</td>
<td>-</td>
<td>6.997</td>
<td>3.999</td>
<td>10.996</td>
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<tr>
<td>7</td>
<td>Shakarnagar (I &amp; II)</td>
<td>8.3</td>
<td>2.885</td>
<td>11.185</td>
<td>14.876</td>
<td>26.020</td>
</tr>
<tr>
<td>8</td>
<td>Vuyyuru *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Samalkot **</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Chagallu</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CO-OPERATIVE**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Unit</th>
<th>Original Capital</th>
<th>Bonus Issues</th>
<th>Total</th>
<th>Reserve</th>
<th>Total net worth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tuni</td>
<td>1.127</td>
<td>-</td>
<td>1.127</td>
<td>-</td>
<td>1.127</td>
</tr>
<tr>
<td>2</td>
<td>Chittoor</td>
<td>3.730</td>
<td>-</td>
<td>3.73</td>
<td>-</td>
<td>3.73</td>
</tr>
<tr>
<td>3</td>
<td>Chodavaram</td>
<td>3.868</td>
<td>-</td>
<td>3.868</td>
<td>.017</td>
<td>3.885</td>
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<tr>
<td>4</td>
<td>Falakol</td>
<td>2.883</td>
<td>-</td>
<td>2.883</td>
<td>.014</td>
<td>2.897</td>
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<tr>
<td>5</td>
<td>Etikoppaka</td>
<td>1.471</td>
<td>-</td>
<td>1.471</td>
<td>3.218</td>
<td>4.689</td>
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<tr>
<td>6</td>
<td>Amadalavalasa</td>
<td>4.046</td>
<td>-</td>
<td>4.046</td>
<td>.036</td>
<td>4.082</td>
</tr>
<tr>
<td>7</td>
<td>Anakapalle *</td>
<td></td>
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<td></td>
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<td></td>
</tr>
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</table>

**GRAND TOTAL**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Unit</th>
<th>Original Capital</th>
<th>Bonus Issues</th>
<th>Total</th>
<th>Reserve</th>
<th>Total net worth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Combined Balance Sheets with Pugalur Factory of Madras.
**Combined Balance Sheets with Rayagada Factory of Crissa.
© Balance Sheets not received.

Source: GUNDU RAC COMMITTEE REPORT.
THE POSITION OF SUGAR FACTORIES:

There were, according to Map No. 2, twelve factories working in the State with the total crushing capacity of 15,000 tons. Of these, four units came into existence after 1957. Further licences were already issued to six co-operative and one sugar factory, also one Joint Stock Company. In 1965 there were altogether 20 factories in the State, subject to the Factory Act 1948.

It is evident from Table No. 13 that from 1955-56 to 1962-63, the number of factories in the State rose from 10 to 18. The increase of 8 factories in 7 years worked out to about one every year. This increase does not include the two new factories, the Vijayram Industrial Co-operative Society Ltd., at Visakhapatnam, and the Nizamabad Co-operative Sugar Factory in the Nizamabad District, which were licensed against the 3rd Plan target.

Each sugar factory has been assigned a specified area (zone) from which it can draw its cane supplies called the reserved area. Certain areas are reserved on a temporary basis too. In addition, there are what is known as "Free Areas", they are not reserved for the factories, which however are already allowed to draw cane from them.

The area under cane in factory zones has increased considerably with the coming up of new factories. From 62.73 thousand acres for 9 factories in 1959-60, it has gone up to 123.23 thousand acres in 1962-63 for 15 factories. The yield for the entire State is 29-30 tons and for development zones 32-36 tons per acre.

The position with regard to the number of working factories, registered capacity production of sugar in tons.
### Table 13.

**THE POSITION OF SUGAR FACTORIES IN ANDHRA PRADESH.**

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Working Factories</th>
</tr>
</thead>
<tbody>
<tr>
<td>In 1953-54 to</td>
<td></td>
</tr>
<tr>
<td>1955-56</td>
<td>10</td>
</tr>
<tr>
<td>1956-57</td>
<td>11</td>
</tr>
<tr>
<td>1957-58 to</td>
<td></td>
</tr>
<tr>
<td>1960-61</td>
<td>12</td>
</tr>
<tr>
<td>1961-62</td>
<td>15</td>
</tr>
<tr>
<td>1962-63</td>
<td>18</td>
</tr>
</tbody>
</table>

*Source:* Gundu Rao's Committee Report.
and sugar produced per 100 tons of registered capacity which is exhibited by Table No. 14, which shows that the maximum production of sugar has been 187,660 tonnes in the year 1961-62. The maximum production per 100 tonnes of registered capacity has been 1,651.7 tonnes in the year 1955-56.

The position in regard to average duration of season, cane crushed, sugar produced and average recovery recorded during the preceding 7 years is shown in Table No. 15. It can be seen that during the last 7 years the average duration (32 hours) has varied from 93 days in 1961-62 to 147 days in 1960-61. The maximum production of sugar was .188 million tonnes in 1961-62, and the maximum recovery was 10.32 in 1962-63.

Moreover, the size of distribution of sugar factories in the State is very uneven. From the existing capacity 25 per cent is accounted for by the Nizam Sugar Factory alone. This factory is located in the Nizamabad district. Against this, there are seven units having small capacities varying from 300 to 600 tonnes a day. There are only two units which have a more economic size of 1,000 tonnes a day. This industry alone accounts for one third of the total capital invested in the industries in the State.

It is not then surprising that although there are such large areas of cultivation under cane, and great possibilities of the development of the industry in the State, it has only a few small sugar factories. What is lacking is merely a spirit of enterprise and organised efforts on the part of the people.
WORKING CAPACITY OF FACTORIES IN ANDHRA PRADESH

Table 14

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of working factories</th>
<th>Total registered cane crushing capacity per day in tonnes</th>
<th>Production of Sugar in tonnes</th>
<th>Production of Sugar/100 tons registered capacity in tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950-51</td>
<td>9</td>
<td>7,341</td>
<td>60,665</td>
<td>826.4</td>
</tr>
<tr>
<td>1951-52</td>
<td>11</td>
<td>8,560</td>
<td>84,662</td>
<td>989.0</td>
</tr>
<tr>
<td>1952-53</td>
<td>11</td>
<td>8,560</td>
<td>84,816</td>
<td>990.8</td>
</tr>
<tr>
<td>1953-54</td>
<td>10</td>
<td>8,484</td>
<td>27,916</td>
<td>859.4</td>
</tr>
<tr>
<td>1954-55</td>
<td>10</td>
<td>8,484</td>
<td>1,11,703</td>
<td>1,316.6</td>
</tr>
<tr>
<td>1955-56</td>
<td>10</td>
<td>8,484</td>
<td>1,40,135</td>
<td>1,651.7</td>
</tr>
<tr>
<td>1956-57</td>
<td>11</td>
<td>9,601</td>
<td>1,44,145</td>
<td>1,501.3</td>
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<tr>
<td>1957-58</td>
<td>12</td>
<td>11,227</td>
<td>1,54,731</td>
<td>1,397.8</td>
</tr>
<tr>
<td>1958-59</td>
<td>12</td>
<td>11,633</td>
<td>1,20,931</td>
<td>1,039.5</td>
</tr>
<tr>
<td>1959-60</td>
<td>12</td>
<td>11,836</td>
<td>1,39,129</td>
<td>1,175.5</td>
</tr>
<tr>
<td>1960-61</td>
<td>12</td>
<td>11,836</td>
<td>1,82,738</td>
<td>1,543.9</td>
</tr>
<tr>
<td>1961-62</td>
<td>15</td>
<td>14,376</td>
<td>1,87,660</td>
<td>1,305.4</td>
</tr>
<tr>
<td>1962-63</td>
<td>18</td>
<td>19,406</td>
<td>1,68,513</td>
<td>868.3</td>
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</table>

CRUSHING CAPACITY OF FACTORIES IN ANDHRA PRADESH

Table 15

<table>
<thead>
<tr>
<th>Year</th>
<th>Average duration 22 hours</th>
<th>Cane crushed (million tonnes)</th>
<th>Sugar made (Million tonnes)</th>
<th>Average recovery per cent cane</th>
</tr>
</thead>
<tbody>
<tr>
<td>1956-57</td>
<td>146</td>
<td>1.567</td>
<td>.144</td>
<td>9.20</td>
</tr>
<tr>
<td>1957-58</td>
<td>139</td>
<td>1.594</td>
<td>.155</td>
<td>9.71</td>
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<tr>
<td>1958-59</td>
<td>107</td>
<td>1.299</td>
<td>.122</td>
<td>9.42</td>
</tr>
<tr>
<td>1959-60</td>
<td>111</td>
<td>1.416</td>
<td>.139</td>
<td>9.85</td>
</tr>
<tr>
<td>1960-61</td>
<td>147</td>
<td>1.933</td>
<td>.183</td>
<td>9.46</td>
</tr>
<tr>
<td>1961-62</td>
<td>125</td>
<td>1.895</td>
<td>.188</td>
<td>9.90</td>
</tr>
<tr>
<td>1962-63</td>
<td>93</td>
<td>1.666</td>
<td>.172</td>
<td>10.32</td>
</tr>
</tbody>
</table>

Source: - GUNDU RAO'S COMMITTEE REPORT.
DEVELOPMENT WORK:

Sugarcane development work has been in progress in selected areas since the beginning of the First Five Year Plan period covering an area of 62,318 acres in ten revenue taluks in the State. During the Second Plan period, the development Scheme was extended to a wider area of 78,605 acres. With the formation of Andhra Pradesh, the development zone now tends to an area of 165,000 acres. The objective of the development Scheme is to step up the per acre yield of cane through adoption of improved techniques in cane cultivation. The sugarcane development work at present consists of:-

1. Running of zonal centres termed as "Sugarcane Liaison Farm" in the factory areas, with the cooperation of the sugar factory managements.

2. Employment of Special Development staff in the intensive cane growing taluks for extending the finding of research into the cultivator's fields.

Sugarcane Liaison Farms:-

In 1953 there was only one big sugarcane Liaison Farm in Samalkot factory zone in East Godavari district. At present there are six Sugarcane Liaison Farms in the State, one each in size out of seven districts, where vacuum pan sugar industry is now concentrated, (there are nine in the Nizamabad district). These kinds of farms serve as zonal testing-cum-demonstration farms to extend the results of research by demonstration in factory zones.

As already stated above, the extension work on sugarcane has been in progress in 29 Development Centres, each centre being a revenue taluk. They were working prior to the year 1956-57. One special
Agricultural Assistant, assisted by one Fieldman and four Demonstration Maistries, attend to the Sugarcane Development work in each centre, under the direct control of zonal Superintendents who are also in charge of the Liaison Farms. The special staff publicises the recommendations by way of group discussions, exhibitions and by associating with the developmental activities of the local cane development councils.

**Sugarcane Varieties:**

It is a known fact that in any crop improvement the choice of an appropriate variety plays a vital role. In order to prolong the season in sugar factories, it is imperative that varietal schedules should be adopted; such a schedule is being followed in 12 out of 19 factories in the State. The most important varieties of sugarcane raised in Andhra Pradesh recommended by the Indian Council of Agriculture Research are the following:

(a) Andhra..... Co.419 .....Co.449 .....Co.527.
(b) Telengana.. Co.419 .....Co.290 .....Co.517 .....Co.2878.

The varietal position of sugarcane cultivation in the State is under the constant vigilance of the Sugarcane Specialist as well as of the Advisory Committee of the State.

**Manuring Schedule:**

It is well known that soils in India are mostly deficient in Nitrogen. Some soils respond to the application of phosphate and very few to potash. The nutrient intake studies, done at the Research Station Zonal Farms in the State, have indicated the lack of economical response to phosphoric acid or potassium in the different regions of the State. In the present context of short supply of inorganic fertilizers, use of Sugarcane Trash, compost, farm yard manure & green manure or green leaf manure, are being popularised in the
development areas.

Maximisation of Cane Yields:–

In order to bring forth fully the potentialities of the cane growing regions of the State and to create a spirit of healthy competition among cane growers, crop competitions both at all India and State levels, are being organised and conducted. These competitions have amply proved their utility in the Scheme of cane development, and the competitors have been recording more than a hundred tons per acre continuously for the past 15 years. The highest acre yield ever recorded was 152.20 tons in the year 1958-59, in the Krishna District. The State has also annexed thrice within five years the rolling shield for recording the highest cane yield in the Southern Region crop competitions.

A 3-channel credit facility is available to the cane growers in the State, namely:–

(a) Panchayat Samatties
(b) Co-operative Societies, and
(c) Sugar factory managements.

Plant protection:–

The sugarcane development staff carries out propaganda on methods of controlling sugarcane, pests like Shoot Borers, White Ants, White Fly and Grass Hopper, which are reported to be the pests infecting the cane crops in different zones. Amongst the diseases, Smut is more prevalent. Steps are under­way to root out affected clumps and to encourage the use of disease-free seed. Rationing is discouraged and organo­mercurial fungicides like Agallol and Aretan are being used. Insecticides are being given by the funds of Development Councils.

@ Rural Board for self rule.
The cane supply to the factories is regulated under the provisions of the Andhra Pradesh Sugarcane (Regulation and Purchase) Act 1961. According to the Act, the growers offer their cane before a particular date fixed by the Cane Commissioner, and the factory Management enters into agreement with the growers for the supply of cane. Sugar factories issue cutting orders according to their requirements and as far as possible on the maturity basis.

Means of Communication:-

Speedy transport of sugarcane from the field to the factory is of great importance, as the quality deteriorates in time after harvest. Stress has been laid on compacting of areas around the sugar factories. Opening up of a network of communications, for speedy transport of sugarcane by road to the factories, is most important. These roads not only help inflow of modern ideas to villages speedily, but serve to take the various inputs into the villages speedily and economically. They also take the various agriculture as well as cottage industries-products to the markets.

At present, road transport is poorly developed. About 1717 kms. of roads exist in the State in the area of 10 factories. A considerable part of these roads are the main highways. The additional requirements of these factory zones, according to Gunde Rao's Committee's estimation, are 1042 kms., which will cost about Rs. 57.3 million per kilometer, and as regards bridges, about 10 bridges and 792 culverts are required. The expenditure on these items is estimated at Rs. 5 million and Rs. 2.376 million respectively. Therefore, a network of roads is essential in the factory zone. This enables not only the transport of cane, but also supervision and survey of crops, also services to cane growers and control
campaign.

It is hardly necessary to repeat that the prosperity of the Nation is largely dependent on such industrial developments as sugar, which provides employment at outlying rural areas, not only to a large number of labourers but also to a very important section of the agricultural population. Thus, in view of the importance the railways and other carriers of the State having a special duty to perform, with referenda to this industry, the policy of their rates and transportation may be in accordance with the general policy of national economic development. Further transport developments are partly determined by the strategic geographic location of Andhra Pradesh as the gateway to the southern zone, and its central position as a link between the North and the South. Telengana, especially Hyderabad and Secunderabad, is centrally located for serving all-India markets. Another factor in influencing future transport requirements in Andhra Pradesh is all round industrial development. The output of industries is expected to grow at an average annual rate of 11.5% during the coming years. Therefore, a suitable provision for transportation and communication is necessary.

Utilisation of By-Products:-

Molasses, Press Mud and Bagasse are the by-products of the sugar factories of Andhra Pradesh. As far as Molasses is concerned, it is almost entirely used for the production of alcohol and is supplied by the factories to the distilleries at Government controlled price. Some Molasses is, however, released for sale to permit holders, and for export. Molasses utilisation for cattle feed and the manufacture of chemicals, however, offers a better scope for increased returns.

Press Mud is used as manure in the factory farms or is sold out to the growers for the same purpose.

Survey report of the N.C.A.E.R.
As regards Bagasse, almost all factories are using their entire production as fuel and do not save any Bagasse. At present, even extra fuel is also used by the factories, but scope is there for saving the Bagasse by adopting suitable means of steam and fuel economy.

In short, the achievements in the field of sugarcane development, so far attained in Andhra Pradesh State, are not inconsiderable. Yet the scope for further development is vast. The money spent on sugarcane development is so far negligible when compared with the results achieved, for instance in the Third Five Year Plan Period. A sum of Rs. 1.62 million only was spent in the first four years for implementation of developmental schemes and this has yielded dividends to the tune of Rs. 52.4 million as additional revenue from increased per acre sugarcane production.

Given proper incentives, as envisaged for the Fourth Five Year Plan Period, it will be possible to raise the per acre yield of cane in the State over an estimated 301,000 acres from 31.15 tonnes per acre (1965-66) to 36.72 tonnes (1970-71) which represents an increase of about 18%. During the same period, the per acre yield, in the cane development zones, covering an area of about two million acres under sugarcane, is sought to be raised by about 16 per cent.

**A Critical Review:**

In fact the State of Andhra Pradesh has not yet had a chance to develop as an integral economic unit. It came into being through the fusion of regions with diverse political backgrounds that had conditioned their economic discipline and development. Consequently, there are regional disparities not only in the general level and orientation of development, but also in such other
economically significant aspects of peoples' life as habit-patterns and social attitudes, hence the well recognised divisions of the State into the three regions. The coastal regions Telengana and Rayalseems, though essentially political has sufficient economic validity.

Industrially, Andhra Pradesh lags behind many other States in India, but as sugarcane is one of the most important crops of the State, the sugar industry has become important in the State of Andhra Pradesh. It occupies the second place as far as yield per acre of sugarcane is concerned, after Maharashtra in the Country. Yet the development did not take place in proportion to the advantages the region enjoys for the industry. In reality, the growth of sugarcane output generally depends on the extent of its utilisation by industries.

Although the sugar industry in the State of Andhra Pradesh has certain advantages, i.e., yield of cane per acre is high, the machinery is also comparatively new, and the recovery of sugarcane is as high as 10 per cent or more, being the only exception in the whole Country. It suffers from stress and strain in the matter of the supply of cane. The clash between the different users of cane is predominant and, unless this is satisfactorily solved, it will engulf both in a common damage. There are also some industrial units in the State which require rehabilitation, and the need, for integrated planning and development of cane cultivation and utilisation of by-products, is paramount.

The State has taken up the job of producing raw sugar for export purposes since 1962-63, and it has produced some 207.67, 426.40, 605.55 and 712.89 tons of sugar during the seasons 1962/3, 1963/4, 1964/5 and 1965/6 respectively. It ranks third among the sugar producing States of the Country.
Yet, the per capita consumption is very low in the State, being 6.5 pounds in 1961/62 (including gur and khandsari figures also). There is no doubt, taking into consideration, the improvement in the conditions of the people and the consequent rise in the standard of living, that there is every likelihood for a rise in the consumption in future.

The experience of implementation of the Sugarcane Development Scheme has shown, that for quick achievement of increased production in sugarcane, greater emphasis will have to be laid on necessary items of the development, such as, irrigation, fertiliser, plant protection measures and supplies of seed etc.

All this kind of development is possible only by laying proper emphasis on expansion of existing factories into as larger units as possible rather than the establishing of new units with small capacities and intensive development of sugar cultivation around sugar factories in a manner that cultivator owned and operated fields turn practically into a field of co-operative or joint effort in the progressive development of which both the growers and the industry would have an ever increasing and abiding interest.

Furthermore, with little more co-ordination between the cane growers and the factories on the one hand, and the factories and the agriculture on the other, it would be possible to increase the productivity of the existing sugar factories to a significant extent. It is recognised that growers have their interest in the factories if regular supplies of cane are to be ensured. Again, the factory should cover the maximum number of holdings in its area of operation in order to develop a better cropping pattern on the farms. Giving licences for new units exclusively to co-operatives
would bring about better co-operation between the cane growers and the factories, and mobilise agricultural savings for a productive investment. The extension of cane development would increase the percentage of cane recovery. The working season of the factory would increase if farmers are helped and encouraged to grow canes of different durations by supplying the necessary seed etc., by the department.

There is a possibility for the expansion of the sugar industry in the next decade in the State in view of the favourable conditions the industry enjoys. In such expansion, care must be taken to co-ordinate the plans for establishing new factories, Khandsari units and ceasing jaggery production to ensure balanced development both for sugarcane cultivation and cane processing units. In some areas, like Chittoor and Vishakapatnam districts, where farmers are well accustomed to jaggery preparation, establishing new sugar factories, would only divert the existing cane from jaggery without any large additional economic benefits. Moreover, in such cases, wide fluctuation in jaggery markets tend to disturb the smooth supply of cane to the factories, and it is difficult to ensure that farmers would have their obligations to the factories. Since the new factories in the Country are likely to divert most of their cane from jaggery, it is necessary that certain areas may be reserved for meeting cane demand for jaggery. Demarcation of such areas may be made in the State, and no sugar factories should be licensed for such areas. But, on the contrary, licenses were recently given to establish sugar factories in such areas. Khandsari units should be encouraged in those areas where sugarcane is grown in small pockets under wells, streams and other minor irrigation sources, and where farmers are not accustomed to jaggery making.
For the future development of the industries, full utilization of the amount allotted is also necessary.
3rd Chapter.
The Nizamabad District:

Nizamabad district is neither a geographical nor a historical entity but a creation of administrative convenience. Prior to 1905 it was known as Indur district and in 1905, when the administrative units of erstwhile Hyderabad State were reconstituted, the name of Indur district was changed into that of Nizamabad district. At the time of Reorganisation of States, Bichkonda and Jukkal circles of Deglur taluk of Nanded district were transferred to Andhra Pradesh and included in this district and in 1958 constituted into a new independent sub-taluk with an area of 230.8 sq. miles.

As it is shown in the relief map 3, the present district of Nizamabad is bounded in the North by Adilabad and Nanded district, on the East by Karimnagar, on the South by Medak district and on the West by Maharashtra State. It lies between 18° 40' and 78° 37' of the Eastern longitude.

The district at present occupies an area of 3,105 sq. miles and has a population of 1,022,013 persons and a density of 328 persons per sq. mile according to the 1961 Census count. There are altogether 865 inhabited villages, 56 uninhabited villages and 6 towns in the district. Nizamabad district is divided into three revenue divisions and 7 taluks for the purpose of revenue administration.

The district consists mostly of plains on the Eastern side adjoining Karimnagar district and is dotted with a large number of tanks. The canals and tanks with their blue waters and green hills with boulders toppling one over the other and sometimes standing queerly balanced, present a picturesque spectacle.
Irrigation:

Map No. 4 exhibits that the principal rivers, flowing in this district, are the River Godavaria on the Northern boundary separating it from Nanded and Adilabad districts, and the Mangira. The map shows that the River Mangira crosses the district from the South-West and joins the Godavaria in Bodhan taluk after a course of 62 miles. The Nizamabad district supposed to be the most prosperous district of the Telangana region as the district owes its prosperity to the advent of the Nizamsagar Project across the Mangira River about 30 years ago. The benefits of this project are being fully reaped and an extensive quick development of irrigation has brought in considerable immigration of agricultural families, even from the distant coastal Andhra districts. The Nizamsagar Project, constructed across this River at Achampet in Banswade taluk, forms a major source of irrigation with its splendid network of canals. The effective storage of the reservoir is 25,600 m.c.f.t. It is proposed to utilise 58,000 m.c.f.t. of the normal supply for irrigation. The area of the water spread at full reservoir level was estimated at 59 sq. miles and 40 villages were submerged in this area. At the deepest foundation the masonry dam is 158 ft. high with a base width of 12 ft. The dam is built of random rubble masonry with a facing of dressed stone and is one of the largest in India. Water stored in the reservoir is let out for irrigation in the main canal through the head sluice having 11 steel gates $8'\times 10\frac{1}{2}'$. The canal is designed to carry a discharge of $3,400$ cusecs and $100$ ft. wide in its head reach with a depth of flow $10\frac{1}{2}$ ft. In its long course of 90 miles it passes through many high spurs that needed deep cutting. Two of these cuttings at 10 and 32 miles are over
45 ft. in depth. The main canal passes through tree tanks on its way. There are 82 distributories taking off from the canal. The channels with their branches measuring 660 miles in length command an area of more than 50 thousand acres spread over 345 villages of Banswada, Bodhan, Nizamabad and Armoor taluks. As per the forecast, the proposed irrigation was for 275,000 acres comprising 220,000 acres of Abi Paddy, 30,000 acres of Tabi paddy, 20,000 acres of sugarcane and 5,000 acres of orchards. Work on this was commenced in 1924 and completed in 1932. The total cost of the project was nearly 4 million Rupees and after full development it was anticipated to fetch a net revenue of 3.5 million rupees giving an annual return of about 10% on the capital outlay.

Ever since the opening of the canal for irrigation in 1931, the ayacut under it has been gradually developing, enhancing the prosperity of the land and its people. Apart from irrigating large tracts of lands, the project contributed to the economy of the district to a considerable extent.

Besides the Nizamsagar Canal there are a number of canals, wells and tubewells working for irrigation purposes. There are seasonal streams which have been dammed up to form tanks for irrigation. One of the principle canals of Nizamabad is 100 ft. wide and 10½ ft. deep known as Alisagar. The water of the canal is also being used for irrigation purposes. Though canals, tanks and wells are common practises of irrigation, fragmentation and indebtedness retard the sinking of more wells.

Table 15b shows the area under each source of irrigation since 1951. The figures of land improvement since the
### Table 15b.

**AREA IRRIGATED UNDER DIFFERENT SOURCES OF IRRIGATION**  
(In Acres)

<table>
<thead>
<tr>
<th>Year</th>
<th>Govt. Canals</th>
<th>Private Canals</th>
<th>Tanks</th>
<th>Wells</th>
<th>Other Sources</th>
<th>Net area irrigated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955-56</td>
<td>128,606</td>
<td>741</td>
<td>107,449</td>
<td>17,586</td>
<td>...</td>
<td>254,382</td>
</tr>
<tr>
<td>1956-57</td>
<td>125,909</td>
<td>105</td>
<td>125,465</td>
<td>16,622</td>
<td>...</td>
<td>268,101</td>
</tr>
<tr>
<td>1957-58</td>
<td>133,457</td>
<td>551</td>
<td>112,786</td>
<td>17,384</td>
<td>...</td>
<td>264,178</td>
</tr>
<tr>
<td>1958-59</td>
<td>133,907</td>
<td>316</td>
<td>135,346</td>
<td>17,532</td>
<td>...</td>
<td>287,101</td>
</tr>
<tr>
<td>1959-60</td>
<td>151,323</td>
<td>206</td>
<td>124,626</td>
<td>23,705</td>
<td>...</td>
<td>299,860</td>
</tr>
<tr>
<td>1960-61</td>
<td>151,315</td>
<td>1,140</td>
<td>120,814</td>
<td>14,635</td>
<td>...</td>
<td>287,904</td>
</tr>
</tbody>
</table>

The same Table indicates that whereas the acreage under canal irrigation is gradually and perceptibly on the increase, there is a steep fall in the acreage under well irrigation. Increasing prosperity is thus reflected in the continuous increase of the area under wet cultivation from year to year.

The district of Nizamabad has 40% of the cultivated area under irrigation (mostly under the Nizamsagar Project). Canal irrigation in Telangana is significant only in the Nizamabad district, and the area under well was 5.52% of the total irrigated area in 1959-60. 41.56% was under tanks, 50.53% under canals, and under other sources only 2.78% of the total irrigated area, whereas the total irrigated area was 39.25%.

Apart from the Project of Nizamsagar there are two more projects proposed for irrigation in the district. When these projects are, to a considerable extent completed, they will benefit the districts of Nizamabad and Karimnagar.

The slope of the country is North by East with a fall of, from 40 ft. per mile in some parts to 5 ft. per mile near the Godavari River. This ensures a good drainage and sub-soil water is found on an average of about 25 ft. below ground level.

**CLIMATIC CONDITIONS:**

As the district of Nizamabad, which the relief map No. 3 shows, is favourably situated in the Deccan plateau at a fairly good elevation of about 2,000 ft. above the sea level (Map 3), the climate is considered to be quite pleasant. Average temperature is about 32° c. whereas maximum (May), as the chart indicates, rises to over 40° c. and a minimum (Dec.-Jan.) falls to 15° c. It is dry and healthy from February to the
MONTHLY MEAN METEOROLOGICAL DATA AVERAGE FOR 30 YEARS 1938-1967.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>TEMPERATURE °C</th>
<th>R.HUMIDITY AT</th>
<th>RAINFALL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Max.</td>
<td>Min.</td>
<td>7-19</td>
</tr>
<tr>
<td></td>
<td>mm.</td>
<td>mm.</td>
<td>mm.</td>
</tr>
<tr>
<td>1.</td>
<td>January</td>
<td>29.45</td>
<td>15.01</td>
</tr>
<tr>
<td>2.</td>
<td>February</td>
<td>32.40</td>
<td>17.53</td>
</tr>
<tr>
<td>3.</td>
<td>March</td>
<td>35.68</td>
<td>19.05</td>
</tr>
<tr>
<td>4.</td>
<td>April</td>
<td>38.27</td>
<td>24.83</td>
</tr>
<tr>
<td>5.</td>
<td>May</td>
<td>39.97</td>
<td>25.61</td>
</tr>
<tr>
<td>6.</td>
<td>June</td>
<td>35.80</td>
<td>25.19</td>
</tr>
<tr>
<td>7.</td>
<td>July</td>
<td>30.87</td>
<td>23.52</td>
</tr>
<tr>
<td>8.</td>
<td>August</td>
<td>30.21</td>
<td>23.00</td>
</tr>
<tr>
<td>9.</td>
<td>September</td>
<td>30.53</td>
<td>22.73</td>
</tr>
<tr>
<td>10.</td>
<td>October</td>
<td>31.11</td>
<td>20.51</td>
</tr>
<tr>
<td>11.</td>
<td>November</td>
<td>29.38</td>
<td>15.81</td>
</tr>
<tr>
<td>12.</td>
<td>December</td>
<td>28.15</td>
<td>14.32</td>
</tr>
</tbody>
</table>

Total: 1,164.11 58.03

Source: The Nizam Sugar Factory.
end of May and damp during the rainy and cold seasons.

Temperature:

The range of temperatures between maximum and minimum characterises its typical tropical character. According to Nov., Dec., Jan., Table 16a/(with temperatures less than 20° c.), provide ideal conditions for planting sugarcane. These months are also ideal for harvesting, but harvesting varies between the months of November and March. The highest yields are obtained in December, January and February.

Sugarcane requires above 35° c. temperature in the early stage of growth, which is very suitably available in Nizamabad throughout the months of February, March, April, May, June, July and partly August. This peculiarity has favoured Nizamabad for specialisation in sugarcane cultivation.

Rainfall:

The Nizamabad district, though lying in the middle of the Deccan Plateau and in the way of South-West and North-East monsoons, has an average annual rainfall of only about 40 inches. The rainy season commences with the onset of South-West monsoon in the latter part of June and ends in the month of October, has a rainfall above 40 inches. The maximum rainfall occurs in the months of June, July, August and September during the South-West monsoon period. The following graph exhibits the total annual rainfall received during each monsoon, as well as humidity and temperatures, from 1938 - 1967.

The average rainfall varies between 150-200 m.m. Maximum rainfall occurs in July (over 300 m.m.) and minimum in December (0.30 m.m.). June, July and August are the rainiest months and more than 75% of the rain falls during these months.
MONTHLY MEAN METEOROLOGICAL DATA AVERAGE
FOR 30 yrs. 1938-'67

SOURCE: Nizam Sugar Factory

GRAPH 1
The average number of rainy days during these months is 12 but July has more than 15 rainy days in a month which is the maximum of all months.

The highest relative humidity is experienced in August (85.54) and the lowest in May (49.70). Throughout the months from July to December, the average is above 80.00. It gradually declines towards Winter being 76 in January, 66 in February, 56 in April and 49 in May, as exhibited in the chart.

SOILS AND GEOLOGY:

The soil in Telengana is indicated in Map No. 5. It shows that the soils in this region are made up of a variety like Black Cotton, Chalka, Red Sandy Loam, Clay Loams, Deep Black Soil, Medium Black Soil, Black Soil, Red Soil and Laterite Soil. Of these, Chalka and Black Cotton are considered to be fertile. Owing to the extensive sugarcane cultivation the value of Black Cotton Soil is greater than that of the other soils. Madnur, Banswada, and Bodhan have a considerable area of Black Cotton and Chalka soils. In Kamareddy and Yellareddy taluks the soil is of four kinds viz. Clay Loam, Black Cotton, Red Sandy Loam and ordinary soil known as Sandy Soil. Thus, in almost all taluks Cotton Soil known for fertility is predominant.

Being situated in the table land of the Deccan, hills of any considerable size are quite rare in this part of the Country, though isolated peaks and rocky clusters occur frequently, which are so characteristic of the Deccan. Map No. 6 shows the geology of the Telengana region. It explains the peneplain of Telengana where the land is highly eroded and hillocks are scattered over the surface. In the North,
SOIL TYPES

- Deep Black Soil
- Medium Black Soil
- Black Soil
- Red Soil
- Laterite Soil

MAP 5
faulting has preserved a belt of Gondwana series along the lower Godavari which is below 150 meters in altitude. The most general level lies between 480 to 800 meters altitude in this portion. This Telengana region is an extensive plateau with an average elevation of 1,200 to 2,000 feet above sea level. The land is barren and dry and its agriculture is confined to growing some dry crops with the help of tank irrigation. Life is hard except in basins where soil wash and tank irrigation bring some prosperity.

The most widespread rocks that are found in this area are the Archaen gneisses with some patches of Deccan trap rocks. The Archaen gneisses are the oldest types of rock formations which dominate the entire region of Telengana. These schists are irregularly distributed in patches, folded with gneisses in the Nizamabad district. The Deccan trap rocks which cover small portions of Nizamabad, Banswada, Bodhan and Yellareddy taluks consist of massive or vesicular and amygdaloidal flows of basalt forming a high table top plateau.

Thus, it is clear that the soils in the district are formed out of different rock types viz., Sedentary, representing those soils which remain at the place where they are formed from the rocks, e.g., black, red and laterite soils.

However, the main sugarcane growing taluks of Nizamabad viz. Bodhan, Banswada and Nizamabad contain a rich variety of sedentary type soil, which is a mixture of lime and chalka, that has already been discussed. The chalka or regar soil is a finely pulverized reddish soil with sand and traces of lime, and is well suited for rainy season crops, i.e., the sugarcane crop.
VILLAGES CLASSIFIED BY POPULATION:

About 80 per cent of the district's population live in villages. "Village", according to the 1961 Census can be described as the Revenue Administrative Unit with well defined boundaries. A village having one or more groups of habitation is treated as an inhabited village, and a village with no habitation at all is treated as an uninhabited village. All the Revenue villages within the district are demarcated and numbered off continuously from North-West to South-East.

The total number of inhabited villages in the Nizamabad district is classified by various population sizes and categories of (1) Less than 999 population (small villages), (2) 1,000 - 1,999 (medium villages) and (3) 2,000 - 4,999 and above (large villages).

The small villages are 540 in number out of 865 inhabited villages of the district. They account for only 29.1 per cent of the district's rural population. These villages are located close to the very limited patches of land developed for agriculture. There is little possibility of these villages growing very much bigger and the development of these villages is slow and presents great difficulties. It will be observed that this category of villages tend to disappear in the well developed areas.

The category of "medium villages" with a population of 1,000 - 1,999 accounts for 36.37 per cent of the district's rural population composed of 227 villages. This group may be taken as representing a typical village of the dry cultivation tracts of the district. The largest proportion of rural population of the district live in villages of this category.

@ Some of the villages are to be found generally adjoining the forest areas and the hilly tracts, they are naturally not many in the plains and canal areas.
The large type of villages account for 34.62 per cent of the rural population of the district.

Generally speaking, in terms of percentage of rural population, it shows more indications towards the small and medium villages, and shows a considerable fall when it comes to large villages. The better developed rural areas of the district according to the Census of 1961 show a propensity for a steep rise from very small to very large villages.

The "Town" is a place usually not having less than 5,000 inhabitants, possessing distinct urban characteristics and also satisfying certain criteria prescribed.

For recognition of any place as a town at the present Census, it should be covered by a City Corporation, Municipality or Cantonment Board or that it should generally satisfy the following criteria:

(a) It should have a minimum population of 5,000.
(b) The density of population should not be less than 1,000 per square mile; and
(c) at least three quarters of the adult population should be non-agricultural.

All the towns were classified into six classes, according to population size.

<table>
<thead>
<tr>
<th>Class of Town</th>
<th>Population Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100,000 and above</td>
</tr>
<tr>
<td>11</td>
<td>50,000 - 99,999</td>
</tr>
<tr>
<td>111</td>
<td>20,000 - 49,999</td>
</tr>
<tr>
<td>1V</td>
<td>10,000 - 19,999</td>
</tr>
<tr>
<td>V</td>
<td>5,000 - 9,999</td>
</tr>
<tr>
<td>VI</td>
<td>Less than 5,000</td>
</tr>
</tbody>
</table>
NIZAMABAD DISTRICT

Progress of Urbanization
1901-61

Urban population living in each class of town

<table>
<thead>
<tr>
<th>Class</th>
<th>Population Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV V VI Class</td>
<td>&lt;20,000</td>
</tr>
<tr>
<td>II Class</td>
<td>50,000-99,999</td>
</tr>
<tr>
<td>III Class</td>
<td>20,000-49,999</td>
</tr>
<tr>
<td>I Class</td>
<td>100,000 &amp; above</td>
</tr>
</tbody>
</table>

CHART 1
Class 1 towns with a population of 100,000 and above have been treated as cities. Until 1951 there was no other Class 1 town at all in the district.

The percentage of total urban population to total population of the district was 14.51 in 1961 and the total proportion of the percentage of rural population to total population of the district was 85.49. It means the rural population was predominantly in the district according to the Census of 1961.

The growth of urban population in the Nizamabad district from 1901 to 1941 was very slow, but from 1941 - 51 the growth was very conspicuous. The total urban population was increased from 1901 to 1961. Chart 1 shows the progress of urbanization from 1901 to 1961. There were three towns in the district in 1901, but they lost their urban status in the 1961 Census. These "Towns" have been de-classified mainly because of the lack of urban characteristics. For example, Balakonda was a town in 1901 and also in 1911 Census but lost its status in 1921 and regained in 1931, 1941 and 1951 and was recognised as a town. Ultimately in the 1961 Census it lost its urban status.

These patterns of increases and decreases can be both due to a natural increase in population in that class of towns and villages and is also due to inter-rural migration. The main reason for inter-rural migration is nothing but the employment opportunities provided by the sugar industry in the district.

Thus, this clearly reveals a tendency for the larger units to develop faster exerting a greater pull on the population leading to a gradual decline of the smaller units.

At present, the Nizamabad district has altogether 6 towns. Their names and population figures are as follows:
POPULATION AND ITS ETHNIC COMPOSITION:

On 1st March 1961, the reference date of Census, 1,022,013 persons were found in the Nizamabad district. This means an increase of 22.36% over the 1951 population. There are 328 persons per square mile in the district as against 339 in the State as a whole. The density of urban population in the district is 3,196 as against the corresponding State average of 4,340. The density of rural population is 285, which is slightly more than the corresponding State average of 284. The urban figures for the 1951 Census stood at 19,629 for the district and 4,074 for the whole state. Amongst the districts of the State, the Nizamabad district, with an area of 3,112.8 sq. miles occupies eighteenth rank in regard to area and nineteenth rank as regards population.

Growth of Population:

During the past 6 decades, i.e., from the turn of the present century, Nizamabad is the only district in Telengana region that has recorded the smallest percentage (47.23%) in the growth of population as against the State average of 88.73%. This district registered a decrease in the growth of population in the first decade of the present century. This decade was markedly higher in the first decade than in the second decade. The district recorded a decrease in the
NIZAMABAD DISTRICT

CHANGE IN POPULATION
(1951 - 61)

SCALE

0 8 16
(miles)

Maharashtra State

INDEX

Intercensal change in population 1951-61
Gain (P.C)
10.00 - 19.99
20.00 - 29.99
30.00 - 39.99

MAP 7
growth of population by 19.03% during the decade 1901-1911, when there was an overall increase in the growth of population by 12.4 in the State and this can be considered as quite an unusual feature. In the second decade too (1911-1921) the district had recorded a decrease in the growth of population by 3.3%, as against a State average decrease of 0.13%. This reduction in population was more pronounced in the urban areas (20.98%) than in the rural areas (1.94%) from which it is evident that the urban areas were more affected in the district as in the case of the other districts in the Telangana.

Gradually the district recovered from this epidemic and has since exhibited a considerable increase in the growth of population during the decade ending 1931, the percentage being 20.71, which is higher than the percentage of the next two decades in which the rate of growth was rather steady. In the decade ending 1931 the urban areas alone had shown a marked increase by 106.80% in this district. It is notable that during the decade ending 1961 the district envisaged a high rate of growth (22.36%) in population when compared with the percentage of the previous decades. Map No. 7 illustrates the growth of population and the percentage decade variation in the district as well as in the taluks. During this decade Nizamabad and Bodhan taluks recorded an increase of 33.66% and 24.77% respectively which is higher than the overall increase in the district (22.36%). The increase in the growth of population in this decade is understandable on account of the extending Ayacut, under the Nizamsagar and other irrigation projects, which has drawn a considerable number of immigrants from amongst the experienced cultivating families of the delta districts of the State. The Nizam Sugar Factory at
Shakkarnager and other fast developing industries might also have attracted several immigrants from the neighbouring districts as well as from the delta districts. A detailed study of the migration trends in this district reveals that 129,305 persons (60,485 males and 68,820 females) have immigrated into this district from other districts of the State and 35,669 persons (15,245 males and 20,424 females) from other states in this Country.

**Sex Ratio:**

For every 1,000 males there are 1,007 females in the district. In the 1951 Census their number was markedly higher as there were 1,019 females for every 1,000 males in the district. In the urban areas of the district there are 93\(\frac{1}{4}\) females for every 1,000 males which is prominently less than at the 1951 Census figure of 972 and in the rural areas there are 1,020 females for every 1,000 males and this figure is also less than at the previous Census figure of 1,028. In general, it may therefore, be seen that there is an overall shortage of males in the district, but elsewhere in the State the urban area recorded much less women than men.

**Rural and Urban Population:**

In this district 85.49\% of the total population lives in villages and only 14.51\% lives in towns. Nizamabad and Bodhan towns occupy the first and the second places respectively in the district as regards urban population.

**Age Structure:**

According to the Census of 1961 the population in proportion of males in the working age group (15 - 60), in the
NIZAMABAD DISTRICT
Age & Sex Structure
1961

**Male Age Group**
- >60
- 45-59
- 35-44
- 30-34
- 25-29
- 20-24
- 15-19
- 10-14
- 5-9
- 0-4

**Female Age Group**
- >60
- 45-59
- 35-44
- 30-34
- 25-29
- 20-24
- 15-19
- 10-14
- 5-9
- 0-4

**Age & Sex Structure**
- Old men & women
- Middle aged men & women
- Young men & women
- Boys & Girls
- Infants
District is 57.73% which was higher than the State's proportion of 56.95%. Whereas the proportion of female working population to the females in the district was 58.7%. This is because of the beedi industry of Armur Taluk, and Metpalli which engages mostly females. The average male population of the urban areas was 58.77%, whereas the urban female percentage of the district was 57.02%. The age pyramids for both the sexes show that in most of the age groups, the proportions amongst the males and females are nearly equal. Chart shows in detail the sex and age structure of the district.

There are no reliable statistics of specific age death rates and therefore the cause of disparity in the proportion of persons of specific age groups cannot be related to disease or death, with confidence, particularly in the young age groups. But the slightly higher proportion of males of the age group 25-29 in the district can be directly related to the migrational forces that have attracted able-bodied men to agriculture and industries in the Nizamabad district, mostly the sugar industry.

Working Population:

Persons engaged in productive work whether they derive income or not, have been treated as 'Workers' in the 1961 Census in respect of seasonal work like cultivation, livestock, household industry etc. If a person had some regular work for more than one hour a day throughout the greater part of the working season, he has been recorded as a 'Worker'. Persons, temporarily incapacitated, and prisoners under trial, if they had been working before, have also been treated as workers. Those that were treated as 'non-workers' were full-
NIZAMABAD DISTRICT

Factory Industries Classified By Type & Size of Employment-1961

<table>
<thead>
<tr>
<th>Name of Factory - Industry</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agro-Based Industry</td>
<td>80</td>
</tr>
<tr>
<td>Forest-Based - do-</td>
<td>0</td>
</tr>
<tr>
<td>Live-Stock &amp; Fish-Based</td>
<td>0</td>
</tr>
<tr>
<td>Textile Industry</td>
<td>0</td>
</tr>
<tr>
<td>Mineral-Based Industry</td>
<td>0</td>
</tr>
<tr>
<td>Engineering - do-</td>
<td>0</td>
</tr>
<tr>
<td>Chemical - do-</td>
<td>0</td>
</tr>
<tr>
<td>Miscellaneous Industries</td>
<td>0</td>
</tr>
</tbody>
</table>

CHART 3
time students, housewives, dependants, persons permanently disabled from work, retired persons, people of independent means for which they need not work, beggers, convicts in jail, unemployed persons etc.

From the above classification of 'Workers' and 'Non-Workers', it may be seen that the definition of a worker has been liberally conceived. Anyone who generally spends more than an hour a day on any particular productive occupation has been considered as a worker. 57.52% of the population is found to be economically active.

There are 252,680 persons between the ages of 5-14 years, representing 24.72% of the total population. The recent trend has been to regard this age group as representing the school going population. With the introduction of compulsory education this age group will henceforth be automatically eliminated from the working population. In 1961 Census, it is seen that 66,807 persons of this age group belong to the working population. That is, 6.54% of the non-adults constitutes the earning members of the population.

The figures of the district indicate that the working women are not in keeping with their numbers. 50.52% of the females come under the inference of workers.

Persons engaged in Agriculture (Cultivation and Agricultural Labour) as their main work constitute 69.13% of the total working population. Women outnumber men in the category of agricultural labour.

The total employment in all factory industries in the district in 1961 was 29,518. It may be seen from the Chart No. 3 that the highest proportion of employment, taking the district as a whole, is the agro-based industry; that is 81%.
This is mainly due to the existence of sugar and Khandasari and a number of large beedi factories. The proportion of factories and workshops employing 20 to 49 persons is less than 1% in the State, but in Nizamabad it is 4.5%. The number of fairly large beedi factories is responsible for this relative high proportion. The number of establishments employing 100 persons or more is only 1.77% in the State whereas it is 0.1% in the district. As Map No. 8 (Food Processing Industries) shows, the sugar and Khandasari factories and some large beedi factories also come under this category. The district has 20 units of factories and workshops employing 50 to 99%.

**Land Utilisation:**

The pattern of land utilisation in the district has been exhibited in the following Diagram 1. It shows the percentage of classification of the geographical area under different categories of utilisation in the district for the year 1960-61. The net area grown under all crops forms 39.06% of the district area. Forests account for 20.18% of the district area, while uncultivable land covers 8.76% of the district's total area. The area put to non-agricultural use, such as for building, roads etc., covers 7.70% of the district total area. The total fallow land during 1960-61 accounts for 16.8% of the district area of which current fallows (i.e., land left fallow in the current year only) covers 8.97%, other fallow land (i.e., land left fallow for more than one year but less than five years) covers 2.88%, and culturable waste land (i.e., land left fallow for more than five years) accounts for 5.05%. During 1960-61, permanent pastures account for 6.34%, while land under miscellaneous trees and crops and groves form 1.06% of the district area. The net area under cultivation has
increased from 5,262 acres in 1955-56 to 6,617 in 1960-61. In the entire Telangana region, the highest percentage of net area irrigated to the net area sown is recorded by this district, and this may largely be attributed to the benefits of Nizamsagar and other irrigation projects, and better irrigation sources like Nizamsagar and Pocharam projects, also due to the fertility of the soil in the district. A good number of persons have emigrated from Karimnagar and Medak districts to the Nizamabad district.

From the pattern of land cultivation it is evident that for the district of Nizamabad as a whole, more than 55% of the total area is available for agriculture. The area available for agricultural cultivation was 811,895 acres in 1951. The area available for cultivation was 1,097,969 acres and the net sown area was 763,885 acres. It shows that agriculture continues to be the major source of livelihood of the district. The percentage of the net sown area is increasing every year. The increase in the 'net sown area' and decrease in barren land 'fallow lands' is due to unfavourable weather conditions at the sowing time and extending of cultivation. The increase in area sown more than once appears to be due to increase in irrigated area. From 1951 to 1961, as the Census figures show, the area under 'barren-culturable land' has been increased from year to year. More land has been brought under cultivation during the period of the last 10 years, hence there was an increase in 'net sown area' and a fall in area under 'fallow lands' and other uncultivated land.

However, the Census report of 1961 reveals that a considerable extent of land is uncultivated due to meagre financial resources to reclaim the land, whereas some land is left uncultivated being at a higher level than it can be fed by the present irrigation resources. The waste land

@ Season & Crop Report 1959-60, issued by Bureau of Economics &
is used to raise vegetables for domestic consumption or for grazing cattle.

**Size of the Holdings:**

Before studying the economy of the district, it is necessary to note the size of holding, as this seriously affects the employment of labour. The predominance of large-sized and absentee holdings forms another serious handicap to the rapid development of the area.

The average size of agricultural holding per cultivating household in the Nizamabad district is 5.61 acres, but in Madnur taluk the average size of holding is larger than the district and the State's average, being 7.67 acres. The average figures of the taluk as Map No. 9 of the agricultural holding indicates, is between 10.00 to 14.99 acres. Nearly three taluks of the district have less than 5 acres of average size of holding viz. Nizamabad, Banswada and Yellareddy being 4.99 acres, 4.91 acres and 4.20 acres respectively. The remaining three taluks contain between 5 to 9.99 acres of holdings viz. Madnur 4.04, Bodhan 6.99 and Amur 5.02 acres.

According to the 1961 Census the average capita holding was only 0.75 in the district. The per capita agricultural land tends to be small where the extent of land is limited or valuable with irrigational facilities and the pressure of population on land becomes great, but in the dry areas of poor soil and little rainfall, the cultivator cannot subsist unless the size of the holding is extensive.

The problem of poverty in agriculture is a real one, because nearly two-thirds of the farms are of 5 acres each and nearly half of them are of less than 3 acres each, as Table

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* statistics. Andhra Pradesh.
NIZAMABAD DISTRICT

AGRICULTURAL HOLDING

INDEX

Agricultural holding per cultivating household
(in acres)

1.00 — 4.99
5.00 — 9.99
10.00 — 14.99

MAP 9
No. 16 indicates, by which neither family consumption nor bullock and cattle maintenance is adequately met. At the same time, these farms cannot deliver much surplus for other sectors of the economy. Furthermore, these draft-farms are mere specimens of wastages of resources, for they cannot utilise fully their own family labour or bullock labour. Being already too small, they are further divided into smaller fragments, thereby raising the cost of production too high. These farms are further fragmented as population grows and the family breaks up. Table shows that these pocket sized farms of less than 5 acres, occupy only 15% of the total cropped area, so that the other 85% of the area is relatively free from the defects of petty farming. The low income found in the majority to small farms is partly the result of a settlement of people on small sized farm units, surplus members in farm families, lack of productive investment and low productivity.

The Economy of the District:
The economy of the inhabitant of Nizamabad centres around agriculture. In all, the majority of households are dependent on cultivation and they are mainly owner-cultivators i.e., those who own the land and cultivate it, and some are tenant-cultivators, i.e., those who do not own the land but cultivate the land leased out by the owner. The land owners in the district usually cultivate their lands but for a few stray cases. A few land owners, who are engaged in service, take leave during the season from the office to cultivate their lands by engaging hired labourers on daily wages, and the remaining operations are attended to by the women. Besides agriculture, blacksmithy, carpentry, beedi making, service and running of hotels and businesses are some of the other occupations of different households. As indicated in the table, Agricultural labour is the chief subsidiary
occupation for a large number of households of various communities. Both adult males and females of different castes engage themselves as labourers during the season. A study of the occupational pattern reveals that agriculture is the main occupation with sugarcane cultivation as the main source of income. Economically, the district has been quite progressive. The economic growth of this district is due to the irrigation facilities created on the opening of the Nizamsagar Canal in the year 1938, and it has further become a predominant sugarcane growing district due to the marketing facilities assured by the Bodhan Sugar Factory. The main crop of this district is paddy and sugarcane. The paddy produced in the entire district is more than sufficient for domestic consumption, and as such, the paddy is sold to other districts. Sugarcane is mostly grown purely on a commercial basis (in this district). Added to this, the proximity of the Bodhan Sugar Factory has greatly influenced the economic structure of this district within the span of a decade.

Table 16b.
Sample Household engaged in cultivation classified by Size of Land cultivation (Based on 20 per cent sample)

<table>
<thead>
<tr>
<th>Household Engaged in Cultivation by Size of Land cultivated</th>
<th>Number of Cultivating Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Less than 1</td>
<td>4,927</td>
</tr>
<tr>
<td>(2) 1.0 - 2.4</td>
<td>8,595</td>
</tr>
<tr>
<td>(3) 2.5 - 4.9</td>
<td>5,963</td>
</tr>
<tr>
<td>(4) 5.0 - 7.4</td>
<td>3,266</td>
</tr>
<tr>
<td>(5) 7.5 - 9.9</td>
<td>1,391</td>
</tr>
<tr>
<td>(6) 10.0 - 12.4</td>
<td>1,399</td>
</tr>
<tr>
<td>(7) 12.5 - 14.9</td>
<td>481</td>
</tr>
<tr>
<td>(8) 15.0 - 29.9</td>
<td>1,551</td>
</tr>
<tr>
<td>(9) 30.0 - 49.9</td>
<td>446</td>
</tr>
<tr>
<td>(10) 50+</td>
<td>212</td>
</tr>
<tr>
<td>(11) Unspecified</td>
<td>7</td>
</tr>
</tbody>
</table>

Source: Census of India - Andhra Pradesh, 1961 vol. II Part II
Census Household:

The definition of a "Census House" and a "Census Household" as adopted in the 1961 Census - a house represents a structure, whereas a household is the human group. A household means a group of persons who live together as a family.

There are four kinds of families, i.e., simple, intermediate, joint and others, and all the four types can be seen in this district. The simple family consists of Husband, Wife and unmarried children, and the intermediate family consists of a married couple, unmarried brothers, sisters and one of the parents; the joint family consists of a married couple with married brother, sons/daughters or with married brothers/sisters. All the rest are treated as other types. The existence of a major number of simple family type of households indicated a disintegrating tendency in the joint and intermediate form of family organisation. The heads of the households are mostly males. The rapid pace of industrialisation and the growth of urban centres providing wide avenues of employment and entertainment have brought in their wake the simple family system in place of the traditional joint family system. This trend is slowly spreading even to this place also, therefore, there is a majority of simple households. It is therefore clear that the joint family system is slowly being replaced by the simple type of families.

According to the 1961 Census, in the rural areas of the district, households engaged in cultivation only are the most numerous, constituting nearly 50% or more of the total number of households; the next numerous category being that of households engaged neither in cultivation nor household industry. These households in the urban areas, however
largest category in the district. Also, the proportion of households engaged in household industry only is higher in the rural areas perhaps indicating the tendency on the part of rural areas of the craftsmen and artisans to migrate to urban areas, than in the rural areas, because household industry in the rural areas may not be paying adequate returns. Household industry such as handloom weaving is mostly concentrated in small urban units. Another important point noticed is that the proportion of household industries is considerably higher compared to the proportion of households engaged both in cultivation and household industry, probably suggesting that in this district organised household industry has not yet developed to the extent of meeting the requirements of the population. Further, the proportion of households engaged neither in cultivation nor household industry is relatively smaller in the rural areas of the district which are backward and in which apparently the population still depends on the traditional family cultivation and rural crafts to a larger extent, than in the more prosperous areas where the people are able to take to alternative occupation.

Problem of Inheritance:—

In a joint family system after the death of the father, the sons will inherit the property in equal shares and the expenses in connection with the marriages of unmarried sisters and maintenance of mother are also equally borne by all of them. Most of the households have reported according to the Census that the property is inherited by the sons. No share is given to daughters, and, if anything at all is given it is in the shape of dowry offered at the time of marriage of the daughter, by the father. In a case where there are
no sons they generally adopt the children of their blood relation. They do not know the changes in the Inheritance of Property Act.

The marked decline in the joint family system is one of the potential causes for the periodical change in the land holding. It is quite usual that sons invariably divide the land amongst themselves to establish independent families soon after the death of their father. These resultant small land holdings are neither conductive to efficient farming nor sufficient enough to meet the needs of the family, and thereby the majority of them have to work as agricultural labourers or in any other occupation, to supplement their meagre income. In a few cases, the land that was mortgaged to raise finance had to be sold as the loans could not be repaid. Many of the farmers possessing small holdings have pledged their lands to the well-to-do families to finance cultivation expenses and social functions like marriage. The possession of a large extend of land is a measure of the social status of a person in the district. The people have great attachment for their land and traditional occupations. The agricultural farms located in the district are slowly changing the traditional methods of cultivation and are encouraging them to adopt modern techniques and practices of agriculture. The introduction of sugarcane cultivation on scientific lines has brought about perceptible change in the agrarian organisation of the village in the district. Farming practices have changed due to the local agricultural farms and the cultivation of commercial crops. It may be a matter of surprise if the villagers in due course leave the age-old methods of cultivation and adopt scientific methods for better agricultural output.
Agrarian Population:

The agrarian population of Nizamabad can be broadly classified as peasants, functionaries, and untouchables. The peasants' main subsistence is agriculture, where untouchables derive the major part of their income from agricultural labour. The functionary castes are numerically small and eke out their livelihood by rendering their traditional services both to the agriculturalist and the agricultural labourers. The Reddis are the dominant people as they are economically sound and politically strong. The major portion of cultivable land is under the ownership of Reddi caste people, and the required agricultural labour is recruited from the scheduled castes which is the weakest section in the district. This caste maintains a sort of line of least resistance policy with the farmer caste as they mainly depend on the goodwill of the farmers for their living.

With the advent of freedom, though many social legislations have been enacted by the Government in the country as well as in the district, the village and the rural people of this district are particularly hardly aware of them. The main cause is the illiteracy as according to the 1961 Census Nizamabad has recorded very low percentage of literate population. Taking the district as a whole, 35.32 per cent of the total population is literate, among them 40.30 per cent are males and 21.10 per cent females. Whereas 31.96 per cent of the urban population is literate and only 11.3 per cent of the rural population is literate. The urban population shows a higher percentage of literacy. The literacy among female population of the district has been quite poor, only 21 per cent of the females are literate. The literate percentage of urban and rural female population is 18.05 and 3.73 respectively. The majority of the females
in urban areas usually work in the fields.

No doubt illiteracy is the main cause of social evils, but one cannot help entertaining a feeling that the Government machinery has taken no effective measures to propagate knowledge of social legislation among villages and dispel the ignorance of the masses. For example, though the Child Marriage Restraint Act and the Prohibition of Dowary Act are in force, the villagers are hardly aware of their existence. Hence, widespread education may be the only remedy to correct the social evils.

**Inter-village relationship:**

Nizamabad has many independent villages. They are independent in the matter of education, traditional services of the blacksmith and carpenter, village panchayat and supply of labour. During the peak and agricultural season, the agricultural labourers are recruited from neighbouring villages. The culturalists of different villages affirm their mutual relationship by lending and borrowing the agricultural implements, bullocks and seeds whenever required during the peak seasons. They also discuss the cropping pattern. The villagers of one village prepare the required agricultural implements of the other villages. In turn the farmers make customary payments annually during the harvest season to them. They also help one another by supplying interest-free loans in time of need. Above all, the villagers most frequently visit Nizamabad town, the district headquarters, to purchase their domestic requirements and to sell the surplus agricultural produce. All other agricultural implements are also purchased from the Nizamabad market.

The regular markets are Nizamabad and Bodhan. The agriculturalists sell most of their sugarcane to the Bodhan
Sugar Factory. The villagers who live far from Bodhan sell their surplus, however, in the open market at Nizamabad, or consume it domestically in the form of gur, because they cannot go to the factory due to lack of communication resources. On the day of marketing the produce, the farmers enquire the prevailing market rate and then dispose of the stocks at a fair price. The ryots take particular care to ensure correct weights and measures, but a few illiterate and simple ryots are however, puzzled to calculate the weight of their produce in metric weights and measures such as quintal, killograms and other units which have recently been introduced. The ryots themselves market their produce. There are also a few commission agents who voluntarily assist the ryots in marketing the produce. All the villages are connected by roads and cart tracks, and a few of them with railways.

Agricultural Practices in the Region:—

In the district of Nizamabad as a whole, more than 55 per cent of the total area is available for agriculture, but the agricultural practices in the Nizamabad district, despite its favourable natural conditions has been stabilized at the lowest level of production. The land is very much under-utilised. The efforts of the farmers have been concentrated on the cultivation of wet lands, which form a very small portion in each village of the district and dry cultivation is almost neglected. The dry crops are completely left to nature. Dry cultivation is mostly done on primitive lines with wooden implements. Improved seeds are not common. The inadequate attention to manuring is another factor regarding agricultural growth in this area. Green manuring and inorganic manuring have not yet become very popular. Since the rainfall is
sufficiently high in the area and since red soils are most effective for crop growth, a smaller quantity of water and chemical fertilisers can well be used in dry areas. Despite the favourable natural conditions in terms of ground-water and rainfall, intensive cultivation has not developed in this region.

The study of existing structure of holdings reveals that land is concentrated either in large holdings or in uneconomic small holdings and a middle class peasantry having both labour and capital resources required for intensive cultivation has not yet developed. The agricultural population is found to be relatively less efficient. For a long time, this region was under feudal economy of Sarf-e-Khas (that is, estate owned by the ruler himself), and jagirs. Hence, incentives were absolutely absent in this regime. This stumbling block has been removed with the abolition of jagirs and with the enactment of Hyderabad Tenants and Agricultural Land Act, but the effect is not impressive, because the landless agricultural population still constitutes 25 per cent of the total agricultural population, according to the 1961 Census. The number of protected tenants recorded was over 6,000,000 and they were reported to be cultivating more than one quarter of the cultivated area of the State.

One other characteristic of this district is that the burden of livestock per acre is the highest, and to some extent comes in the way of intensive cultivation. Wet cultivation requires many ploughings even after water is let in and ploughing is very taxing due to the clayey nature of the soil. Even in dry areas, ploughing is very difficult due to the rocky nature of chalka soils. The practice of rearing animals within the farm is rare, and cultivators usually purchase their animals. The maintenance cost of livestock
is high due to the negligible quantity of hay available from the farm. The cultivators find it more economical to leave some land fallow rather than spend money on purchasing fodder. It is estimated by the planning commission that the average value of net produce from the dry area would be more than the expenditure they have to incur to feed the animals if they were to purchase the fodder. Such heavy cost of livestock per acre is a great handicap to the extension of areas under wells and in making cultivation more intensive.

Since most of the lands are chalka in this region, having no capacity for retaining moisture, fields must be watered every day for cultivation, particularly for sugarcane, unless the family has surplus labour to work on its own land, day and night, irrespective of the rate of remuneration, life irrigation for sugarcane cultivation is uneconomic. Again, the number of animal pairs required for dry cultivation increase more than proportionately with the increase in area under wells and their numbers. The expenditure required for maintaining these animals would not justify, for many farmers, the increase in the number of wells and their aycuts, because most of the areas, where wells can be sunk, there is undulation of the ground which reduces the scope for life irrigation. Electric pump sets or oil engines can only be useful in these areas.

The factors thus, which retard the growth of agriculture in this region are many, but they are inter-related. The imperfect institutional organisation typified by tenurial relationships has been the major factor so far. This factor is being removed through agrarian reforms but their impact is yet to be felt. The Ryotwari system is expected to prevail in future in this region, but major land improvements like sinking more wells, purchasing livestock should be first undertaken if the productivity of land is to be improved. If this is
not done, mere Ryotwari systems will not be in a position to raise productivity. What agriculture in this region requires in the initial stages is, therefore, more of fixed than of working capital. Since the savings available from increased production in the areas affected by land reforms will be diverted for paying compensation for a very long time, the region will not by itself be able to supply the necessary wherewithal to break the viscous circle of low productivity.

No doubt, this region has great potentialities for development of agriculture. The future development in the region as well as in the State, may therefore be tackled from different angles, taking into consideration the particular conditions prevailing in this region.
4th Chapter.
The high concentration of the sugar industry in the district of Nizamabad can be attributed to the physical, and climatic factors, which have favoured the cultivation of sugarcane.

Sugarcane is a thick stemmed grass not unlike maize in general appearance, it requires a rich soil and a hot moist climate with an annual rainfall of 40" or more (unless irrigated) and freedom from frost throughout the year, high humidity and a temperature of 80° or over in the warmest months are desirable. The climatic conditions of the district are particularly favourable for cane cultivation.

The alluvial soil contains adequate quantities of lime and potash and is suitable for sugarcane cultivation. This area lies entirely within the tropics, hence rainfall is uncertain, it averages 31" of rainfall throughout the year and more than 78 per cent rainfall is confined to only four months, i.e., June to September, and hence where agriculture is a gamble with the monsoon, irrigation is a necessity for assured returns. Therefore, cane cultivation is concentrated in the canal irrigated areas of the district of Nizamabad, where the water is plentiful due to the Nizamsagar canal. The cane production is spread all over the district but because of the existence of the cheap irrigation facilities, which are not completely present in other districts of the State of Andhra Pradesh.

The opening of Nizamsagar canal and the provision of irrigation facilities in the district in 1938 has played a notable part in the economic growth of Nizamabad. The entire area of sugarcane is grown under irrigated conditions. The main and greater source of irrigation
is the canal water. Next come the large tanks which are situated in the east, north and south parts of the district.

In 1931 some 16 per cent of the total area of the district was irrigated which corresponds to roughly twice that of the state. In 1961 the total area irrigated was 46.5 per cent. This increase may be mainly attributed to the Nizamsagar canal.

The cane area of this region increased from 1,000 acres to 13,000 acres in 1940. From then on, the area under cane cultivation has been increased every year. According to the 1961 Census the entire area under cultivation was 44,000 acres. This suggests that irrigation holds the key to agricultural prosperity in this region.

Since the opening of the canal the dry lands are being slowly converted into wet lands. Wet cultivation which was, prior to the opening of the canal, dependent upon tanks and wells, is now increasingly served by the canal. An appreciable increase in the size of the biggest holding under wet cultivation and a steep fall in the biggest size of holdings under dry cultivation indicate the trend brought about by the irrigation facilities provided by the canal. There is no marked change in the size of the smallest holdings.

Prior to the opening of the Nizamsagar canal, only dry crops like Jawar and Gingly etc., and a little rain fed paddy dependent upon the undependable monsoon were grown. Now much of the dry cultivation is replaced by irrigated crops.
Table 17

PARTICULARS OF LAND VALUE

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Year</th>
<th>Value of one acre of wet land (Rs.)</th>
<th>Value of one acre of dry land (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1951-52</td>
<td>1,500</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>1952-53</td>
<td>1,500</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>1953-54</td>
<td>1,600</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>1954-55</td>
<td>1,600</td>
<td>150</td>
</tr>
<tr>
<td>5</td>
<td>1955-56</td>
<td>1,800</td>
<td>150</td>
</tr>
<tr>
<td>6</td>
<td>1956-57</td>
<td>1,800</td>
<td>150</td>
</tr>
<tr>
<td>7</td>
<td>1957-58</td>
<td>1,800</td>
<td>200</td>
</tr>
<tr>
<td>8</td>
<td>1958-59</td>
<td>1,800</td>
<td>300</td>
</tr>
<tr>
<td>9</td>
<td>1959-60</td>
<td>2,000</td>
<td>400</td>
</tr>
<tr>
<td>10</td>
<td>1960-61</td>
<td>2,000</td>
<td>500</td>
</tr>
</tbody>
</table>

Source: Census of India 1961, Vol. 2 (A.P.)

There is a considerable increase in the land values also. Table 17 indicates the value of one acre of each of wet and dry land. There has been a steady increase in both the dry and the wet land as a consequence of the measures adopted for cultivating commercial crops. It is revealed by the Census Report of 1961 that a decade ago an acre of wet land used to cost about Rs. 500 but it was Rs. 2,000 in 1961. Similarly, the rate for dry land was about Rs. 100 per acre or even less.
but in 1961 the rate was Rs. 250 to Rs. 299, whereas the State's average was Rs. 199.3. Likewise the gross output per acre for sugarcane is the highest compared with that of other crops in all the districts excepting those districts where tobacco stands first, but in Nizamabad tobacco crops come next to sugarcane. The gross value of agricultural output depends upon the fertility of the soil, climate and rainfall, irrigation facilities, the cropping pattern and the variations in the value of agricultural output. According to the Census of 1961 the average value of annual agricultural output per cultivator was 876 rupees whereas the State's average was 836 rupees. Besides this, the State's average per cultivating household is also less than the district, being 1,618 rupees whereas the figure of Nizamabad district is 1,765 rupees.

In recent years the sugar industry has gained importance as an earner of foreign exchange, which can be assumed as one of the greatest factors of cultivating of sugarcane; as sugarcane at Nizamabad district contributes 27.7 per cent of the total agricultural output value in the State, which is the highest value among the districts of Andhra Pradesh, whereas the State's share was 5.6 percent of the total agricultural output value in the country in 1961.

Another reason for the concentration of cane cultivation in this region is multiple opportunities of employment, which is also a significant effect of the canal, which tempted many people to migrate from dry areas to this place.
The impact on population and employment:

The population density in the district is 328 per square mile, well above the average for the State, primarily because it is by far the most developed district in the State from the point of view of irrigation.

In 1901, the population of the Nizamabad district was 694,180 and in 1931 it was 655,737. During those 30 years the population of the district declined by 5.7%, but since 1931 there was a steady increase in numbers so that in 1961 the total was 1,021,513, thus showing an increase of 35.8 percent. This features an increase in the population only after 1931, i.e., after the completion of the project and proves beyond doubt the sustenance capacity of the project area. Some of the important reasons for the increase in population in the district, particularly the sugarcane cultivation area under the canal zone, are the influx of a large number of Andhra cultivating families and also thousands of agricultural landless labour from neighbouring districts.

The percentage of the population under agricultural employment in 1928 was 27.8 and each cultivator had an average of 1.83 acres of land. With the ensuring of water supply the percentage of population under agricultural employment increased to 68 per cent. In the canal tract agricultural labour, on an average, gets gainful employment for ten months of the year, whereas in the non-command zone of the canal, agricultural employment is irregular and the wage rate is much lower. Under sugarcane cultivation employment is spread throughout the year and during peak seasons the demand for farm labour rises very high.

1. Please refer also to Chapter III
2. Report on the Nizam Sugar Project by the Special Compensation Office 1332 F/ 1921 A.D.
Table 18 a.

(GOVERNMENT)

POWER ALCOHOL FACTORY SHAKARNAGAR.

Yearly Production, Sales & Profit Chart.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>ALCOHOL PRODUCTION (GALLONS)</th>
<th>SALES (GALLONS)</th>
<th>PROFIT (LAKHS Rs/)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1949-50</td>
<td>580,000</td>
<td>481,000</td>
<td>2.77</td>
</tr>
<tr>
<td>1950-51</td>
<td>464,000</td>
<td>462,000</td>
<td>2.51</td>
</tr>
<tr>
<td>1951-52</td>
<td>536,000</td>
<td>417,000</td>
<td>2.02</td>
</tr>
<tr>
<td>1952-53</td>
<td>884,000</td>
<td>830,000</td>
<td>2.14</td>
</tr>
<tr>
<td>1953-54</td>
<td>703,000</td>
<td>688,000</td>
<td>3.01</td>
</tr>
<tr>
<td>1954-55</td>
<td>726,000</td>
<td>338,000</td>
<td>1.25</td>
</tr>
<tr>
<td>1955-56</td>
<td>1,001,000</td>
<td>903,000</td>
<td>0.22</td>
</tr>
<tr>
<td>1956-57</td>
<td>1,086,000</td>
<td>1,189,000</td>
<td>2.16</td>
</tr>
<tr>
<td>1957-58</td>
<td>1,132,000</td>
<td>1,228,000</td>
<td>3.03</td>
</tr>
<tr>
<td>1958-59</td>
<td>1,137,000</td>
<td>1,032,000</td>
<td>4.30</td>
</tr>
<tr>
<td>1959-60</td>
<td>1,140,000</td>
<td>1,148,000</td>
<td>1.82</td>
</tr>
<tr>
<td>1960-61</td>
<td>1,782,000</td>
<td>1,809,000</td>
<td>4.37</td>
</tr>
<tr>
<td>1961-62</td>
<td>1,782,000</td>
<td>1,806,000</td>
<td>6.96</td>
</tr>
<tr>
<td>1962-63</td>
<td>1,884,000</td>
<td>1,562,000</td>
<td>6.72</td>
</tr>
<tr>
<td>1963-64</td>
<td>1,626,000</td>
<td>2,019,000</td>
<td>4.39</td>
</tr>
<tr>
<td>1964-65</td>
<td>1,838,000</td>
<td>1,879,000</td>
<td>2.28</td>
</tr>
<tr>
<td>1965-66</td>
<td>2,018,000</td>
<td>2,038,000</td>
<td>5.27</td>
</tr>
<tr>
<td>1966-67</td>
<td>1,515,000</td>
<td>1,502,000</td>
<td>3.20</td>
</tr>
<tr>
<td>1967-68</td>
<td>1,018,000</td>
<td>1,172,000</td>
<td>2.29</td>
</tr>
</tbody>
</table>

Source: The Nizam Sugar Factory.
Besides the Nizamsagar canal, the establishment of Bodhan Sugar Factory played an important role in localization of sugarcane cultivation in the district of Nizamabad.

As Nizamabad district on account of abundant irrigation facilities is an agricultural district, it is also considered to be one of the granaries of Andhra Pradesh. A great deal of sugarcane is grown here, therefore most of the large scale and other industries are agro-based with the bias on the exploitation of the sugarcane resources in the district. At Shakkarnagar in Bodhan taluk of this district is located the largest sugar factory in the country, and which ranks amongst the largest sugar factories in East Asia. Its producing capacity is 425 tons of sugar per day. Most of its raw material, i.e., sugarcane, is obtained from within the district. As an ancillary to this industry a power Alcohol Factory is also situated at the same place. Its production capacity according to Table 18a is 1,018,000 gallons per annum. Both these large scale units are under the public sector, situated at Bodhan. Bodhan is one of the most important sugar manufacturing centres in India. The Nizamsugar Factory is constructed here which distinguishes itself as manufacturers of white crystal sugar and 'Nifa' brand confectionery. Enormous quantities of sugarcane received by this factory are grown here, mostly within the taluk, and also in the rest of the district itself, as it is exhibited by Map 119. The Nizamsagar project provides assured supplies of water and so a rich variety of sugarcane is raised besides wet paddy. Bodhan presents a prosperous appearance and in recent years seems to have further increased in prosperity. Close to it
lies Nizamabad, the district Headquarters and it is connected with Nizamabad-Bodhan Branch Railway Line which is an important station on the Secunderabad-Manmad Line (meter gauge), which is indicated in Map No. 10. Besides being a business centre the town is also growing to be an important industrial centre. Bodhan connected by two telephone and telegraph exchanges including two sub-post offices, one at Shakkarnager and the other at Bodhan. The important Research Station of Rudrur is located in Bodhan. Another recently established sugar factory which is known as the Nizamabad Co-operative Sugar Factory is also situated at Jankampet, a few miles from Bodhan in Nizamabad Taluk.

In short, the sugar industry received great impetus from the completion of the Nizamssager Project and also

1 The Hyderabad Sugarcane Research Scheme started functioning in 1938 at the Government Agricultural Research Station, Rudrur. The principal object of the Institute is to select suitable types of cane and find out the manurial and cultural requirements for the "Chalka and Regar" soils at the Nizamabad area. The farm at the Research Station is carrying out varietal experiments on Eksali (one year) crop and the factory farm conducts the same varietal trail with Adsali (one and a half year) crop.

The Imperial Council of Agricultural Research has been granting a certain amount every year to this station and the rate of the expenditure is being borne by the State Government of Andhra Pradesh.

2 The Nizamabad co-operative Sugar Factory Ltd., ................
with the establishment of the Nizam Sugar Factory. The concentration of sugarcane crops in compact blocks enable the factory to get fresh supplies of sugarcane direct from the fields. A fortunate combination of these natural and man-made advantages is thus responsible for the localisation of sugar industry in the Nizamabad district.

The Nizamabad Co-operative Sugar Factory Limited, Nizamabad is registered as a Co-operative Society under Andhra Pradesh (Telengana area) Co-operative Societies Act 1952. This factory went into production on 14th November 1964 at Jankampet in Nizamabad Taluk. The sugarcane growers - members of the factory raise the cane from their own resources and also availing the facility provided by the primary Agricultural Co-operative credit societies, functioning within the zone of the factory.

Some 13,000 acres of land is under the cane cultivation and the crushing capacity of the factory is 11,000 tons per day.
THE NIZAM SUGAR FACTORY:

There are two plants, namely, N.S.F.I., and N.S.F.II in the Nizamsugar Factory with a total crushing capacity of 4,200 tons per day. These two plants function simultaneously. Graph No. 1 shows the production figures of the factory from 1950-51 to 1967-68.

The first plant of the factory with a crushing capacity of 1,200 tons per day was commissioned at Shakkarnagar in Bodhan taluk in the year 1938-39. Subsequently the increase in the area of sugarcane cultivation called for an increased crushing capacity. The management had also found it difficult to crush the available cane within the most economical period because of low crushing capacity. Consequently a bigger plant was then built, the largest in India. Thus from 1951-52 onwards the quantity of sugarcane used to be crushed in both plants was four thousand tons per day. Later additions to the plants has brought the crushing capacity to 4,200 tons per day. It is estimated that these additions alone have cost approximately 10 million rupees.

The installation of Oliver Vacuum Filters in the first plant in 1954-55 reduced sugar losses from 0.16% to 0.06%. The installation of the Turbo-Sugar Drive in 1957-58 has improved the lustre and appearance of the sugar produced in the same plant. In this regard it is quite interesting to note the performance of the Nizamsugar Factory from the point of view of production during the last fifteen years.
The Plantation Department.

The Nizam Sugar Factory actually started cane cultivation in the year 1937-38. The company which started with 100 acres of sugar plantation now has its own "Estate" of 16,000 acres.

ORGANISATION:

The Chief Plantation Officer is the Head of the Plantation Department. He is also the Technical Advisor to the Department and has directly under him two Plantation Officers, one Research Officer also known as an Agronomist, and one Extension Officer and two Superintendents. Plantation Officer I supervises five farms and Plantation Officer II supervises six farms. The Research Officer has a farm for experimentation. The work of the Extension Officer is to carry the results of the Research to Ryots and guide them to cultivate good quality cane. There are five small farms and six big farms, i.e., the whole estate of N.S.F. is divided into eleven organisational units called farms. There is one farm Superintendent for each of these eleven farms, who is assisted by two to four overseers and subordinate staff such as field men, Mukadams etc., five farm Superintendents are under Plantation Officer I and the other six farm Superintendents are under Plantation Officer II. The Overseers are assisted by irrigators, watchmen etc.

An organisation Chart of the Plantation Department is shown overleaf:
The Nizam Sugar Factory cultivates and contracts three varieties of crops viz., (1) Adsali, (2) Eksali and (3) Ratoon.

Table 18 shows the figures of the percentage of acreage under each crop, and indicates that the percentage of area under the Adsali crop is more than Eksali or Ratoon. The yield of Adsali crop per acre is also higher compared with the Eksali crop. Table 19 shows the yield per acre of Adsali and Eksali crops in the Nizam Sugar Factory Estate.

It can be seen from the above table that Adsali yield per acre on an average is more, compared with Eksali. Although the cost of production is higher for Adsali crop.
Table 18.b

<table>
<thead>
<tr>
<th>Years</th>
<th>Adsali</th>
<th>Eksali</th>
<th>Ratoon</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940-41</td>
<td>39</td>
<td>38</td>
<td>23</td>
</tr>
<tr>
<td>1941-42</td>
<td>70</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>1942-43</td>
<td>68</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>1943-44</td>
<td>68</td>
<td>22</td>
<td>10</td>
</tr>
<tr>
<td>1944-45</td>
<td>65</td>
<td>26</td>
<td>9</td>
</tr>
<tr>
<td>1945-46</td>
<td>96</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>1946-47</td>
<td>86</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>1947-48</td>
<td>89</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>1948-49</td>
<td>81</td>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>1949-50</td>
<td>92.20</td>
<td>5.60</td>
<td>2.20</td>
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<tr>
<td>1950-51</td>
<td>90.60</td>
<td>3.90</td>
<td>5.50</td>
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<tr>
<td>1951-52</td>
<td>76</td>
<td>0.90</td>
<td>23.10</td>
</tr>
<tr>
<td>1952-53</td>
<td>72.10</td>
<td>4.50</td>
<td>23.40</td>
</tr>
<tr>
<td>1953-54</td>
<td>71.30</td>
<td>0.60</td>
<td>28.10</td>
</tr>
<tr>
<td>1954-55</td>
<td>71</td>
<td>7</td>
<td>22</td>
</tr>
<tr>
<td>1955-56</td>
<td>83</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>1956-57</td>
<td>96.80</td>
<td>0.20</td>
<td>3</td>
</tr>
<tr>
<td>1957-58</td>
<td>92.70</td>
<td>2.50</td>
<td>4.80</td>
</tr>
<tr>
<td>1958-59</td>
<td>91</td>
<td>3.20</td>
<td>15.40</td>
</tr>
<tr>
<td>1959-60</td>
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<td>-</td>
<td>1.80</td>
</tr>
<tr>
<td>1960-61</td>
<td>98.20</td>
<td>-</td>
<td>0.99</td>
</tr>
<tr>
<td>1961-62</td>
<td>98.98</td>
<td>0.03</td>
<td>0.86</td>
</tr>
<tr>
<td>1962-63</td>
<td>99.14</td>
<td>-</td>
<td>1.20</td>
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<tr>
<td>1963-64</td>
<td>97.50</td>
<td>1.30</td>
<td>0.98</td>
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<td>1964-65</td>
<td>99.00</td>
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<td>1.15</td>
</tr>
<tr>
<td>1965-66</td>
<td>98.50</td>
<td>1.75</td>
<td></td>
</tr>
</tbody>
</table>

Source: The Nizam Sugar Factory.
The yield obtained in the first year was only 9 tons per acre on an average, now the average yield increased to 35 to 45 tons per acre which is much higher than the average yields in India, and this compares very well with the average yield of land under the farmers, which is about 35 tons per acre.

Approximately 250,000 tons of sugarcane crushed in the factory come directly from the factory plantation and about 350,000 tons are supplied by the farmers. The average crushing season lasts for five to six months. Since the installation of the factory, the value of the land in this area has risen from Rs. 50 per acre to an average of Rs. 2,000. Whereas the Company paid a rate of 8 annas per mound to the cane growers, the price now being paid is Rs. 2 per mound, i.e., three times more than the previous price. The net profits are also increased from Rs. 50,099 in 1959 to Rs. 240,000 in 1962-63.

In reality in the Nizamabad district all practical and realistic steps were taken for the development of cane cultivation and the major credit goes to the N.S.F. in this regard. In order to encourage cane production in the N.S.F. zone, from its beginning it has been launching a scheme of contracting cane in advance, giving the growers loans both in cash and kind, i.e., manure.

Table 22 shows the amount disbursed by way of contract advances, contracted area etc., from 1953-54, to 1966-67.

Apart from this, suitable varieties of cane seed were brought from outside the region and had been propagating for its adoption. The factory not only grows sugarcane on its own farm on scientific lines but also encourages ryots to grow cane by advancing loans. The impact of all these

* Please refer page no. 148 also.
### Table 19.

<table>
<thead>
<tr>
<th>Years</th>
<th>Yield per acre in tons</th>
<th>Adsali</th>
<th>Eksali</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950-51</td>
<td></td>
<td>32.80</td>
<td>20.40</td>
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<tr>
<td>1951-52</td>
<td></td>
<td>36.70</td>
<td>26.60</td>
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<tr>
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<td></td>
<td>33.70</td>
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</tr>
<tr>
<td>1953-54</td>
<td></td>
<td>40.80</td>
<td>29.50</td>
</tr>
<tr>
<td>1954-55</td>
<td></td>
<td>41.10</td>
<td>24.60</td>
</tr>
<tr>
<td>1955-56</td>
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</tr>
<tr>
<td>1957-58</td>
<td></td>
<td>48.20</td>
<td>33.70</td>
</tr>
<tr>
<td>1958-59</td>
<td></td>
<td>37.40</td>
<td>21.30</td>
</tr>
<tr>
<td>1959-60</td>
<td></td>
<td>44.47</td>
<td>-</td>
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<tr>
<td>1960-61</td>
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<td>38.48</td>
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<td>1961-62</td>
<td></td>
<td>44.34</td>
<td>21.16</td>
</tr>
<tr>
<td>1962-63</td>
<td></td>
<td>43.53</td>
<td>20.50</td>
</tr>
<tr>
<td>1963-64</td>
<td></td>
<td>37.73</td>
<td>23.04</td>
</tr>
<tr>
<td>1964-65</td>
<td></td>
<td>34.79</td>
<td>21.21</td>
</tr>
<tr>
<td>1965-66</td>
<td></td>
<td>36.03</td>
<td>21.97</td>
</tr>
</tbody>
</table>

**Source:** Report of The Nizam Sugar Factory
incentives and location has been tremendous, as is reflected in the total area under sugarcane cultivation which is about 16,000 acres in the entire region. The factory has 13,000 acres of wet land, and grows cane which is sufficient for about 30-35 per cent of its needs. The soil surrounding the factory, extending to a radius of about 15 to 20 miles, is ideally suitable for the growth of sugarcane and is entirely irrigated by the Nizam Sugar canal. The vast plantation system of the factory is divided into 11 farms and mechanised farming has also been introduced.

In fact, there is more area now under the improved varieties. In 1940, after the introduction of the Nizamsagar canal the area under the improved varieties was 57.7 per cent of the total area which increased to 1.98 per cent in 1961, whereas in 1930 only indigenous varieties were grown. Co.419 has been termed a 'wonder cane' and is cultivated on 80 per cent of the estate, as the graph No. 2 indicates the growth of Co.419 in both kinds of soils.

There is a proper co-ordination maintained between the Research work conducted by the Government Sugar Cane Research Station Rudroor and the Research Work Station of the factories at Belal. Both the stations have been continuously working on development of cane cultivation in the right channels for the past thirty years and the working is still in progress to achieve better results.

Surprisingly there is no production department as such in the N.S.F. On the other hand, the Chemical Department and the Mechanical Department are combinely called the production department.
The Nizam Sugar Factory was also an instrumental in the establishment of a power alcohol factory, its capacity is to produce 2,000,000 gallons per year, and it converts molasses from the sugar factory into industrial alcohol, which is the base for the entire pharmaceutical industries and also for the production of acetic acid and acetate rayon. A confectionary unit was established in the year 1961 and NIFA sweets are the most popular varieties consumed by all children of all ages. A unit for the production of Carbon-di-Oxide which is a by-product of alcohol has also been established and thus the Nizam Sugar Factory is the hub round which a number of industries are built, and it is a vital factory in the industrial growth of Andhra Pradesh.

Any undertaking nowadays can be judged by the profits made and the return on the capital. From 1937 to 1966, the company must have returned to its subscribers the original capital at least eight times over. It has given various bonus issues. It served the difference between the conversion of the Osmania Sicca to the Indian Government currency and this was virtually another bonus share issue. Its average dividend was little over 20% all these years and the lowest dividend declared ever is 15% judged in the context of the average return on capital in India by the one hundred leading companies. This is a remarkable achievement no doubt.

Moreover, in view of the general shortfall in sugar production all over the world, and also in this country during the last season, controls have been introduced by the Government of India on the production and distribution of sugar. To meet the internal demand for sugar and for export purposes a scheme to further increase the capacity
to 5,000 tons per day is under the consideration of the management Committee. With the implementation of this scheme, the Nizam Sugar Factory could be classified as one of the major sugar units in the world.

The Nizam Sugar Factory provides employment for about 15,000 workers including the plantations. In addition, the private farms provide a source of livelihood for about 20,000 persons. Even then, it requires a surplus labour; so, as far as the N.S.F. is concerned, in the past it had some surplus labour. At present it is being managed by the bearest minimum. As a matter of fact, in some cases the labour employed is little less than the minimum requirements.

Though the two plants can be said to be one hundred per cent efficient, both of them are working with a fair amount of efficiency, and with the development that is being planned, the efficiency will improve further.

Out of the 11 farms, only eight farms are benefitted by the factory's own light railway facilities. Map No. 12 shows that the railway cover is about 48 miles for transport of sugar. The factory has seven steam locomotives, five diesel engines and a rolling stock of 1,200 bogies. Besides transporting farm cane, the company transports farmers' cane also where Central Railway transport facilities are not available.

By utilizing the vast water potential provided by Nizam-Sagar Project, the Nizam Sugar Factory became the key to the prosperity in the entire countryside. Hence this is the main cause for the localization of sugarcane in the district of Nizamabad.
CALENDER OF SUGAR CANE CULTIVATION
IN TELANGANA

SOURCE: Nizam Sugar Factory
THE CHARACTERS OF CANE CULTIVATION.

In the district of Mizamahad, as in the rest of India, the agricultural year is clearly divided into a Kharif (Autumn) and a Rabi (Spring). The Rabi crops wheat, Jawar and gram are sown in October, November, December and January and is harvested from mid March to mid May. The Kharif crops Kharif Jawar, Bajra, Cotton and small Millets are sown from May to July and are harvested from September to November. Winter Rice is also an important Kharif crop. The first rice crop is sown in July to August and is harvested in November to December, whereas the second rice crop of shorter duration is sown in December to January and is harvested in April to June. Hence the cane crop here may partially interfere with the harvesting of the first rice crop and the sowing of the second.

In the Nizamabad district the cane crop is usually counted as a Kharif crop although it does not fall clearly into either category. Where cane is grown on land, which normally yields only one Kharif crop a year, it may displace only one crop, for cane can be planted in January to February, or four months after a Kharif crop harvest, and be harvested by March-April in the following year, well before another Kharif crop is due to be planted, i.e., the Second Rice Crop.

Sometimes, however, farmers find it necessary to leave land fallow for a full year before cane is planted. In such a case, sugarcane would displace two Kharif crops. Where cane is grown on land, which normally yields one Rabi crop of the year in which the cane is planted as well as the Rabi crop of the year in which cane is harvested. (Often cane is grown on fertile land yielding rarely three crops a year) other things being equal, the cost of growing cane would obviously be
higher, the greater number of crops it displaces.

The Calendar of Sugarcane Cultivation is exhibited in diagram No. 2.

The sugarcane cultivation may be classified into two types, and in some places three, namely Adsal or dedsal (1½ year crops), eksal (one year crop) and madgam (nine months crop) depending on the duration of the crop. For the last fifteen years, sugarcane cultivation has been taken up in most of the villages of Nizamabad district, particularly in Bodhan Taluk, as a commercial crop, though it requires more capital and labour. Moreover, the soil needs several deep ploughings before seedlings are planted. Each acre so ploughed requires sixty maunds (one maund is equal to 83% lbs) of seedling. Sugarcane requires not only 14 to 16 months to mature but also attention until it is harvested. The most common season to prepare the land for sugarcane cultivation is after the first fall of rain, i.e., in May. The indigenous method employed by local cultivators to plough the land after serving the plot with water in the months of March and April, followed by manuring with organic manure at the rate of 20 to 30 cart-loads per acre, and after ploughing a number of times. Some cultivators engage tractors to plough the sugarcane plots as it requires deep furrows. The other prerequisite is assured and ample supply of water all through the period of cultivation until harvesting.

During the months of May and June, earthen bunds (locally known with various names, i.e., Bodelu) of 16" width, 10" to 12" depth including 4" soil at the base of the trench are dug. The trenches are usually spaced so that they are about 30" to 40" apart. Afterwards the chemical fertilisers (two bags of superphosphate, one bag of ammonium

Madam or Ratoon.
sulphate and two bags of oil-cake) are used both for basal and top dressing of these trenches. The well grown sugarcane is cut into convenient pieces for handling and each piece contains three buds, which is technically known as a setts. As the top setts are fertile for germination, only one eighth portion of the cane is used as seed material. Some cultivators grow sugarcane in small plots of 15 to 20 cents of area and the immature sugarcane of six months old is entirely cut into convenient sizes so as to avoid the wastage that would otherwise be there. The seed material is to be handled carefully and the canes are hand stripped to avoid damage to the buds. Such canes, which are not affected by the common diseases, namely redrot, striga, borer pest and smut, are only used for seed material. Thus the selected setts are kept along the ridges for speedy plantation. Water is then let into the furrows or trenches, as the case may be, to soak them thoroughly and the setts are pushed in carefully leaving a four foot space in between the rows, keeping the buds to the sides. A greater number of setts germinate during the second and third weeks and it continues even up to the fifth week after plantation. Those setts which have not germinated even in the fifth week are removed, and the gaps are filled up again by new setts. Some cultivators raise a nursery in a small plot of land to meet the eventuality of gap filling with the seedlings of the same age as the main crop so as to maintain uniform growth of all the plants.

Sugarcane is an exhausting crop, hence the soil requires heavy doses of manure. During the first six months of the crop, constant irrigation and particular attention is essential. The crop is watered once in every 15 or 20 days. The weeding operations are conducted one month after earthing.
the setts. Small holes are made at every sett to serve the seedling with manure. These holes are then covered with earth. This method prevents the fertilisers from draining off due to heavy rains or excess of water supplied through the channels. The second dose of chemical fertilisers usually consists of eight bags of oil-cake, two bags of ammonium sulphate and two bags of superphosphate. The land is ploughed twice before applying this dose during the second month of the crop. Half of this dose is used for basal dressing, while the other half is used for top dressing. Hoeing and weeding operations are conducted a month later, leaving a gap of 45 days. The third dose of manure, consisting of six bags of oil-cake, and two bags of ammonium sulphate is applied to the field as described earlier. The earthing is done at least once a month by removing the earth on the ridges or by trenching in the centre of the inter spaces with spades. This periodical earthing gives a very good hold to the crop. Consequently with this type of earthing, the previous furrows become ridges and the former ridges become furrows or trenches. The advantage of this method is that it enables rain water or the excess water to run out in the fields from the feeding channels to drain off easily. The crop vigorously grows to the maximum possible during the period of November to February by which time the crop is five months old. The early shoots of the plant, springing from the bottom of the original sett are not removed periodically as they are injurious to another plant. The early tillers mature along with other plants by the time of the harvest season, and thereby increase the output. The following Charts No. 4-5 exhibits the studies on time of planting and harvesting.
It is quite a common practise in the sugarcane tracts to twist the bottom leaves round the sugarcane stem so as to keep the sugarcane covered completely round the stem and thereby protect the stem from any possible damage, such as exposure to the weather and the sun, cracking of the bark or damage by rats, lizards, squirrels and jackals, also insects. A thick wrapping of these leaves, which is not a common practise, preserves the high quality of juice. The wrapping is started when the crop is three months old and the second wrapping is done in the fifth or sixth month of the crop, thus this process is carried on once a month or once in one and a half months until two months prior to the harvest of the crop.

To keep the plant verticle, two methods are employed by the cultivator.
1) The thin slender canes are supported by straight long bamboos fixed close to the plant and the leaves are twisted round the stems, the props are for additional support during the period of second wrapping. This avoids uprooting of plants due to forcible winds or when the soil becomes wet and soft due to excess water. The lodging of sugarcane deteriorates the juice quality of the cane.
2) The trashtwist method is advised by the Department of Agriculture. It is an economical method of keeping the crop erect. The canes of two adjacent rows of a bed are bent a little and brought together at a height of four feet, and the leaves are carefully twisted and interlooped to form a thick rope in order to hold the canes against any type of casualty. These methods are adopted to make the cane stand erect. It is interesting to note that no need is

1 When a crop is heavy, i.e., yielding about 40 tons to an acre, the canes bend and lie almost flat on the ground.
given to improve the quality of the cane which is mainly intended for crushing in the factories. This reduces the amount of expenditure as payment is made on tonnage rather than on quality of juice.

The crop is usually protected by applying pesticides against such common pests as top shoot borers, leaf hopper (Pyrilla perpusilla) and must. Flowering indicates that the growth of plant has ceased and that ripening phase has set in. At this stage, the cultivator will be busy again trying to secure labour for harvesting the crop. The maturity of the sugarcane is usually tested by testing the cane. If the cane is sweet when chewed, it is considered mature for harvest. The majority of cultivators conduct the harvest operation on a contract basis. A fixed amount (Rs. 2.50) is paid per ton of harvested crop. The cane is simply cut and tied into portable bundles. In order to transport these bundles to the roadside, an amount of Rs. 2 is paid to the labourer for each ton. Thus the crop is made ready for transport to Bodhan Sugar Factory by lorry by paying Rs. 6 normally for a distance of eight miles, for each ton of cane. Only 50 paisa is paid for loading and unloading a ton of sugarcane. In some villages the average yield per acre varies from 45 tonnes to 50 tonnes.

The cultivation of Eksali sugarcane is usually started in the month of January or soon after the harvest of paddy crop. Chart No. 5 indicates the time of planting and harvesting for the years 1957-60. The process is not much different to that of the Dedsal crop. It is also quite complicated and cumbersome. Here, the dressing of the ridges is neither taken up nor the water channels are provided. The field is ploughed three or four times and the bunds are formed just as in the Dedsal crop. The
cultivators usually apply a total dose of 225 lbs of nitrogen for the Eksal crop while a minimum of 350 lbs of nitrogen is required for the Dedasl crop. Each acre requires 60 maunds of seed material. The first dose of manure is applied within a month of transplantation, which consists of two bags of superphosphate, two bags of khalli (oil-cake) and one bag of ammonium sulphate. The land is then ploughed after applying the manure and weeds are also removed. The second dose of manure, consisting of four bags of khalli and one bag of ammonium sulphate is applied after a gap of 45 days from the date of application of the first dose of manure. The land is again ploughed and the weeds are removed so as to enable the maximum crop growth. The third dose of manure, six bags of khalli and one bag of ammonium sulphate, is applied in the first week of June when the crop is six months old. The earthing is done with a spade whenever manure is applied. The cultivator takes particular care to water the fields without forming any cracks. The twisting and propping operations are also conducted, depending on the need. The trashtwist method is usually followed to economise expenses of cultivation. This crop requires one full year (12 months) for maturity. In this Eksal crop the total yield per acre varies from 30 to 40 tons depending on the care taken by the cultivator.

The sugarcane crop of nine months duration is colloquially known as madam. This method is usually preferred by the cultivators when they are unable to finance the paddy crop as they need not spend any amount for preparation of the field and for seed material. Unlike Dedasl and Eksal crops, the land is neither ploughed nor are the bunds constructed for transplanting the setts. Soon after the harvest of the Dedasl or Aksal crop, the field is
watered and ploughed in such a way that the roots of the original plantations are not disturbed. The earth is carefully loosened around these seedlings and the first dose of manure consisting of two bags of oil-cake, one bag of ammonium sulphate and one bag of superphosphate is applied. The weeds are also removed, then the field is watered. Afterwards, the field is ploughed so as to cover the manure with earth. The second dose of manuring, six bags of oil-cake, two bags of ammonium sulphate and one bag of superphosphate, is taken up after an interval of 45 days from the date of the first manuring and then it is covered with earth by ploughing the land. If it is necessary, the weeds and tillers are removed. Accordingly, the third dose of manure, i.e., two bags of ammonium sulphate is again applied after a gap of 45 days from the date of the second manuring and the field is then watered. Care is taken to remove the weeds and tillers to allow the maximum growth of the crop. All other precautions like constant watering, wrapping and periodical spraying of insecticides to guard the crop against common diseases, are taken to improve the field. The crop usually ripens in the ninth month but the harvest operation is only conducted in the eleventh month. The harvest operations are the same as in the case of Dedsal and Eksal crops. The yield varies between 30 to 40 tonnes per acre.

The cost of cultivation under the different systems of cultivation employed in this area is described in Table 20. In this table, the expenditure is calculated on the following yields:

Dedsal 45 tonnes, Eksal 40 tonnes, Madam 30 tonnes (per acre), XXXX is an assumed yield of an average farmer. The sugar factory pays Rs. 45 per tonne of sugarcane as delivered,
### Table 20

**COST OF CULTIVATION PER ACRE**

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of activity</th>
<th>Dedsal</th>
<th>Eksal</th>
<th>Madkam</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Organic manure 20 or 30 cart loads</td>
<td>60.00</td>
<td>60.00</td>
<td></td>
<td>Invariably home supply.</td>
</tr>
<tr>
<td>2a</td>
<td>Ploughing charges (including first and second ploughing)</td>
<td>60.00</td>
<td>60.00</td>
<td>30.00</td>
<td>No first &amp; 2nd ploughing in case of Madkam.</td>
</tr>
<tr>
<td>2b</td>
<td>Tractor cultivation (ploughing)</td>
<td>125.00</td>
<td>125.00</td>
<td>30.00</td>
<td>(Exclude this from the total expenditure)</td>
</tr>
<tr>
<td>3</td>
<td>Forming bodelu (furrows and trenches)</td>
<td>22.50</td>
<td>22.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Planting of setts</td>
<td>15.00</td>
<td>15.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Construction of water channels</td>
<td>9.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>First weeding</td>
<td>20.00</td>
<td>20.00</td>
<td>15.00</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Total manuring charges</td>
<td>580.00</td>
<td>400.00</td>
<td>400.00</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Application of manure for three times</td>
<td>45.00</td>
<td>45.00</td>
<td>45.00</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Cost of seed material (80 mds. per acre)</td>
<td>180.00</td>
<td>135.00</td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Second weeding</td>
<td>12.00</td>
<td>12.00</td>
<td>12.00</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Trenching of manure</td>
<td>50.00</td>
<td>50.00</td>
<td>50.00</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Wrapping</td>
<td>15.00</td>
<td>15.00</td>
<td>15.00</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Second wrapping and propping</td>
<td>15.00</td>
<td>15.00</td>
<td>15.00</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Periodically feeding the plot with water till harvested</td>
<td>60.00</td>
<td>60.00</td>
<td>60.00</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Harvesting, i.e., cutting and making bundles @ 2.50 per ton</td>
<td>112.50</td>
<td>100.50</td>
<td>75.00</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Transport to road side @ Rs. 2 per ton</td>
<td>90.00</td>
<td>80.00</td>
<td>60.00</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Transport on a lorry or bullock carts @ Rs. 6 per ton</td>
<td>270.00</td>
<td>240.00</td>
<td>180.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,616.00</td>
<td>1,330.00</td>
<td>957.00</td>
<td></td>
</tr>
</tbody>
</table>

The Research Programme Committee, Planning Commission, Government of India.
hence, the respective income per acre of land under each of these three systems of cultivation is given in Table 21, which shows the differences of the expenditure.

The farmers who have cultivated Dedsal crop invariably take up the cultivation of Madam crop as well, since they can save the expenditure on seed, initial ploughing, bunding and water channels etc. Moreover, the cumulative margin of profit is quite appreciable in this type of cultivation.
Table 21

NET INCOME PER ACRE

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of type of crop</th>
<th>Gross Income</th>
<th>Expenditure</th>
<th>Net Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Dedsal</td>
<td>Rs. 2,025.00</td>
<td>Rs. 1,616.00</td>
<td>Rs. 409.00</td>
</tr>
<tr>
<td>2.</td>
<td>Eksal</td>
<td>Rs. 1,800.00</td>
<td>Rs. 1,330.00</td>
<td>Rs. 470.00</td>
</tr>
<tr>
<td>3.</td>
<td>Madkam</td>
<td>Rs. 1,350.00</td>
<td>Rs. 957.00</td>
<td>Rs. 393.00</td>
</tr>
</tbody>
</table>

Impact of Bodhan Sugar Factory:

The present economic prosperity of the district is built around irrigation and the establishment of the Bodhan Sugar Factory. The change from a mere subsistence economy to cash economy is the concomitant of the irrigation facilities provided by the Nizamsagar Canal. The operations connected with sugar cane cultivation extend through all seasons, and this has brought in a remarkable adjustment between the productive and social aspects of life. Due to planned programming of sugarcane cultivation to meet the demands of the factory, the farmer, unlike in old times, has got very little time to devote his attention to any of the social functions. Irrigation has made their lands remunerative, intensified the farmer's attention on cultivation and thus strengthened the agricultural economy.

As regards the capital investment, most of the farmers borrow from the local and well-to-do agriculturalists or from private money lenders until they earn cash from the sale of the cane. The large sized co-operative societies also offer loans for agricultural purposes. The sugar factory also pays generally Rs. 400 (£20-0-0) per acre to the farmer to enable him to meet the cultivation and harvest expenses on condition that cane is supplied to it. The factory extended various amounts of loans and charges 7½% interest on such advances and the entire amount is realised at the time of delivery of the cane. In some villages, the sugarcane is, however, essentially grown under contract to the Factory. In the month of July or August, a responsible Officer of the sugar factory inspects the sugarcane plots and specifies the tonnage to be supplied but not the cane produced on an acre of land. Thus the factory avoids the risk of supervising every acre.
The amounts disbursed by way of contract advances, contracted area and cane supplied by ryots during the last 14 years are given below:

<table>
<thead>
<tr>
<th>Year</th>
<th>Total contract advance paid in Rs.</th>
<th>Contracted area in acres</th>
<th>Cane supply by ryots in tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1953-54</td>
<td>1,525,657</td>
<td>13,441</td>
<td>158,798</td>
</tr>
<tr>
<td>1954-55</td>
<td>2,451,129</td>
<td>13,798</td>
<td>226,058</td>
</tr>
<tr>
<td>1955-56</td>
<td>4,160,663</td>
<td>19,575</td>
<td>423,400</td>
</tr>
<tr>
<td>1956-57</td>
<td>2,057,869</td>
<td>12,614</td>
<td>342,981</td>
</tr>
<tr>
<td>1957-58</td>
<td>1,456,997</td>
<td>8,742</td>
<td>284,774</td>
</tr>
<tr>
<td>1958-59</td>
<td>2,016,715</td>
<td>11,486</td>
<td>258,712</td>
</tr>
<tr>
<td>1959-60</td>
<td>3,409,444</td>
<td>13,696</td>
<td>272,068</td>
</tr>
<tr>
<td>1960-61</td>
<td>5,083,235</td>
<td>16,204</td>
<td>447,329</td>
</tr>
<tr>
<td>1961-62</td>
<td>4,341,926</td>
<td>14,959</td>
<td>366,280</td>
</tr>
<tr>
<td>1962-63</td>
<td>4,615,255</td>
<td>11,630</td>
<td>340,845</td>
</tr>
<tr>
<td>1963-64</td>
<td>3,737,847</td>
<td>12,523</td>
<td>244,078</td>
</tr>
<tr>
<td>1964-65</td>
<td>6,671,390</td>
<td>16,894</td>
<td>457,361</td>
</tr>
<tr>
<td>1965-66</td>
<td>5,195,395</td>
<td>15,767</td>
<td>1,818,438</td>
</tr>
<tr>
<td>1966-67</td>
<td>1,423,996</td>
<td>8,037</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Recent of The Nizam Sugar Factory.
of land at all stages for better yield of the crop. The farmers, in their anxiety to earn more money by supplying more tonnes of cane to the factory take great interest throughout the growth of the crop. The Factory's fieldman inspects the crop three or four times before it is harvested and advises the ryots (farmers) to take the necessary measures to produce better cane. Each ryot is issued with a permit specifying the tonnes of cane to be brought to the Factory. The fieldman also reports to the Factory authorities about the stage of the crop in different fields so as to enable the latter to issue cutting permits depending on the cane requirements. The cropping seasons are also decided by the Factory so as to maintain a continuous supply of the cane all through the year. The cutting permits are issued depending on the recommendations made by the fieldman. In order to win the good will of the fieldman, the peasants offer presents and also bribe him so as to secure cutting permits. The factory does not take any responsibility to purchase the cane which is not covered by a permit. Moreover, no compensation is paid to any ryot if the crop is affected by draught. The Factory has not only control of most of the area under sugarcane but also regulates the cropping pattern depending on their needs.

As regards the marketing of sugarcane, the ryots do not have any anxiety, as they simply deliver the cane according to the direction of the Factory authorities. The agricultural produce is usually transported by the double bullock carts to various marketing centres. Most of the quantity of sugarcane produced in various villages is sold to the Bodhan Factory and the surplus sugarcane at Nizamabad markets. Lorries are also used to transport
the agricultural produce.

Good progress has, however, been achieved during the last decade, i.e., since the establishment of the Nizam Sugar Factory at Bodhan (\textit{Graph 3}). The chief improvements are:

a) Though most of the soils are generally poor in organic matter, suffering from impeded drainage and are highly abrasive to tillage implements, their moisture retentive power is also low, but in spite of these drawbacks, as a result of the developmental efforts of the Company during the last 25 years, adoption of new and hardy (long standing) crop varieties, manurial tests and Chanisation of cultivation, it has been found possible to obtain yields ranging from 50 - 75 tonnes per acre on an area of about 1,000 acres, and the average of 43 tonnes per acre on the entire estate of 16,000 acres. (But in the year 1964-65, the factory farms yielded an average of only 32 tonnes per acre. The decrease in yield was mainly due to severe drought conditions and scanty supply of water.)

b) The successful working of the factory farms, which were also serving as demonstration centres to the cultivators of the area, has served to encourage farming by the ryots. Improved methods of cultivation practised on the farms were adapted by ryots, and cane cultivation became a remunerative enterprise. This has resulted in the increase in land prices from Rs. 330 per acre in 1938-39 to about Rs. 3,000 at present.
ECONOMICS OF CANE CULTIVATION:

The economics of cane cultivation on the factory estate can be known with the help of an Analytical Statement of Cost of Cane Cultivation per acre over four years i.e., from 1959-60 to 1964-65. This statement is shown on the next page.

The Analytical Statement of Cost of Cane Cultivation shows that the cost of cane cultivation per ton works out on average to about Rs. 35/- except in the year 1964-65.

The cost of cane cultivation in this period is as much as Rs. 48.35 paise per ton. This was mainly because of acute drought conditions and low yield in this period. 1

The cost of cane cultivation by the factory is more compared with the ryots cost. The higher cost is mainly due to two reasons:

1) The wages paid to the labourers by the Factory are considerably more than wages paid by ryots. Normally the farmers pay labourers not more than one rupee per day whereas the Factory pays about Rs. 2.50 to Rs. 3.00 per day.

2) The cultivation of factory farms is supervised by the paid employees who may not have the same interest as the owner has. This will sometimes lead to wastages, but the ryots cultivate with great care and avoid all possible wastages. Unfortunately, it has not been found possible to frame any reliable estimates of cost of sugarcane cultivation by the farmers as they do not maintain any accounts.

Although the cost of cane cultivation in the factory's

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1 Please see the Analytical Statement on the following page.
Table 24.
STATEMENT SHOWING THE COST OF CANE CULTIVATION PER ACRE
IN N.S.F. ESTATE
(FROM 1959-60 TO 1964-65).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Direct Charges</td>
<td>1,118.28</td>
<td>1,033.18</td>
<td>1,236.18</td>
<td>1,109.02</td>
<td>1,024.09</td>
<td>994.74</td>
</tr>
<tr>
<td>B. Indirect Charges</td>
<td>316.43</td>
<td>329.46</td>
<td>280.60</td>
<td>314.35</td>
<td>308.41</td>
<td>302.47</td>
</tr>
<tr>
<td>Yield obtained in tons (Total)</td>
<td>1,434.71</td>
<td>1,361.64</td>
<td>1,516.78</td>
<td>1,423.37</td>
<td>1,332.50</td>
<td>1,302.21</td>
</tr>
<tr>
<td>Average yield per acre on the mill area in tons</td>
<td>40.38</td>
<td>38.27</td>
<td>44.28</td>
<td>43.42</td>
<td>39.89</td>
<td>31.98</td>
</tr>
<tr>
<td>Cost of cane per ton (A plus B average)</td>
<td>36.39</td>
<td>37.24</td>
<td>36.78</td>
<td>35.82</td>
<td>40.31</td>
<td>48.35</td>
</tr>
</tbody>
</table>

NOTE: (A) Direct charges include:

(B) Indirect charges include:

Source: The Nizam Sugar Factory.
farms is more than the cost of cultivation by ryots, the factory is making a good amount of profit every year, on its agricultural operations. The reason being that the minimum price fixed by the Government for sugarcane is much more than the cost of cultivation. The factory made a profit of Rs. 961,751 during the year 1964-65 as against Rs. 471,185 in the previous year on its agricultural operations.

The factory purchases cane from ryots at the rate of about Rs. 54 per ton, whereas it can cultivate at a considerably lesser cost. This is because of the limited area of cultivation by the factory. For the same reason the Nizam Sugar Factory follows the intensive method of cultivation. Therefore, the company has to necessarily buy the remaining quantity from ryots, as Table 23 shows both the figures, even if it is costly, otherwise it would result in under-utilisation of the plants, and the cost of under-utilisation may be much more than what the company has to pay per ton of cane. Further, the Nizam Sugar Factory, being a public undertaking has to take into consideration the socio-economic conditions of the ryots, whose well being or adversity largely depends on the Factory.

Control by the Government over Marketing Sales Methods:

Marketing of sugar, sales methods and prices are controlled by the Central Government. The Nizam Sugar Factory, as well as other sugar factories sell sugar in such quantities and to such parties as are determined by the Government. The dealers come to the Factory with permits and purchase the sugar. Sometimes the Government will direct the factories to release additional quantities of sugar to such States where there is serious sugar shortage. Graph 4 shows the total production and the sale value in rupees from 1949-50 to 1967-68.
### Table 23.

**AREA UNDER SUGARCANE, YIELD ETC. IN N.S.F. ZONE.**

<table>
<thead>
<tr>
<th>Season</th>
<th>Factory Farms</th>
<th>Ryots</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area Acres</td>
<td>Tons Supplied</td>
</tr>
<tr>
<td></td>
<td>Tons Supplied</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average Acre</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average Acre</td>
<td></td>
</tr>
<tr>
<td>1938-39</td>
<td>1,419</td>
<td>13,621</td>
</tr>
<tr>
<td>1939-40</td>
<td>2,271</td>
<td>30,102</td>
</tr>
<tr>
<td>1940-41</td>
<td>2,663</td>
<td>60,296</td>
</tr>
<tr>
<td>1941-42</td>
<td>2,911</td>
<td>83,780</td>
</tr>
<tr>
<td>1942-43</td>
<td>3,181</td>
<td>70,783</td>
</tr>
<tr>
<td>1943-44</td>
<td>3,376</td>
<td>65,777</td>
</tr>
<tr>
<td>1944-45</td>
<td>3,385</td>
<td>99,056</td>
</tr>
<tr>
<td>1945-46</td>
<td>2,680</td>
<td>103,700</td>
</tr>
<tr>
<td>1946-47</td>
<td>3,018</td>
<td>90,119</td>
</tr>
<tr>
<td>1947-48</td>
<td>2,769</td>
<td>104,926</td>
</tr>
<tr>
<td>1948-49</td>
<td>3,606</td>
<td>134,197</td>
</tr>
<tr>
<td>1949-50</td>
<td>3,411</td>
<td>105,330</td>
</tr>
<tr>
<td>1950-51</td>
<td>3,978</td>
<td>126,269</td>
</tr>
<tr>
<td>1951-52</td>
<td>4,190</td>
<td>142,470</td>
</tr>
<tr>
<td>1952-53</td>
<td>4,660</td>
<td>140,850</td>
</tr>
<tr>
<td>1953-54</td>
<td>5,162</td>
<td>200,324</td>
</tr>
<tr>
<td>1954-55</td>
<td>5,074</td>
<td>187,815</td>
</tr>
<tr>
<td>1955-56</td>
<td>5,181</td>
<td>226,161</td>
</tr>
<tr>
<td>1956-57</td>
<td>5,080</td>
<td>131,254</td>
</tr>
<tr>
<td>1957-58</td>
<td>5,247</td>
<td>188,692</td>
</tr>
<tr>
<td>1958-59</td>
<td>5,247</td>
<td>146,344</td>
</tr>
<tr>
<td>1959-60</td>
<td>5,592</td>
<td>225,818</td>
</tr>
<tr>
<td>1960-61</td>
<td>5,454</td>
<td>269,774</td>
</tr>
<tr>
<td>1961-62</td>
<td>5,365</td>
<td>237,059</td>
</tr>
<tr>
<td>1962-63</td>
<td>5,514</td>
<td>257,923</td>
</tr>
<tr>
<td>1963-64</td>
<td>5,904</td>
<td>224,176</td>
</tr>
<tr>
<td>1964-65</td>
<td>5,660</td>
<td>171,325</td>
</tr>
<tr>
<td>1965-66</td>
<td>5,852</td>
<td>197,474</td>
</tr>
</tbody>
</table>

Source: The Nizam Sugar Factory.
Again prices are a chief barometer indicating the degree of economic stability of the cultivators of a nation. Productivity, income and consumption pattern etc., are the secondary indicators. Stable prices stimulate better resource allocation in agriculture. This results in productive efficiency, income, security and economic stability. Thus all the three objectives of agricultural policy are interrelated and ultimately lead to improving social welfare.

The minimum sugarcane prices during 1963-64 to 1965-66 were fixed by the Government of India vide notifications and dated mentioned against the year given below:-


For the year 1963-64, the minimum prices of sugarcane linked to a recovery rate of 9% was fixed at Rs. 4.69 per quintal with a provision for an increase of Rs. 4.9 per quintal for every 0.1 increase in recovery. The factories in area where competition with gur and Khandsari was intense, were permitted to pay Rs. 5.36 per quintal in case the notified minimum price was less than Rs. 5.36 per quintal. The deduction which factories used to make on account of transport of cane delivered by cane growers to them at road side purchasing centres was limited to 32 paisa per quintal instead of up to 96 paisa per quintal allowed until the season 1962-63, calculated at the rate of Rs. 2.5 paisa per quintal per km. This was done to give an advantage up to 64 paisa per quintal to the cane growers supplying cane from more than eight miles away from the factories.

For the season of 1964-65, the basic minimum price of cane payable by sugar factories was fixed at Rs. 5.36 paisa per quintal delivered at the factory gate linked to recovery
rate of 10.4% or less. A premium of 4 paisa per quintal was payable for 0.1% rise in recovery above 10.4%. The maximum price for sugarcane delivered at the cane purchasing centres connected by rail was 32 paisa per quintal less than the price fixed for delivery at the rate of Rs. 2.5 paisa per quintal per kilometre could be deducted from the cane price in the case of sugarcane delivered at the balance at the cane purchasing centres connected by road if such cane was transported by the sugar factories at its cost. The rebate was also subject to a maximum of 32 paisa per quintal. For the season 1965-66, the Government of India announced in November 1965 that the basic minimum price of sugarcane should be the same as was fixed by the season 1964-65.

Before 1950, the protection Act 1932, was granted to the sugar industry. It was intended to benefit both the sugar industry and cane growers, with a view to ensuring the farmer of a fair and reasonable price for his produce. The Central Sugarcane Act 1934 was enacted, because with the Protection Act of 1932 benefit was reaped more by the industry than the cane grower. The Act of 1934 empowered the State Governments to fix minimum prices for sugarcane to be paid by sugar factories. As different prices were being fixed by different State Governments, the Government of India, in order to introduce uniformity, fixed the minimum prices of sugarcane for the first time in 1950-51 on an all India basis. Since then, the minimum price of sugarcane has been fixed under this order having regard to such factors as:—

1. The cost of production of sugarcane. (2*) The return to the growers from alternative crops and general trend of prices of other agricultural commodities and (3*) Fair price of
sugar for the prices of other agricultural consumers. The prices from 1962 to 1966 have already been discussed. In short, the cane prices fluctuated over the years in different States until 1950-51, when a general price of Rs. 1.20 per mound was introduced.

In regard to the fixation of price from year to year, it was noted that no scientific basis or accepted method was available. In practice it used to be settled by mutual negotiation or bargaining between the factory owner and the cane grower. It had no reference or relation to the cost of cultivation. The cane prices paid by the Nizam Sugar Factory over the years are given in the following Table No. 25.

Up to 1966-67 both the prices of sugar and sugarcane were controlled rigidly by the Government. But in the season of 1966-67, the sugar industry was beaten down to its knees by khandSari and gur producers as under the statutory control it was not able to buy all the cane that it needed at prices fixed by the Government. Consequently, there was a shortfall in production by about 35 per cent. This was the result of an unequal race where in the sugar industry was handicapped by fixed sugarcane and sugar prices, while gur and khandsari producers were left free.

The khandsari sugar manufacturers had the advantage of being able to sell their sugar and molasses in the free market at high prices and they were able to pay a considerably high price for sugarcane, even up to 160 per cent or more of the basic price. (The basic rate of cane was Rs. 53.40 all over the Country). The white sugar factories could not compete with the khandsaries and sizeable part of their cane supplies were diverted by the latter, and there was a fall in white sugar production. Drought in successive years and
### Table 25. PRICES PAID BY N.S.F.

<table>
<thead>
<tr>
<th>Season</th>
<th>Rate per maund</th>
<th>Extra price</th>
<th>Total price paid</th>
<th>Minimum price</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rs.</td>
<td>Rs.</td>
<td>Rs.</td>
<td>Rs.</td>
<td></td>
</tr>
<tr>
<td>1938-39</td>
<td>0.48</td>
<td>-</td>
<td>0.48</td>
<td>0.42</td>
<td></td>
</tr>
<tr>
<td>1939-40</td>
<td>0.54</td>
<td>-</td>
<td>0.54</td>
<td>0.52\frac{1}{2}</td>
<td></td>
</tr>
<tr>
<td>1940-41</td>
<td>0.37</td>
<td>-</td>
<td>0.37</td>
<td>0.29</td>
<td></td>
</tr>
<tr>
<td>1941-42</td>
<td>0.48</td>
<td>-</td>
<td>0.48</td>
<td>0.44</td>
<td></td>
</tr>
<tr>
<td>1942-43</td>
<td>0.67</td>
<td>-</td>
<td>0.67</td>
<td>0.62</td>
<td></td>
</tr>
<tr>
<td>1943-44</td>
<td>0.75</td>
<td>-</td>
<td>0.75</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>1944-45</td>
<td>0.68</td>
<td>-</td>
<td>0.68</td>
<td>0.68</td>
<td></td>
</tr>
<tr>
<td>1945-46</td>
<td>0.68</td>
<td>-</td>
<td>0.68</td>
<td>0.68</td>
<td></td>
</tr>
<tr>
<td>1946-47</td>
<td>1.18</td>
<td>-</td>
<td>1.18</td>
<td>1.25</td>
<td></td>
</tr>
<tr>
<td>1947-48</td>
<td>1.61</td>
<td>-</td>
<td>1.61</td>
<td>2.00</td>
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</tr>
<tr>
<td>1948-49</td>
<td>1.50</td>
<td>-</td>
<td>1.50</td>
<td>1.71</td>
<td></td>
</tr>
<tr>
<td>1949-50</td>
<td>1.71</td>
<td>-</td>
<td>1.71</td>
<td>1.68</td>
<td></td>
</tr>
<tr>
<td>1950-51</td>
<td>1.75</td>
<td>-</td>
<td>1.75</td>
<td>1.75</td>
<td></td>
</tr>
<tr>
<td>1951-52</td>
<td>1.75</td>
<td>-</td>
<td>1.75</td>
<td>1.75</td>
<td></td>
</tr>
<tr>
<td>1952-53</td>
<td>1.39</td>
<td>0.17</td>
<td>1.56</td>
<td>1.31</td>
<td></td>
</tr>
<tr>
<td>1953-54</td>
<td>1.44</td>
<td>0.39</td>
<td>1.83</td>
<td>1.44</td>
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</tr>
<tr>
<td>1954-55</td>
<td>1.44</td>
<td>0.22</td>
<td>1.66</td>
<td>1.44</td>
<td></td>
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<tr>
<td>1955-56</td>
<td>1.44</td>
<td>-</td>
<td>1.44</td>
<td>1.44</td>
<td></td>
</tr>
<tr>
<td>1956-57</td>
<td>1.44</td>
<td>-</td>
<td>1.44</td>
<td>1.44</td>
<td></td>
</tr>
<tr>
<td>1957-58</td>
<td>1.44</td>
<td>0.17</td>
<td>1.61</td>
<td>1.44</td>
<td></td>
</tr>
<tr>
<td>1958-59</td>
<td>1.44</td>
<td>0.22</td>
<td>1.66</td>
<td>1.44</td>
<td></td>
</tr>
<tr>
<td>1959-60</td>
<td>1.62</td>
<td>0.17</td>
<td>1.79</td>
<td>1.62</td>
<td>4.3\frac{1}{4} per Qtl.</td>
</tr>
<tr>
<td>1960-61</td>
<td>1.62</td>
<td>0.16</td>
<td>1.78</td>
<td>1.62</td>
<td></td>
</tr>
<tr>
<td>1961-62</td>
<td>1.62</td>
<td>-</td>
<td>1.62</td>
<td>1.62</td>
<td>4.3\frac{1}{4} &quot; &quot;</td>
</tr>
<tr>
<td>1962-63</td>
<td>1.73</td>
<td>-</td>
<td>1.73</td>
<td>1.62</td>
<td>4.66 &quot; &quot;</td>
</tr>
<tr>
<td>1963-64</td>
<td>2.00</td>
<td>-</td>
<td>2.00</td>
<td>2.00</td>
<td>5.37 &quot; &quot;</td>
</tr>
<tr>
<td>1964-65</td>
<td>2.00</td>
<td>-</td>
<td>2.00</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>1965-66</td>
<td>2.00</td>
<td>-</td>
<td>2.00</td>
<td>2.00</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** From 1944-45 to 1948-49 the prices paid by the Nizam Sugar Factory were lower than the minimum fixed, as the Hyderabad State was not in the Indian Union at that time.

**Source:** The Nizam Sugar Factory.
competition by hybrid food crops also seriously reduced the sugarcane area and yields.

Apprehensions about the shortfall in sugar production were in the air at the very commencement of the Fourth Five Year Plan. It became apparent to the Government at the beginning of 1966-67 that sugar production would be drastically reduced if the statutory controls on sugarcane and sugar prices were continued. Hence, to enable the sugar factories to compete with khandsaries and to pay a higher price for cane and to stimulate sugarcane production the Government introduced a dual price policy in 1967-68. Under the new scheme of partial de-control of sugar which implied that sugar manufacturers were to surrender to the Government for distribution in the rationed areas 60 per cent of their produce at prices fixed by the Government, i.e., Rs. 73.70 based on the enhanced sugarcane price of Rs. 2.75 (2 shillings 4 pennies) per maund, whereas they were free to dispose of the remaining 40 per cent of their output at concessions. An excise duty was also provided in regard to production exceeding the level attained in the previous year. The Nizam Sugar Factory had paid Rs. 110 per ton and the 60 per cent of the sugar production had to be sold at controlled prices, which in the case of the Nizam Sugar Factory was Rs. 132.02 per tonne. The balance of the sugar could be sold in the free market.

This pricing policy has been continued in 1968-69 also, but 70 per cent of the sugar produced is earmarked for controlled sale. On account of the higher sugar production current in 1967-68 and in this season, there is a fall in cane and sugar prices, and the cane price in this season is Rs. 100 per tonne.

The floor price of Rs. 73.70 is linked to a sugar
recovery of 9.6 per cent or less, if the recovery is more than the cane, prices are increased in subsequent season. According to this formulae, the floor price for Nizam Sugar Factory is Rs. 77.50 per tonne.
5th Chapter.
The sugar industry is in the main agro-industry in Nizamabad district. A large numbers of growers, workers and technologists depend on the growth and progress of this industry for their livelihood. It makes an important and generous contribution to the economic prosperity of the region, and to the State and central Governments. If the industry is to stand on its legs and take its rightful place side by side with the sugar industries in other regions of the country, it is important that urgent consideration is given to the problem of methods of payment, cane cultivation and cane development.

Methods of Payment:-

The mode of payment of a raw material, whose cost price is more than half of the finished product and which can neither be imported like jute and cotton from other countries nor can it be stored even for a few days, is of fundamental importance in economising the cost of production of the final finished product.

In fact, in India and in turn in this district, the main reason for poor recoveries of sugar per cent. cane has been the method of payment of cane price on weight basis, due to which, the cane growers take interest only in increasing the tonnage per acre of cane, and not the quality. A crop of sugarcane contains only 12.14% sugar and the remaining portion consists of water, organic and inorganic non-sugars & fibre etc., but under the system of payment on weight basis, the same price is paid for water and bagasse as for sugar. Under this system, naturally the growers tendency is to boost the yield of cane by application of water and other non-sugars by the application of inorganic fertilizers in much higher doses. This leads to the inevitable deterioration in
juice quality and low sugar content in cane. All these factors can be controlled if the payment is made on the sugar content of cane and not simply on a weight basis. It is for this reason that no other progressive sugar producing country in the world pays for its cane on a weight basis, but the cane is paid for according to its sugar content, with sometimes a bonus of sugar prices rule high. Fixation of cane price on the basis of average recovery of the proceeding season recently introduced by the Government, is a step in this direction. If full benefit is to be derived out of the system of payment on quality basis, the payment will have to be related to the sugar content of the cane supplied by individuals or a group of growers.

Instances of how other countries have profited a great deal by adopting the system of payment of cane price on quality basis may be cited here. Some years back, some of the factories in Egypt used to record a recovery as low as 7.5% on cane. After adopting the system of cane on quality basis, their recovery has considerably increased and is now of the order of 10.0% on cane. The advantage, that has occurred to the Queensland sugar industry by adopting the system of payment on quality, is also one more living example. The sugar per acre in that country has increased to almost double since they started payment on quality basis. In the Phillipines too, the payment of cane on the basis of quality. Considerable care is taken to harvest mature cane and to supply it to the factory as fresh as possible. The number of growers is comparatively small, for example, the Tarlac Factory has 900 growers supplying cane, and the Canlubang has 687 growers. There are a few small growers as well, having only a fraction of an acre and supplying in lots of 1.5 tons at a time. Samples are taken on even such small
quantities for the purpose of assessing quality. As regards payment for cane, according to the Republic Act No. 809, sugar recovered and the by-products obtained are to be shared between the mills and the planters.

All cane in Hawaii is burnt before harvesting in order to facilitate mechanical harvesting. The high degree of mechanisation in the field and in the factory have resulted in an entirely different picture of an Hawaiian Factory which cannot be met with anywhere in the world. Most of the plantations in Hawaii are factory owned, considerable areas, are however, on long term leases. The variation is from complete owning to complete leasing. In the whole of Hawaii, 10% of the area is cultivated by independent growers called "planters" who total about 1,500. There is no specific price fixation. They are members of a co-operative sugar organisation which is paid by the factory on the sugar basis. The fixation of the planter's share of the cane supply is as per contract which has the approval of the Department of Agriculture at Washington. The farmer's share varies from 58% to 70% while that of the factory from 39% to 42%. In all these contracts care is taken that the net return to the grower is more or less the same.

In Louisiana, payment of cane is made on the basis of its quality and the average price at which sugar is sold. The quality of cane is determined by sampling cane from the trucks and determining the weight of extraneous material and the purity of normal juice obtained by grinding the samples in a small crusher. The results of the analysis of juice obtained from the samples are reduced to the values which would be obtained by the commercial mills with the application of appropriate factors. The average factory will obtain...
about 160 lbs of 96 test sugar from a ton of cane of standard quality. For this cane, the factory pays to the grower a cash equivalent value of 106 lbs. of sugar. In addition, the grower is also paid bonus for the molasses production amounting to 0.12 dollars to 0.15 dollars per ton of cane. In addition, the cane growers are granted an additional allowance for weighing and operation of the field hoist. Generally, the prices of cane including all allowances is about 7.5 dollars per ton of cane.

The mode of payment in Puerto Rico is also on quality basis and the growers get from 63% to 68% of the sugar in cane and they also get a bonus for transformation amounting to 15 cents per ton of cane plus 5 cents per ton with the maximum of a dollar. The growers also get two thirds of the net income from the molasses. In some areas, the growers have been able to get as much as 50 to 60 cents per ton of cane for molasses.

Thus, there can be no opinions that if sugar production has to be made profitable in India and in Nizamabad, there is no other alternative but to resort to payment of cane prices on quality basis. If this fact is accepted, most of the objections raised, and problems posed, can be faced and solved squarely. The argument in favour of this system is that if the system has been working beneficially in other countries, there is no reason why it should not work in the same manner in India. Only in view of very small holdings of cane in most parts of the region, the problem is rather difficult but even so, it is not impossible.

@ In Hawaii **
The experience of implementation of various sugarcane development schemes has shown that for quick achievement of increased production, greater emphasis will have to be laid on the following cultural, economical and social problems.

Cultural Problems:

Adoption of improved cultural practices play an important role in the improvement of cane yields, and help to lower the cost of production. The cultivator should be educated to adopt them as this could bring about a higher level of cane production at economic cost. Many improved practices and methods of economy have been worked out. Demonstration of these methods on a commercial scale would be necessary.

Major cultural practices where improvements are possible are:

Planting Time:

Timely planting of sugarcane is very essential to ensure the prospect of a bumper harvest of good quality canes. Early planting has been found to promote early tillering and increased number of canes per stool, whereas in late planting, a large number of tillers are produced at later stages and very few of them are turned into millable canes. It is therefore always beneficial to plant cane at an appropriate time.

**@ In Hawaii, sugarcane is allowed to grow from eighteen to twentyfour months before being harvested. Cane ready for harvesting is set to the torch to burn off leaves and trash. The flames pass through the cane quickly without doing harm to the stalks. The harvesting is done mechanically. The mechanical harvester has heavy push rakes which simply pushes the cane stalks from out of the ground along with adhesive soil.
time for getting good results.

**Spacing:**

The distance between rows that is recommended to the cultivators varies from two to four feet. In Nizamabad a distance of four feet in between the rows for conditions where the average yield is about twentyfive tons, may turn out to be too much. A distance of two feet is advisable. It is generally stated that the spacing should vary with the type of soil and the standard of cultivation.

A large amount of work has been done on this aspect of the problem in foreign countries and all have laid emphasis on the advantage of closer planting on an economic point of view. Wider spacing necessitates frequent cultivation to keep down the weeds, whereas closer spacing helps quick "closing in" which prevents the growth of weeds. In the Phillipines, closer planting showing a higher germination than wider spacing gave a higher yield. The same has been observed in Java where the trend has been towards narrowing down the spaces. One of the most important facts is in favour of closer spacing, a dense crop suffers less from drought and dry wind, unlike the widely spaced crops.

**Earthing:**

Spacing tillers which come up at an early stage are more profitable in getting a better yield and quality of cane. Efforts thus should be made to get the tillers as early as possible. Early tillering may be initiated by covering the cuttings with a little soil. Early heavy earthing often reduces tillering whereas earthing after July - August promotes greater tillering.
Fertilizers:—

Fertilizers have a marked effect on sucrose per cent cane. It is generally claimed that nitrogen depresses whereas phosphate and potash increase sucrose content. Truly speaking, nitrogen fertilization with adequate supplementation of phosphate, potash and irrigation may improve the quality. Where a field is exceedingly deficient in any plant food, photosynthesis is probably impaired and the sucrose is lowered with the result that application of that plant food is likely to increase sucrose content. Nitrogen, applied early does not have a marked influence in reducing sugar per cent cane though it is seen that every late application increases it.

The "Chalka" soils in the canal tract of the district of Nizamabad are characterised physically by extreme hardness impermeable and presence of harmful salts. These soils have a high saturation of sodium at the surface and an accumulation layer of soluble salts. Studies have revealed that a mixture of sulphur (½ tons) and farmyard manure (2 tons) per acre is best for reclaiming these soils. Molasses also helps to some extent. Proper irrigation and crop rotations prevent deterioration of these soils to a great extent.

It is indeed gratifying to note that greater emphasis is being laid on soil studies, manurial experiments and reclamation studies at the sugarcane station in Rudroor.

Preparatory Cultivation:—

The cane requires a range of "Soil air-soil moisture relationship" for proper germination and shoot formation. Deep ploughing by tractors or by bullock drawn implements and planting cane in finely powdered soils is essential for a good
start for a cane plant. Where trenching is done by hand, care is to be taken to see that there is at least four inches of loose soil at the bottom of the furrows to enable easy penetration of roots. Planting cane in deep trenches dug with 40 cm. width and 20 cm. depth and 100 cm. apart is conducive to better yields than when cane is planted in shallow furrows.

Deep trench planting is found to save irrigation water in Summer up to 12\(^{1/2}\) per cent, besides, higher levels of soil moisture are maintained for a longer time. There is better germination and less incidence of early shoot borer in deep trenches, and coupled with high earthing up, it also prevents lodging of cane to considerable extent. Directing trenching equipment by hitching middle busters to 45.50 hp. tractors is being widely demonstrated to encourage deep trench planting at cheaper cost and already this method is popular in other parts of the country. If the same effective practice is adopted here it will also increase cane yield and thus give good results.

Germination:-

To obtain a good crop stand (i.e., plant population) which is an important factor for obtaining high yields, one should strive to get good germination as impoverished germination leads to poor and gappy stand as is commonly seen here in the cultivators fields, resulting in inadequate utilisation of the manures applied and low yields per acre.

Sugarcane is propagated vegetatively by small cuttings of the stalks having one or more buds, each of which is called a seed sett. The germination takes place through buds when moisture and temperature are adequate. The first signs of
germination are the swelling of buds and change of colour after 24 hours. One day later, the primary root breaks through the seed coat and the first leaf starts growing. Previously, it was a belief that sugarcane was unable to produce germination, viable seeds.

The most important factors which affect germination are:

**Conditions of the Bud at Sowing-time:**

Each seed sett must have sound, healthy vigorous buds and those with injured buds must be rejected. At some places in this district, sowing of sprouted setts has given good results, because the crop gets an early sprout and the chance of the uneven stand is reduced, besides, scope for the selection of the healthy and pure seed is increased. However, this practice necessitates proper careful handling of the setts while sowing, so as not to injure the sprouts, otherwise it suffers with similar drawbacks of gappy stand. Such planting of the sprouted seeds needs irrigation immediately after planting.

**Freshness of the Seed Material:**

The time lag between the harvest of seed material and its planting should be minimum. Stale setts may adversely affect germination due to dryage of the bud. At Pusa (Bihar) better germination with fresh seed was recorded than the seed kept longer after harvest. Likewise, it is better in this district to avoid using the stale seed. Fresh seed gives significantly better germination than two days stale cane.
Arrowing of Canes:-

Seed setts from un-arrowed canes may germinate earlier than those from arrowed ones. It is therefore recommended to plant setts from un-arrowed canes. It has been shown by an experiment at Shahjahanpur conducted for three years that the seed from arrowed canes gave 0.9% and 0.7% less germination than the setts from un-arrowed canes in two years respectively.

Presence of dry scales on the Buds:-

Presence of dry scales has been reported to inhibit germination as direct contact with the soil moisture is cut off. Experiments at Padegaon in Bombay showed that buds with dry scales are slower in germination than those with green scales, so care should be taken in Nizamabad.

Seed Nurseries:-

Immature seed of good nutritional status is the foundation on which a bumper crop can be raised. Special seed or nursery crops have to be raised and the seed cut from these plots at the age of six or seven months. These are to be protected from pests and diseases. It is necessary to have special seed nursery plots raised in each factory zone under strict technical supervision and to distribute this healthy seed to the growers on the basis of subsidy or easy credit terms, and realise the costs in the ensuing harvesting season from the grower's cane supply.

Diseases:-

The major sugarcane disease in this area is wilt which completely decomposes the cane stalk reducing the yield of cane and sugar by 30 to 100 per cent. This was particularly
severe in 1965-66 and 1967-68 seasons in this district. Other diseases are Smut in certain varieties of cane, grassy shoot, Ratoon stuntung disease and root-rot etc.

The pests include different types of shoot borers, white-fly scales and mite, the last being most important. It was responsible for serious loss in production in the previous seasons. In short, all the above diseases and pests are a great potential danger to the sugarcane crop. Pest control equipment therefore should necessarily be available to deal with outbreaks of insect attack. Pockets of disease-infected cane should be cleaned up by incentive campaigns and use of disease free seed cane produced in central seed nurseries should be extended to cover the entire area of the sugar factory zone. The agricultural staff should be able to keep a strict vigilance on the incidence of insect pests and diseases in this area, so that timely action may be taken in the event of the diseases or pests, assuming an epidemic form.

Prevention of Crop Lodging:-

In the cultivation fields of this district, the growth of the cane crop, especially in the grand period of growth, is as rapid as about one inch per day, resulting in the lodging of the cane crop and consequential damage and lowering of yields and quality.

To keep the crop erect with bamboos is a costly but efficient method and is in vogue in this district. The need for an alternative cheap method was emphasised by sugarcane workers and a cheaper method called "Trash Twist Method" was evolved at the Sugarcane Research Station, Anakapalle. In this method, two adjacent rows of cane are brought together and enclosed in the loops of rope made by twisting the cane
trash from the older leaves of the standing crop. Trials laid down at Samalkot indicated the possibility of successfully adopting the Trash Twist Method of propping for crops yielding up to 45 tons of cane per acre with considerable reduction in the cost of cultivation, thus enabling cutting down cost of production of raw material is essential to produce cheaper sugar than at present. It is advisable to adopt this method in this district also for achieving good results.

**Agricultural Engineering Section:**

One of the most important sections, fundamentally would be the engineering section. The modern agricultural practices need different types of machinery and implements. The farmers should be given 'know-how' of the new equipment developed in their own country and abroad for the better production. This section would be responsible for the maintenance of a fleet of tractors and implements required for general cultivation of farms. It should have implements manufactured by others, and the best implements thus recommended, being supported by actual results to the farmers for better production.

**Irrigation:**

Sugarcane is noted to have a remarkable thirst for water during its vegetative growth. It is stated that about a ton of water is required to produce a pound of sugar. Probably no other single cultural treatment will boost up cane yields as high as adequate irrigation. The greatest single factor responsible for the lower yield in comparison with other countries of the world in the Nizamabad district, is the lack of adequate irrigation, especially in the Summer
months, because most of the Nizamsagar area is under more or less perennial irrigation but for two or three weeks in a year. Hence, it is evident that more frequent irrigation, especially in the pre-monsoon period invariably leads to higher cane yields. The magnitude of increase in yield depended upon the frequency of irrigation and rainfall in the period.

In this connection, it is as well to remember that drainage is as important as irrigation. In monsoon months ill-drained conditions limit cane growth, and consequently yield. After water stagnation ceases, there is a possibility of large scale death of root system resulting in dryage of cane, unless there is facility for frequent irrigation in the post-stagnation period.

A significant factor that has to be kept in view is the interaction between fertilizer and irrigation. The consumption of water was observed to be more efficient in terms of dry matter production for unit weight of water when recommended levels of fertilizers are applied. The converse is also true.

Likewise, late irrigation or over irrigation can certainly lower sucrose content but with proper control and a drying off period no harmful effects need occur. In fact, the only source of water for irrigation is the Nizamsagar reservoir with a designed capacity of 27,000 million cubic feet (TMC). This dam is about 35 years old. Its capacity is decreasing gradually and at present has nothing more than 40% of the anticipated capacity because of silting of the tank bund. This dam envisaged 20,000 acres of cane which requires perennial irrigation. The cane acreage has gone up to 40 - 45,000 acres. This increase in area coupled
with the reduced storage capacity of the dam has resulted in acute water shortage. The capacity of the dam shortage is depressing the production of cane. The problem is further aggravated in recent years by low rainfall and no inflow of water to the reservoir in the post-monsoon months. Apart from this, utilisation of Manjira water before it reaches Nizamabad for various other purposes is also one of the causes for reduction in the capacity of the Nizamsagar. This position is adversely affecting the sugar industry (in the district) and unless something is done, a day will come when the sugar industry in the district will be reduced to about 50 per cent of its present capacity. In this connection, it is understood that the State Government is actively considering the remodelling of Nizamsagar along with resorting to some other methods of augmenting the income of water resources. In addition to this, ryots, as well as the factory farms have also started utilising waste water and sub-soil water increasing the lift irrigation potential in the area.

Drought and water logging has been a cause of anxiety in the cane cultivation. There is hardly any good cure for fighting areas of drought but there is a way to do away with water logging. Water logging not only involves wastage of water that could have been utilised for irrigation, but also results in spoiling the area where water logging exists. This could be avoided by improving the canal distributeries and also the field channels. Of late, there is deterioration in maintenance of all the three. The other step is creating a canal consciousness among the cane growers for economic use of water and avoidance of water logging.

In short, in view of the encouraging economics of providing irrigation to sugarcane, sustained and earnest attempts to provide adequate irrigation to this crop over as wide an area
as possible, should be initiated and pursued vigorously.

**Plant Protection:**

As far as plant protection is concerned, as well as the Agricultural Department in the district have been propagating the need for plant protection and steps to be taken in this regard. The cane growers have adopted most of these methods, but the achievement is not said to be a hundred per cent. As a matter of fact, plant protection measures or absence so far as small alterations are concerned is an economic factor that creates the situation. The small ryots do not find themselves in a position to plan the required amount of plant protection. Some of the formation finished above will reveal that the capacity of producing in the factories has very little influence on the area under sugar cane. The area increases or decreases according to the seasonal conditions as well as prevailing prices of different products of sugarcane like jaggery, Khandsari sugar and also molasses.

**Cattle and Green Manure:**

Soil in the Nizamabad district has been practically starved of manures, and actually there is serious deficiency of manures. It is estimated that in this district a field of 10 acres requires 40 cart loads, and seven acres of red chillies requires 20 cart loads. In 1960 there were only 7,000 cart loads less than the minimum required. Another important source of manure is animal bones. A large part of these is used by the cultivators due to religious susceptibilities and other prejudices. The use of green manure is also of very little account. If agriculture is to make satisfactory progress in the district it is essential that
manure resources must be considerably increased and resort must be made to artificial manure.

It is general practice in the villages that the people possessing small holdings do not generally maintain livestock. Only the households having bigger holdings and depending entirely on agriculture maintain the livestock. Some people having drought bullocks, after attending to their field work, generally go and plough others' land on hire.

Though there is a large number of livestock in the area of this district being 1,301,794 acres according to 1961 Census, in spite of this, one can easily find that the district has not got the adequate number of tillage requirements. This is mostly due to the presence of a large number of inefficient cattle. Probably two-thirds of the cattle in this district are inefficient. In a survey report of the village Dopolli of Nizamabad, it was discovered that only 60.3 per cent of the cattle in the village was fit for work. Out of this 8.3 per cent were really of the right standard of efficiency whereas the remaining 52 per cent were below this standard of which again 24.3 per cent were really very poor. The better class cattle is able to do more work and for a long period, as compared with the poor class of cattle.

One can easily find that owing to an increase in the number of useless or inefficient cattle coupled with an increase in the human population, the pressure on land is being increasingly felt.

Hence, the real solution for the district is not to have more cattle, but efficient cattle, and also to make use of more mechanical power. The following remarks made by a keen foreign observer about cattle in India apply with equal force in the district of Nizamabad that, "India is being eaten up by her animals; and that in a nutshell, is the great livestock
Problem of Implements:—

Most of the agricultural implements which indirectly affect the efficiency of the farmers are old-fashioned and out of date and have hardly undergone any change towards improvement. The majority of implements and tools used by cultivators are manufactured and repaired by the local workmen. Modern implements are generally not in use as they are beyond the need of the average peasant who seems to view the modern implements with suspicion. The common agricultural implements in the district are wooden ploughs. Among other accessories possessed by the agriculturalists are crowbar, spade, axe and sickle. Hence, one of the most important reasons of low yield and low productivity is that for more than a century the cultivators have been using the same wooden implements and there has been no change in them at all. In spite of the propaganda campaign by the Department of Agriculture for the use of iron ploughs, wooden ploughs are still common.

It is rather strange that in spite of the fact that the improved plough is more efficient and in a way more economical, it has not been able to displace the antiquated wooden plough in the district. The explanation of this strange phenomenon may be summarised as follows:—

(1) There has been a poor, inadequate and unconvincing demonstration of improved ploughs. In many instances, the improved plough has been manufactured with unsatisfactory
design and unsuitable material.
(2) The improved plough is usually more expensive, so that the illiterate tillers think it more profitable to use the same old wooden plough.

Sugar Industry and the Problems of Transport:

It is needless to say that the welfare of the sugar industry, like all other large scale manufacturing industries is closely bound up with the question of transport, both for raw materials as well as finished products. Adequate provision of transport facilities is of basic importance to the successful implementation of the programme of all-round economic development. In the sugar industry in particular, the importance of cheap and quick transport is very great.

In the first place, sugarcane has got to be supplied from the field to the factory with utmost expedition and at presently the lowest possible cost in order that the cane may not deteriorate in quality, maximum sucrose may be had and it may be possible to get supplies of cane from a fairly wide zone at a moderate over-all cost. In the second place, the finished products, viz., sugar, molasses etc., must have such cost of transport as would enable the factories to supply their products to consume in centres situated at various distances at a reasonable and competitive price.

Transport Policies:

No doubt there is a sufficient capacity in the Nizamabad district (by way of carts, lorries and light railway trucks) for the transport of cane. The main problem in transport is (a) The programming of cane movement from the various harvesting and receiving centres to the factory so that there is maximum turn around of transport vehicles and minimum waiting time. This is sought to be achieved by planning the
tonnage to be supplied from each centre to the factory every
day, the time of arrival and the time of release of cart.
However, since a large number of suppliers and vehicles are
involved, the programme is likely to go out of schedule every
now and then.

Cane within a radius of about three to four miles from
the factory is hauled by bullock carts. The company farms
supply cane by the company's own lorries or by light railway.
The ryots transport cane by company's light railway, lorries
to the extent available or by hired lorries.
(b) The price of cane fixed is for delivery at the factory
gate. If cane is delivered at light-railway out-stations
Rs. 3.20 are recovered from the ryot per ton of cane trans-
ported. This figure is statutorily fixed. The actual cost
of transport to the company will be more. In the case of
transport by the company's lorries, the transport charges are
deducted according to the distance hauled. For instance, if
cane is delivered at nearer depots like Yedpally, Alisagar
and Govoor villages the cost is Rs. 5 per ton and from more
distant places like Banswada and Mohmednagar the cost is Rs. 7
per tonne.
(c) In the case of factory farms, the cane is hauled from
the fields to railhead or factory by bullock carts. These
cartmen and labour are paid in advance and recruited to work
in the season. Payment for harvest and transport is on the
weight of cane. For harvesting one ton they are paid Rs. 4
and for transport the wages range from Rs. 2.25 to 4.55 per
ton depending on the distance involved.

In short, speedy transport of sugarcane from the field
to the factory is of great importance as already said that
the quality deteriorates with time after harvest. Stress
has been laid to contacting of areas around the sugar factories.
Opening up of a network of communications for speedy transport of sugarcane by road to the factories is most important. These roads not only help inflow of modern ideas to villages speedily, but serve to take the various inputs into the villages speedily and economically, and also take the various agricultural as well as cottage industries - products to the markets.

Compactness of areas:

Fuller and more efficient utilisation of the various inputs into agriculture and plant protection measures need compact areas for cultivation. This is more so for a crop like sugarcane which demands a much higher level of inputs. The need for supply of fresh cane to factories makes compact areas near to the factory most desirable. In this district 84% of supplies of cane are at the gate. The development of sugarcane should be directed to achieve 100% supplies at the gate. Consolidation of holdings, which can be found very much in this district, should be expedited and every effort made to develop suitable associations of cultivators, so that large and compact blocks of sugarcane are grown near factory areas.

Land Reforms:

The system of land tenure is the pivot round which all other agricultural problems revolve. With a defective central system, the rest of the associated systems are bound to be defective. In Nizamabad, the whole land tenure system needs drastic re-organisation, because such reform is in no way less vital than any other technological improvement contemplated.

It is beyond doubt that the majority of holdings in this area are too small to be cultivated, i.e., less than five acres,
which are neither conductive to efficient farming nor sufficient enough to meet the needs of the family, and thereby the majority of them have to work as agricultural labourers or in any other occupation to supplement their meagre income.

In general, consolidation of holdings is the main problem of land reforms in this district.

There are various reasons for the limited scope of the consolidation of holdings. Briefly, some of them are given below:

(a) Under rule 9. (1) of the consolidation of Holdings Act 1956, the lands in the village shall be grouped into separate blocks having regard to:

(1) The kind and number of crops grown. (11) the quality and fertility of the soil, and (111) the nature of irrigation facilities, if any available. Further consolidation of holdings shall, as far as possible, be effected with respect to the plots situated within the same blocks and the allotment of plots shall be made, having regard to (1) the location of residence of the owner and (11) the improvements, if any, made by the owner of the land.

The lands in the Nizamabad district are different in nature, soil, fertility etc., also the lands are uneven and undulant. Fertility of soil differs from field to field. Most of the tracts are dry, and where irrigational sources exist they are not common at all.

However, the lands are divided into three groups of various kinds as can be seen. Exchange is not permissible between one kind and another. Moreover, lands are not exchanged on uneven values.

There are no major irrigation projects except the Nizam sar dam, existing in this area, and the wet cultivation which is done on a negligible scale mostly dependent on
sources like tanks, kuntas etc; so exchange of land under wet groups becomes possible only when the plots are cultivated under similar sources. In some cases though, plots which may be considered for exchange are irrigated under like sources, it is found that some plots have a comparative advantage of raising a second crop. In such cases, exchange becomes impossible.

In dry lands too, various difficulties exist in drawing up consolidation proposals. Generally the dry lands are blocked into two groups. Black Chalka and Red Chalka. They are further divided into various kinds. Inter-exchange of lands from one category to another is not permissible, though they may be situated within the same block. Moreover, due to the difference in fertility, impossibility is not uncommon even if they belong to the same category. The undulancy also deters easy exchange.

(a) Under Section 2(b) of the Consolidation of Holding Act, 1956, an 'owner' means a person who has permanent and hereditable rights of possession of land and when alienated land has been mortgaged, owner means the mortgager.

The consolidation is done on owner occupancy. The various laws in force restrict the scope recognising the actual possessor as owner for the purpose. For example, the shikmidars of bilmaqtedars and protected tehants cannot be treated as owners until they purchase and are declared as owners of the lands they cultivate. The illegally alienated lands have also been excluded from the purview of the scheme till the sales validate.

All these factors are responsible for reducing the scope and possibility to extend consolidation of holdings to all the fragments in the district. However, wherever the Scheme can be implemented, it is being done with unspared effort.
Recent Land Legislation:

There are many recent land legislations which have scattered land holdings of even small or medium farmers. The Land Ceiling Act and the Tenancy Act are prominent among these. The Sugar Factories, except in Andhra, Madras and Mysore are not permitted to own their own farm for cultivation. Neither can they take land on lease.

To overcome these technical and legislative problems, a new type of scheme was evolved and tried out. The basic principal of the scheme is to assist the cultivator in his problems in a limited manner and take only a few items for which he has inherent disabilities. Whereas the farmer continues to be the main cultivator, and owner of the land and the crop, the Sugar Factory or any other competent agency, can become partners in cultivation, assist him in specified items and instead of accepting fees for services rendered, share the final produce at the time of harvest. This enables both the parties to take interest in increasing the yields. If any party fails to do his part, the other party reserves the right to carry out the items on the field and recover only actual costs. In taking such schemes, the factory should choose blocks of 100 or 200 acres and group a number of ryots in a manner to create such big blocks. If any single party within the block is not willing for cane cultivation he should be made to lease it out to any other farmer for cultivation of cane. Such grouping is feasible and has been achieved in the factory of K.C.P. Ltd., Vuyyuru. In the factory, registration is offered to ryots, only if they group into blocks of 50 or 100 acres. This was essential, as a result in this area where the average yield of ryots, was fluctuating between 22 to 25 tons per acre, after implementing the scheme it increased to 35 tons per acre. The Company also took keen interest in
efficient and timely operations, and it gained about Rs. 180,000 as net profit and the partner had gained over Rs. 30,000 as net profit.

In view of the above facts, the trial of such a scheme is very much commended in the sugar factories of this district, because in Nizamabad the various enactments (relating to land reforms) are not known to the cultivators. Tenancy-farming is an inevitable feature of the agricultural economy. The land-owners still persist in collecting half of the total harvest. In the majority of cases, it is equal distribution of the total agricultural output between the tenant and the land owner, the land and the water charges are exclusively paid by the owner of the land. The owners usually change the tenant every year or re-write the terms of the tenancy so as to guard against the implications of the Tenancy Legislations. Whereas the legislation relating to the ceiling on agricultural holding was in the making during the year 1961, all the landlords divided the land among their kith and kin. So the majority of the household owns less than five acres of land. As Table 17 shows, more than 80% of the households in the district have holdings of less than 5 acres. Hence, this Act has little affected the landlords in this place. Most of the cultivators are illiterate and as such, they do not envoice much interest in social legislation unless they bring them immediate and direct social benefit. As the majority of cultivators are usually engaged in toiling for their livelihood, they bother little about these social legislations. Hence, discussing a number of features concerning economic development in India, rightly, Mr. A.B. Mountjoy said that '..............: The foremost among them is the need for, and the massive problem of, land reforms. It was recognised that the inherited agrarian structure was an impediment to progress
and the system of land ownership and tenancies a source of exploitation of the majority of the peasantry. 

**INDEBTEDNESS:**

In this connection, one more important problem remains to be discussed, i.e., indebtedness. Indebtedness by itself is neither good nor bad. It all depends to what use the debt is put. If the debt is taken for productive purposes and yields a return higher than the rate of interest at which it is borrowed, it is all well and good. The greater the extent of debt, the better for the farmer because it is a distinct sign of his prosperity and credit-worthiness. Such a debt improves the economic condition of the agriculturalist bringing him better returns. He can improve the condition of his farms by introducing various improvements; for example, sinking a well, fencing his field, practicing intensive farming, using artificial manure, buying better seed, and scores of other such things. In such a case, nothing is to be feared from indebtedness and it does not become any problem. As a matter of fact, it is a sign to be welcomed. In such a case, all that one has to do is to provide more credit at a still lower rate to enable him to push his investments still further.

The position in Andhra Pradesh as well as the Nizamabad district is far from this. Here, the money lenders credit supports the farmer as the rope supports the hanged. There is no doubt that credit is necessary for the farmer, due to the seasonal nature of the industry he needs credit because

@ "Industrialisation and Underdeveloped Countries". Second Edition London Hutchinson. 1966.
income is periodical and his expenditure is constant throughout the year. Ordinarily he should need credit for only productive purposes, but the farmer borrows more towards keeping the wolf of hunger from his door than to improve his land. The rate of interest at which he borrows is very seldom less than 12% and often 18 to 24%, a rate which very few industries in the world can ever yield in normal times, at least agriculture does not yield this return. The difficulty does not end here, the money lender, having a somewhat elastic conscience, follows such methods of business that he is seldom above board. Once a farmer falls into his clutches he seldom gets out.

The range of interest rate has widened from 12% in 1929-30 to 14 to 25% in 1961-62 according to the Census of 1961. Obviously, the institutional credit has made it possible for the district people to borrow money at a lower rate of interest, but it seems that it has to make its headway to supply all the growing credit needs of the farmers at a fair rate of interest.

According to the Census of 1961, and rate of interest and the debt burden of agriculture classes are too high in the project zone, particularly in the poorest section of the agricultural world, i.e., landless agricultural families have got the highest burden of high rate of interest which varies from 18 to 36%. It is very true that "the vicious circle resulting in poverty, debt and high rate of interest rates, holds the cultivators in a tight grip."

It is also revealed from the Census of 1961 that the average indebtedness in the project area is 319 rupees, whereas in the non-project area, as indicated in Table No. 26 it is 189 rupees. The value of agricultural produce in the project area is Rs.11 Crores annually.
From this, it is evident that savings and capital formation have not been satisfactory in the project area. This is chiefly because the average holding is not viable economic unit. The indebtedness is lower in the non-project area because the cultivators are reluctant to effect any improvement or incur any expenditure on sinking wells which cost anything between Rs. 500 and Rs. 800 depending on the depth. On the other hand, when perennial water supply is assured by the project and more and more acres are brought under cultivation, the cost of converting dry to wet land cultivation is approximately Rs. 100 per acre. Moreover, even in the case of farms with fairly economic holdings, no drive in savings has been sponsored, despite the improvement in economic conditions.

The main reasons for indebtedness are as follows:

1) The small size of holdings, accentuated by sub-division and fragmentation due to laws of inheritance:
2) Recurring loss of cattle:
3) Litigation and extravagant expenditure on marriages and domestic expense etc:
4) The money lenders' system of business etc:

Small Holdings:

Small holdings are the result of the Hindu and Muslim laws of Inheritance under which each son gets an equal share of his father's land. The evils of small holdings is aggravated by fragmentation of land due to the practice in many places of all sons getting an equal share of every kind of land, good, bad and indifferent. As Sir Frederick Nicholson, in this connection said that "the necessary complement of the small-holder of land is the money lender. The result of small holdings aided by fragmentation is not
only small incomes, but wasteful cultivation and greater expenses. Cultivators have to go round a number of pieces of land at a distance from one another, have to employ labour uneconomically, and to leave strips in every field uncultivated, with the result that the crop and income both suffer, as the master's eye cannot be everywhere". Record of Right's enquiries which were held in many districts of Telengana in 1961 came to the conclusion that fragmentation condition is still worse in the district of Nizamabad. From a statement prepared by a Settlement Commissioner, who took tests in a few villages in Telengana, it appears that in the district of Nizamabad, the proportion of holdings of wet lands are one acre. It is clear from these figures that very small holdings and fragments of land must be a fruitful source of agricultural indebtedness.

The loss of cattle is a major cause of debt, likewise, it is a poor crop that often drives a borrower to the money lender. This insecurity of harvest ought to teach hard work and thrift to the agriculturalist. It is well said that with toil and progressive skill of the farmer, even the poorest soil may be a garden, but most peasants would rather tolerate a low standard of living than make real excursions against a year of drought by digging wells. They are simple and soon forget the lesson of a bad year. In a good year they spend almost all they earn, and borrow in a bad year.

The farmers of this district revels in litigation. The worst of a loan for litigation like one for marriage, is that it is unproductive and far more difficult to repay. The expenditure of the drinking population of agriculturalists must be making a big hole in their net annual income.

The Moneylender's System:-

With the recurring famines engendered by erratic monsoons,
money-lending must have come into vogue in the district of Nizamabad. One would think that in proper years, when prices rule high, the agriculturalists would try to free themselves from old debts, but it is common knowledge that much of the newly acquired wealth is frittered away on non-productive objects. Again, among small holders of land, high prices are not much of a blessing as they have not got much surplus produce to sell even in good years, whereas in bad years they make both ends meet with difficulty.

It is true that the rural moneylender fulfils a very useful function in an agricultural country, and therefore, before the advent of the communications and irrigation facilities, he must have sometimes stood between the cultivator and death in years of famine. But he often combines the function of lender, middleman and shopkeeper in himself. The cultivators complaint is that they have been exploited in various ways. They have to sell their produce to the money lenders at a low price and have to purchase nearly all their requirements at the same man's shop at higher prices.

When the annual account is made up between the money lender and the cultivator, a full years interest is charged on a loan, although the money may have been borrowed only a few months previously.

Normally, the rate of interest is supposed to vary between 6 and 36% per annum according to the credit of the borrower.

Therefore, it has been said that "an Indian agriculturalist is born in debt, lives in debt and dies in debt."

But when all is said and done, a proper dose of credit will exercise a very stimulating effect on agriculture and any possible step from the Government would be helpful in this direction to save the agricultural community from economic ruin.
Therefore, it is imperative that cultivators in project areas be given the benefit of credit at reasonable rates of interest. Credit operation ends to raise investment, productivity, net farm income and improve farm family living. As Heral Halavow, in his book "Agricultural Policy of the United States" said that "The impact of credit programme on the general price level depends on how operations effect the supply of money and the credit on the production response result from the use of credit".

The effect of credit expansion in the initial stages is inflationary, but the credit expansion has a production effect. The expansion of farm on one hand, and reduction of demand on the other would result in falling of farm prices.

**SOCIAL PROBLEMS:**

It is universally accepted that India's economic development depends primarily on the uplift of the peasantry. At present, most of the cultivators have nothing to do but cultivate. The economy of Nizamabad is mainly agricultural, as such, the hereditary economic relations remain unchanged, though irrigation has brought about improvement in the whole economy. The cultivators cultivate the field for getting food for themselves and their families. As N.G. Rang said, "Just as a worker must sell his labour in order to obtain necessities of life, so also a peasant has to go on producing and supplying his commodities to the market so as to maintain himself."

The continuance of such a policy will automatically lead to the economic and social isolation pattern in a changing world. The right approach to the problem of the development would be a step in the direction of an overall economic reform and a well balanced broad economic policy.

Therefore, it is necessary to consider a sound economic
and social policy of education, health, food and housing problems so that it keeps the cultivator healthy and contented. Mere agriculture as an occupation is pursued largely by a mass or illiterate, ignorant and ill-equipped individuals. Education is compulsory for them. The Committee appointed by U.N.O. for "Measures of Development in under developed Countries" supported this notion that the cultivators in underdeveloped countries are superstitious in thinking and conservative in outlook. They easily loose heart and feel helpless against 'Fate'. The right psychology of approach and education may help to counteract superstition, to adjust religious belief and to open the way to a higher standard of living for a great number of people. But education should be free as it happens in the most advanced countries. Farmers do not have much money to bear the expenses of education, and it is quite clear that farmers with a little capital are bound to impede the progress of all efforts undertaken for improvement. The percentage of literacy is low, being 16% in this district. Most of the villagers are following their traditional occupations, i.e., agricultural, weaving, fishing and tapping etc., due to the lack of other employment opportunities. Though the parents may desire that their children should get educated and take to other profitable professions, their poverty, coupled with lack of educational facilities in the district are the main factors of confining their children to their traditional occupation. A considerable number of illiterates are found in scheduled castes such as Devanga, Vaisya, Goundla etc., Maddga and Malas etc.

Table 26.

AGRICULTURAL INDEBTEDNESS IN THE NIZAMABAD DISTRICT

in 1965 - 66.

<table>
<thead>
<tr>
<th>Taluk</th>
<th>Average Indebtedness per cultivator in the Project Area.</th>
<th>Average Indebtedness per cultivator in Non-Project Area.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rs.</td>
<td>Rs.</td>
</tr>
<tr>
<td>Banswada</td>
<td>177</td>
<td>100</td>
</tr>
<tr>
<td>Bodhan</td>
<td>507</td>
<td>202</td>
</tr>
<tr>
<td>Nizamabad</td>
<td>372</td>
<td>136</td>
</tr>
<tr>
<td>Armur</td>
<td>221</td>
<td>318</td>
</tr>
</tbody>
</table>


Farm Operations:—

Agriculture in this part of the Country, even as it is in most other parts of India, is not conducted as a business by the agriculturalists. They do not normally think of an alternative or a new occupation, partly because of their inbred and environmental outlook and partly because there is really no choice for them due to lack of training, resources and equipment for other jobs. Ignorance, illiteracy and a strong attachment to the traditional ways of life also act as strong barriers to occupational mobility. The result is that the farmer sticks to agriculture through days of weal and woe, and whether the labour and capital put in the farm prove profitable or not. So long as he is able to eke out a
living in the village, and not necessarily for his farm, he would be loathe to leave his village and his occupations. Costs of labour and material put in by him and members of his household do not enter into his calculations at all, whereas assessing the returns from his crops. It is only the costs in cash or kind actually paid out to him for materials purchased or services rendered or purchases for cultivation purposes that he is particular about. Even in respect of these, he does not care to maintain regular accounts. This does not seem necessary to him, barring a few items, most other items viz., seed, manure, labour etc., are supplied from his household. When these have to be paid for the rates, in most cases are not determined by individual bargaining but by tradition or at the village level. For instance, servicing of implements by the carpenter, the blacksmith and the cobbler and irrigation charges by the "Neerad's" etc., are paid for "Bawatta", i.e., the traditional payment in kind, once a year at rates per acre of the holdings or per plough. Similarly wages paid for sowing, weeding, harvesting, threshing etc., are paid in kind at rates obtained at the village level. Individual agreements for cash wages are practically negligible. Similarly with regard to output, the cultivator is more concerned with gross yields of the grain, especially in respect of food crops, rather than their value, for in the case of the majority of the cultivators, consumption rather than exchange accounts for the utilisation of the major part of the crop produced. In the context of these factors, an assessment of the productive economy of the agriculturalists on a business basis or entirely in money terms is not feasible.

**INCENTIVE DESIRE TO PRODUCE MORE:**

Another major social problem is the incentive desire to
produce more. With rising prices and low income and the absence of opportunity to get consumer goods, the peasant might decide to work less, he might exchange work for leisure. This is more likely to happen when the traditional aspirations and leisure oriented rather than work oriented. He is likely to keep for his use, more food, or the better quality, and market less in poorer quantity.\(^\text{3}\)

Farm production will increase only when the farmers can possess the will to enable them to buy for the satisfaction of themselves, their essential consumption of goods for their increased families. Otherwise they have no incentive to produce more than their home requirements. In fact, there is a difference between the farmer's incentive to produce, and their desire to produce. The farmers wants are limited and necessities are few. They require a few clothes for themselves and members of their family, and salt, spices, sugar, gur, soap and kerosene etc. For their present production, if they get sufficient grain to eat, and adequate income to purchase these items, their desire to produce more is impeded.

As Mr. A. James said, "If the average Indian family can obtain sufficient food, a few clothes to wear and a hut to live in, they seem to be content".\(^\text{1}\) If there is no desire to produce more, there is no incentive to produce more. Any Government effort for providing suitable incentive to grow more cane will hardly be successful or effective unless their desire to produce more also grows.

Their desire to produce more depends upon their desire to raise their standard of living. This may be done by

\(^{\text{1}}\) Albert James Sanders, "Land and Rural Economics". p. 81.

\(^{\text{3}}\) Ashok Metha, socialism and Peasantry. 1963. p. 58.
various factors viz., urbanisation of villages through better communications, education, electricity, and by making available in rural areas, manufactured consumer goods of up to date designs to raise their standard of living, increase their wants and stimulate the incentive to produce more.

ECONOMIC PROBLEMS:

The fixed factors of production on the small peasant farm on which most of the sugarcane in Nizamabad is grown, usually consist of land, farm bullocks and implements, and the total available labour of the farm family. These factors are used in the cultivation of several crops, and the costs to which they give rise, that is land rent (which is an 'accounting' cost when the farmer owns his land, at a fixed annual payment when the land is rented), and the cost of maintaining farm bullocks and implements, form the main part of the total overhead charges of the farm. At least in the short period, therefore the earnings of these factors are of the nature of quasi-rents and do not enter into the cost of cultivation of separate crops. On the other hand, many farmers hire supplementary bullock and casual labour at certain times, and seed fertilisers vary according to crop patterns, which forms the main part of the variable cost of cultivating different crops.

The substitution of sugarcane for other crops generally results in an increase of total farm expenditure, since sugarcane is more intensively cultivated than most of the crops it displaces. The expenditure per acre of tropical cane generally exceeds the expenditure on alternative farms of land use by a wide margin.
The extent to which sugarcane cultivation adds to total expenditure depends on the extra quantities of inputs which the farmer has to buy when he substitutes sugarcane for other crops, and the prices of these inputs. The extra inputs he would have to buy would be mainly determined by his methods of cultivation, and by the extent to which he can make fuller use of his fixed factor when he substitutes cane for other crops. The general structure of sugarcane farming, and how far fixed factors can be used in cane cultivation will be briefly considered in this section.

Bullocks:

The small sized farms make the use of tractors and specialised mechanical equipment uneconomical, so that there, agriculture is based on bullock-power assisted by indigenous ploughs and light implements. Bullocks may be either maintained by the farmer or hired when they are required from neighbouring farms, but sugarcane makes such heavy demands on the bullock use that most farmers who grow cane maintain one or more pairs of bullocks. For example, all the cane growing farms, surveyed by the Agricultural Research Council had bullocks. The greatest demand for bullocks in cane cultivation comes in the harvesting season when they are required for working the mechanical crushers which are used for crushing the cane in preparation for gur production, but farmers do not appear to experience any shortage of bullock-power during this season. In this survey of the Deccan (Andhra Pradesh), D.R. Gadgil found that, "Even when a farmer hired the services of a cane-crusher as he did, in the majority of cases, he had enough bullocks of his own to work the crusher, where he had not a sufficiency of bullocks he made up the required number by borrowing them on exchange terms from neighbouring farmers .... On the whole cash outlay on the hire of bullocks was rarely necessary".

In short, it may be concluded that apart from a few exceptional areas, bullocks are generally maintained on cane producing farms. As farmers have generally their own bullocks, their cost may be neglected.

Farm bullocks are needed for ploughing land before the sowing of the Kharif and the Rabi crops and also, immediately after the two harvests. They are therefore busily engaged
from April until June. When the Rabi crop is harvested and the land is prepared for the sowing of the Kharif crops and again for a few weeks from September to November, when the Kharif crops are harvested and the land is prepared for the sowing of the Rabi crops.

But for cane cultivation, bullocks are used for preparatory ploughing in November and December, and again for crushing cane from February to mid-March and April, which is the main part of the cane harvesting season and a slack season for bullocks in areas where cane is not an important crop.

**CAPITAL:**

Cultivation of sugarcane requires comparatively more expenditure per acre than any other alternative crop and limitations of availability of finance for the farmer is a major draw-back in sugarcane cultivation. Many farmers whose total working capital is strictly limited may find it profitable to grow less cane than they would otherwise do. The economic problem of the farmer is illustrated in the diagram No. 3 to follow. In diagram No. 3 it is assumed that he has a fixed amount of land and working capital and these two major factors are to be combined with fixed proportion of land for the production of the sugarcane and grain, in order to produce economic results. If his financial position is sound, the farmer's product possibility curve would be the straight line PP', even when the amount of land he has, is kept constant. If he could acquire an unlimited amount of land but his working capital is constant, his production ....
possibility curve would be straight line TT'. As a matter of fact, both the factors are fixed, as such his choice of product would have to be confined to the combination of cane and grain, as shown along the kinked curve P'M'T. Hence his equilibrium position would be at the point M', and he would produce OX' of cane and OY' of grain, unless market prices are such that it could pay him to produce either cane or grain. Since the production possibility curve is discontinuous in this example, M' would be the stable equilibrium position for many different price ratio between cane and grain.

In Diagram 1, the price ratio is given by the slope of the line Q'Q'. Any point other than M' on the curve P'M'T' would lie on a lower price-line than Q'Q'; thus showing that sum total revenue derived from any combination other than OX' of cane and OY' of grain, is likely to yield a smaller total revenue. In case the farmer is in a position to increase his working capital, then curve TT' would shift to the right, say to LL', which is the new production possibility curve, showing the different combinations of cane and grain which the farmer would produce, provided he has an unlimited amount of land and his working amount of land and his working capital is fixed at a new higher level. Now his equilibrium position would shift from M' to M2 and he would produce OX2 of and OY2 of grain. The increase in his working capital has made it profitable and worthwhile for him to substitute cane for grain, although the price ratio between cane and grain is the same as indicated by Q2Q2, which is parallel to Q'Q'.

In general terms, a farmer would find it increasingly profitable to substitute crops which require a greater proportion of capital to land (e.g. sugarcane), for crops which require comparatively a lower proportion of capital to land resources (e.g. most of the grains and pulses); as his
KEY TO CURVES.

Ox  Sugar cone (line)
Oy  Grain (line)
P P'  Production possibility 1st. curves
T T'  2nd. curve
M1, M2  Equilibrium position points
Q1, Q1, Q2  Price ratio slopes
resources in working capital improve in proportion to his land resources.

The working capital of a farmer may be limited either because he is reluctant to borrow money for business purposes or because he is unable to obtain credit on suitable terms. The absence of agricultural credit facilities on reasonable terms is acknowledged to be one of the gravest defects in the organisation of agricultural production in India in general and in Nizamabad in particular. The Reserve Bank of India Rural Credit Survey made in 1954 reveals that "taking all classes of cultivators together, the families that borrow from any agency at all, are only 58.6% of the total number"; so that over 40% of the cultivators rely on their own resources to finance their agricultural produce. In general, reluctance of the farmers to borrow money is due to the fact that the private money lenders (a main source of rural credit) charge higher than 20% interest rate per year, which is very uneconomical for the farmer and obviously very unreasonable. In most cases the money lenders extend the loans at the above higher rate coupled with mortgaging the future crops of debtors; with the condition that the farmer will not sell the produce at harvest time without the creditor's concurrence. Such conditions result in the sale of the farmer's produce at lower than the market rate.

In these circumstances, the farmers very sparingly borrow the money for raising the general efficiency of agricultural production, except in extreme urgency such as the failure of crops before harvesting or in the event of the death of his bullocks etc.
Labour:

In every form of wealth, productive human labour plays an important part. In agriculture, this aspect is most important, because in this district as well as other parts of India, owing to the meagre use of capital in agriculture, labour assumes special importance, and all other factors, leaving aside land, play a very significant part. This is so because in agriculture, compared with industry, very little machinery is used, the chief factor is human labour, and it is on the welfare and prosperity of the labour that the real future of agriculture lies. An old Oxfordshire farmer was once asked which was the best land and he replied "the one on which the best farmer works".

The number of cultivators in 1961 was 283,730 in the Nizamabad district which includes 155,096 males and 128,634 females, and the number of agricultural labourers 122,058 including 51,947 males and 70,111 females. The Nizamabad district has the fourth largest proportion of workers at cultivation, 306 males and 251 females per 1,000 population of each sex; but amongst agricultural labourers Nizamabad has got very low figures, being 102 males and 137 females per 1,000 population. As far as agricultural labourers are concerned, this district has maintained a higher proportion of females in all the Census of this century except in 1931.

Fifty years ago the number of landless labourers in the district was comparatively small. Then practically every cultivator had some land of his own and he cultivated it with the help of his family. In their spare time small cultivators used to work on the land of big land-lords and were generally paid wages in kind for this work. The number of labourers who have no land and who are becoming more and more independent on wages has been
constantly increasing during the last few decades. There are many reasons which account for this change. Owing to the decay of rural industries, a number of artisans had to give up their hereditary professions and have been turning to the land as agricultural labourers.

Another cause of the increase in the number of agricultural labourers is indebtedness. When a small cultivator gets into heavy debt and is unable to meet his obligations, he is compelled to sell his land and become an agricultural labourer.

On the other hand, as the average size of holding is small and uneconomic, the demand for agricultural labour is restricted. Whereas, due to a tremendous increase in population, the supply outnumbers the demand, especially during the slack months. Many labourers are idle without sufficient remunerative occupation, from four to six months, with the result that wages in rural areas for agricultural workers are very low.

Agricultural labourers can be conveniently divided into the following categories:

1) Those labourers who have generally no land of their own and have to depend on labour for their livelihood.

2) The second category of labourers are those that have generally some land of their own, and who cultivate the land themselves, but as their land is insufficient to provide a living for them, they have to work in the fields of others, as generally the land possessed by them is so little that their major occupation is agricultural labour, and cultivation of land is actually regarded as a subsidiary occupation.

3) The third category consists of those people who generally have enough land of their own and are themselves fully occupied in this work and do not need to labour.
As far as hired workers are concerned, according to the Census of 1961, the proportion of them in households with two workers is less than the proportion of hired workers in households with 3 - 5 workers and 6 - 10 workers, as the case with households engaged in cultivation only. It is also noticed that households with 3 - 5 workers constitute a larger proportion of the cultivating households.

In reality, small farmers hire casual labour during busy seasons of sugarcane cultivation. Whereas large families generally employ a staff of regular servants, so labour costs on most farms are partly fixed and partly variable.

The proportion of hired labourers employed depends on the ratio of family labour to cultivation. The extent to which the farmer has to employ hired labour depends largely on his crop pattern.

The busiest season at Nizamabad is when the kharif crops are harvested and the Rabi crops sown, and again when the Rabi crops are harvested. During these periods, even small farmers hire casual labour, although they are much less than fully employed at other seasons, because

(i) The cultivation of tropical cane requires much more labour,

and (ii) The busy season in cane cultivation partly coincides with the busy season in rice cultivation, so that the farm family would not be able to concentrate on cane cultivation.

It was noted by the Tariff Board on the sugar industry (1932) with reference to cane harvesting and processing that "it occupies the intervals between Kharif and Rabi harvested and serves to afford employment to the agriculturalist and his cattle at a time when employment is scarce." At least in the earlier stage, therefore, a farmer who substitutes sugarcane
for other crops should be able to substitute family labour for hired labour to considerable extent. This would reduce the cost of growing cane, particularly on small farms, and in over populated regions, when most of the work is done by family labour, further, whereas grain crops have to be harvested within two weeks, after the grain ripens, the harvesting of cane can be spread over two or two and a half months. The sugar content in cane deteriorates rapidly after harvest, but very slowly so long as the cane is allowed to stand in the fields. Hence, harvesting cane can absorb the full energies of family labour over a fairly long period.

To sum up, sugarcane requires much greater expenditure per acre of cultivation than its principal alternative crops. The variable cost of producing small quantities may be low, since the busy season in cane cultivation falls entirely outside the main agricultural busy season so that any farmer would be able to make a fuller use of farm bullock and family labour by substituting cane for alternative forms of land use.
6th Chapter.
Localisation of Industries:

The location of a sugar factory is conditioned by the availability of sugarcane in sufficient quantities within a reasonable economic distance. It is essential that the units must be located in close proximity to the sources of raw materials so that the units can be assured of continuous and uninterrupted supplies of fresh sugarcane from the fields within the shortest time. The sucrose content of the cane begins to deteriorate soon after the stalks have been cut, therefore it is essential that the units have easy accessibility to the cane supplied. In Weberian terminology the sugar industry has a "Material Index" of greater than unity, and hence the industry is not capable of considerable dispersal. The importance of raw materials can be judged by the fact that in the cost of production of sugar, the price of sugarcane represents half to two-thirds of the total cost. Any economy secured in this direction would greatly influence the competitive position of the industry. The 'sugar industry' is, therefore, "raw-material localised", and its location is within a reasonable economic distance.

In short, a complete localisation of individual firms near raw-material producing centres is one of the distinguishing characteristics of the sugar industry. The second distinguishing characteristic is that it is a seasonal industry. Since the harvesting and processing of cane are almost simultaneous operations, sugar production ceases soon after the harvesting season comes to an end. Hence, for these reasons, it is imperative for the processing units to be located as near as possible to the actual sites of cultivation, so that the cane can be transported from the fields to the factory as quickly and cheaply as possible.
In Nizamabad, almost all the sugarcane fields are scattered all over the district as can be seen in the sugar production map No. 11. Except of it's own farms, as shown in map No. 12 and table No. 26, which are located in the factory's area, it is difficult for the factory to get cane from distant farms belonging to local farmers of the district. Therefore these farmers will produce enough cane for their own needs and sell some of it in the local market instead of selling it to the factory because of transport difficulties.

From the point of view of the sugar-producing firms, the effective supply price of any given amount of cane, which it buys from a distant area, will be raised by the cost of transporting the cane from that area to the Factory. Nevertheless, the firm may buy cane from distant areas because it becomes cheaper after a point to do so.

As already stated, the white sugar industry became concentrated in Nizamabad district, because the first condition of sugar production i.e. a sufficient concentration of cane cultivation in the factory's own farms has been considerably fulfilled in this area. However, the factory found it necessary to obtain some of it's cane supplies from far flung areas. Some idea of the cane, which is available in the vicinities of the factory, may be made by considering the proportion of 'gate cane' crushed by 'gate cane' is brought to the factory gates by farmers on bullock-carts usually drawn from a radius ranging from 10 to 15 miles away. Based on rough assumption
DEPOTS OF THE NIZAM SUGAR FACTORY
(Farm Cane & Ryot's Cane Supply)

Factory Farm Cane Depots - O
Ryots Cane Supply Depots - O
Factory Farm Shown - O

Miles

MAP 12
it shows that even firms in major sugar producing States like Andhra depend, to a considerable extent, on cane transported over fairly long distance.

If a uniform price is fixed, the factory pays for the transport charges of the cane. If different prices are fixed, the transport charges are indirectly borne by the farmers from the outer areas, in the form of the lower cane prices, they receive. In either case, the effective supply price to the factory, of any given amount of cane is higher than it would have been if the cultivation of cane had been more concentrated in its own gate areas. It may be, therefore, that some more positive action is needed for increasing the supply of gate cane to sugar factories.

Therefore, later, the interest of the farmers was protected by making it compulsory for the factory to purchase at the official minimum prices --- all the cane, which was offered to it for sale either by individual farmers or by the co-operative societies. Provided the quantities offered for sale did not exceed (in each individual case) the output of \( \frac{2}{3} \)rd of land which was suitable for cultivation. The object of this rule being to encourage the introduction of a three year rotation system by farmers (farmers are normally free to produce gur as an alternative to selling their cane to sugar factories in reserve zones).

To summarise, it would be seen that individual factories should be located in areas, where cane cultivation is highly concentrated and where prices of given quantities of cane are low. The lower the prices of cane to the factory, the larger will be the amount of cane which it can obtain at any given prices fixed by the Government, and - other things being
The names of the farms and cultivable area are given below:

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Name of Farm</th>
<th>Total area in acres</th>
<th>Net cultivable area in acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Sathapur</td>
<td>1,953.00</td>
<td>1,682.30</td>
</tr>
<tr>
<td>2.</td>
<td>Boregaon</td>
<td>1,243.07</td>
<td>1,008.01</td>
</tr>
<tr>
<td>3.</td>
<td>Ranyalpenta</td>
<td>1,740.00</td>
<td>1,591.14</td>
</tr>
<tr>
<td>4.</td>
<td>Ambampenta</td>
<td>1,908.20</td>
<td>1,622.15</td>
</tr>
<tr>
<td>5.</td>
<td>Waddapalli</td>
<td>630.31</td>
<td>560.30</td>
</tr>
<tr>
<td>6.</td>
<td>Narsapur</td>
<td>1,512.36</td>
<td>1,506.26</td>
</tr>
<tr>
<td>7.</td>
<td>Pandu</td>
<td>919.15</td>
<td>811.00</td>
</tr>
<tr>
<td>8.</td>
<td>Ottpalli (Amdapur)</td>
<td>2,355.01</td>
<td>1,899.20</td>
</tr>
<tr>
<td>9.</td>
<td>Jallapally (Eklaapur)</td>
<td>2,382.06</td>
<td>1,594.00</td>
</tr>
<tr>
<td>10.</td>
<td>Hangarga</td>
<td>829.05</td>
<td>561.32</td>
</tr>
<tr>
<td>11.</td>
<td>Belal</td>
<td>923.25</td>
<td>756.33</td>
</tr>
</tbody>
</table>

Total acres: 16,395.46  13,592.01

Source: The Nizam Sugar Factory.
equal, the greater will be the amount of sugar produced.

1. The supply of cane should be obtained from as small an area as possible if this condition is not fulfilled and the cost of transporting cane from the fields to the factory begins to acquire dimension, the conditions of sugar production would be much less efficient than otherwise.

2. The supply of cane should be even and regular during the crushing season, and the crushing season should be prolonged as long as possible. This would enable the factories to work to their full capacity, and to spread their overhead charges over larger outputs thus cutting down average costs.

3. The production and sale of sugar should not be monopolized at any cost. Free competition may be organized for the same purpose which might curb the sugar producing firms to use their monopolistic powers in restricting output and raising prices.
Effects of Annual Fluctuations and the Crushing Season

The reason, why annual fluctuations in sugar production are largely determined by changes in the supply of cane, probably arises from the seasonal character of sugar production in Nizamabad as well as in India. Factories, like Nizam Sugar Factory, which process agricultural raw-materials into finished product, generally have limited capacities, especially in the short period. The sizes of their plants depend upon different factors, viz.,

(a) The total supply of raw material obtainable at going prices under normal conditions is perhaps the most important factor,
(b) The supply prices of labour in the surrounding region,
(c) The transport cost of the finished products, and
(d) The nearness of the wholesale markets.

In general, the sizes of their plants are adjusted in such a way that they are able to handle efficiently the normal range of raw material supplies available to them. If, however, in any year, owing, for instance, to a bumper crop, the supply of raw material exceeds the normal level, the factories will find that the marginal cost of processing the larger supply is higher than for their normal level of output. Therefore it would be worth while for them to buy up the surplus raw-material and subsequently increase the production only if the difference between the prices of the final product and the raw-material is wide enough to cover the higher processing cost. Unless there is a considerable increase in their average and marginal costs of production, it would not be feasible for the factories, in general, to increase their outputs to much above the optimum level. And it is
for this reason that higher factory margins (which are an indication of the amounts of cane demanded by processing firms) are expected to be closely associated with larger outputs, at least after a point.

The daily crushing capacity of a sugar factory is also limited, for example, the Nizam Sugar Factory, which crushes more than 4,000 tons of cane, but, since its working period lasts only for a few months, it can increase its annual production, without raising its average daily level of output, merely by lengthening its crushing season. So long as the crushing season is prolonged and its productive capacity is maintained within the efficiency limits, there would be no likelihood for the average variable and marginal cost of production to rise to any considerable extent. If the duration of the crushing season is enhanced, the average fixed processing costs would be associated with greater output. Besides, any increase in production, resulting from lengthening the crushing season, would lower the average fixed costs per unit of output. These overhead charges, which are fixed for the whole year, such as interest on fixed capital, and the salaries of the permanent staff, would be spread over a larger output. Therefore, the annual production capacity of the sugar industry is much more elastic than that of non-seasonal industries, and sugar producing firms find it profitable to increase production even if factory margin are constant, provided the necessary cane supplies are forthcoming.

The yearly fluctuations in the sugar production as described before may be due to changes both in the supply as well as demand for cane. A rise in the price of sugar
would increase the amount of cane demanded by the factory at
given prices, while a fall in the price of cane would extend
the amounts of cane which factories are willing to purchase, other things being equal, the equilibrium output of the factory
given the price of sugar. Changes in the factory margins, would be greater, the higher the price of sugar and lower the price of cane.
therefore, would be a good measure of changes in the demand
for cane.* The supply of cane from farmers in any year depends
mainly not only on total cane production, but on the relative
profitability of producing gur as against selling cane to
sugar factories. In general, with given cane prices, an increase
in total cane production or a fall in the price of gur, would
increase the supply of cane to sugar factories. Therefore
it may be possible to judge whether changes in the demand or
supply of cane were more important in influencing sugar
production by correlating annual movements of both in cane
crushed and in factory margins (representing changes in the
demand for cane), in total cane production, and in the
purchasing power of cane in gur terms.

One point, however, is that, although farmers are free to
increase their cane supplies to factories when the price of
gur falls, they are not always allowed to reduce supplies
when the price of gur rises, as cane is sometimes bonded in
advance to sugar factories, often in return for loans made
by them to farmers. However, this attitude of bonding cane
in advance, is not common enough to prevent a rise in the
price of gur from affecting the total supply of cane or sugar
production.

* 1. For example, a factory whose most efficient daily cane crushing
capacity is 1000 tons, could crush either 90,000 tons of cane on
a ninety-day season or 100,000 tons in a hundred day season without
much change in average variable processing costs per unit of output.
Average fixed costs would be the same for the same total output,
but would be lower for an annual output corresponding to 100,000
than to 90 thousand tons of cane.
2. i.e. a good measure of the demand for sugar for any given
period of time. Since, however, sugar production is a seasonal
industry, the demand for sugar during any season depends also on the
length of the crushing season, which is why as shown below factory *
 margins have little influence on short period changes in production.
The following reasons may help to explain why the correspondent in between movements, in proportions of cane crushed in sugar factory and the purchasing power of cane in terms of gur, is not close, particularly in Nizamabad District:—

(1) Since the Nizam Sugar Factory draws all its cane supplies from areas in its close vicinities, the maximum amount of cane it can obtain depends on production in these areas rather than in the state as a whole. Separate estimates of cane production between different regions may influence greatly the proportions of cane and gur. This is particularly an important consideration in Nizamabad where the factory crushed less than 30% of total cane production in most years.2

(2) Some parts of the cane crop is bonded in advance to the sugar factory. In such cases farmers are not allowed to use their cane for gur production even if they would profit by doing so.

(3) The small quantities are eaten as cane, converted into cane juice, or sold for making khandsari sugar. In this way the supply of cane would be affected by the real relative profitability of using cane for such minor products.

(4) The supply of cane to the sugar factory would also be affected not only by changes in the cost of transporting but in the costs of processing cane into gur also.

(5) Finally, there may be some areas where the supply of cane to the sugar factories is highly insensitive to changes in the relative prices of cane and gur.

There was also close association between annual changes in total cane and sugar production.
During the main part of the non-harvesting season, over 75% of the cane crop is harvested in Nizamabad. Even during the non-harvesting months more cane is harvested in the middle period than at the beginning or at the end. In times of high cane production, the amounts harvested at the beginning and at the end, are sufficient to enable the factory to produce at an economic output. In years of low production, however, the proportion of the cane harvested in different months may be the same but the actual amount harvested would be lower, so that the factory cane can work economically only for a much shorter season. Hence in general, high cane and sugar production are closely associated with longer crushing season.

To sum up, the seasonal character of sugar production enables sugar producing firms to increase their annual outputs without substantially raising their average variables or marginal processing costs, which help to explain changes in factory margins exert so little influence on annual changes in sugar production. Nevertheless, there is always some point beyond which a decrease in factory margins would reduce production. If factory margins fall so low that some firms are unable to cover their average variable processing costs even when producing their most efficient levels of output, these firms will find it unprofitable to continue working, and would tend to close down even if cane supplies are available.

Such a situation, however, is likely to arise, if at all, only in a free market, and not when the sugar production or sugar prices are controlled as in India from 1940-41 to 1952-53.

To summarise, in the long period, the trend of sugar production depends not only on the demand for cane by the sugar factory, but on the supply of cane by the farmers also. The demand for cane (that is the amount of cane which would be
purchased at given prices of sugar and cane) depends mainly on the total number of firms. The number of firms would tend to increase when expected profit margins are high, and to decrease or at least remain constant when expected profit margins are low. If factory margins fall so low that some firms are unable to cope with their average fixed and variable processing costs over a period of years, there would be a gradual decline in the demand for cane, and consequently in the number of firms.

In the short period, changes in the factory margins hardly influence on changes in sugar production which are almost entirely determined by variations in the supply of cane. The supply of cane to the sugar factory fluctuates from year to year according to changes not only in cane production but in the relative prices of cane and gur also. On the other hand, in the short period, the demand for cane is much less variable, since established sugar factories, like Nizam Sugar Factory, find it profitable to work to full capacity, as long as their average prime costs are fully covered. Besides, the seasonal nature of the sugar industry may also help to explain why sugar factories are comparatively insensitive to changes in processing margins.
In India and in Nizamabad sugar factories are not so mechanized as in other countries, that produce sugar. In those foreign countries where manual handling still exists attempts are being made to adopt mechanical means as soon as possible. This method not only reduces the cost of handling, but saves considerable amount of strain on the labour. In Nizamabad on the other hand, the most prominent features of the factory yard are the number of hands employed and the general confusion especially in the neighbourhood of the cane carrier which is caused by the movement of full and empty carts. Except in the case of the factories own farms in which cane is brought on railway trucks into the factory yard and alongside the carrier, to which the cane is invariably removed by hand labour, the usual procedure is for the bullock cart after weighment to discharge its load at the spot which is considered most convenient and then to return to the scale in order that its tare may be ascertained. As carts always come in irregularly, cane has to be stored in order to keep the mills supplied. In consequence it often deteriorates before it can be crushed and the deterioration affects all the subsequent operations in the factory.

The Nizam Sugar Factory is mostly fed by hand labour, a duty which such labour can never be depended upon to perform satisfactorily. Even the best milling plant will not give good results, if it is fed intermittently. In Cuba, where the milling capacity of the factories is especially large, the cane trucks, capacity of which is twenty tons, are fitted with hinged sides. The trucks are run on to a tipping platform alongside a hooper or a especially constructed conveyer, and
are then tilted by means of a hydraulic ram until they are emptied. In this way three men can discharge 60 tons of cane in an hour, whilst in this factory 24 men cannot unload more than 15 tons of cane on to the carrier at the same time. In Java, where the cane trucks are smaller than those in Cuba and hold from six to eight tons of cane only, they are run alongside the carrier; the contents are hoisted bodily from them by means of an electric crane and deposited on a sloping platform and from this the cranes are fed to the carrier by a rake, which is worked mechanically. This method requires more labour than that adopted in Cuba, but is equally efficient in securing a regular supply of cane to the mill. As the bulk of cane in the sugar industry must continue to be brought in to the factory on bullock carts, the contents of which it should be possible for a crane to hoist on to the carrier without difficulty and as the capacity of them is comparatively small, the Java system of dealing with cane is in every way more suited to the factory conditions here than that in use in Cuba; and it is considered that a marked increase in efficiency would result, if it were adopted in this country and in turn in Nizamabad District.

Most of the factories in the foreign sugar producing countries store their sugar (raw sugar)* in bulk silos where

* Sugar production in some countries is divided into two stages. Sugar (or beet) is first converted into raw sugar, which is then refined in sugar refineries. In such cases the refining process need not be confined to one season, but can be continued throughout the year. In India all the sugar factories were equipped to produce white crystal sugar from cane. In the twenties there were a number of refineries.
elaborate precautions are taken in order to prevent the
deterioration of sugar. In Nizamabad, sugar packed in gunny
bags is stored in Godowns, in such a way as to be away from
the walls by a few feet. Bags are not kept directly on the
floor. During long periods of storage and due to defective
construction of godowns, the quality of sugar, however, has
been found to deteriorate considerably in a number of cases.

Hence storage is another problem facing difficulties in
the processing of the factory. During storage, because of
unfavourable weather conditions, sugar deteriorates if not
stored properly. The owners do not want to take the risk of
storing sugar for a long time. Therefore they try to sell it
at lower prices than the prevailing ones and this affects
the sugar industry considerably.
Production Planning, Programming and Control:

Planning is necessary for carrying out the production efficiently. Besides this, planning provides effective measures of control.

In general, the following factors are taken into account regarding planning production:

1. The capacity of the Plant.
3. Quantity of cane to be crushed.
4. The varieties of sugarcane to be cultivated.
5. Grades of sugar to be manufactured.
6. The likely crushing period.
7. Percentage of recovery to be achieved.
8. Existing and Potential demand for the product and the quantity of sugar to be produced.

The capacity of the two plants at present is 4,200 tonnes per day. The availability of cane has a bearing on production planning, and as such, the planning has to be done taking into consideration the availability of cane. At present, the sources of supply of cane are the factory's own plantations and cane grown by ryots. The former source accounts for about 40 per-cent, and the latter about 60 per-cent. While the factory can have a complete control over the availability of cane from its own farms, the position, with regard to cane supply from ryots, is slightly different.

Sometimes the production programme of the factory is influenced not entirely by economic factors. Being a public enterprise, the company has to take into account certain social considerations in its production programming. Probably this may not be at the factory's initiative itself, but the origin of such factors may lie with the Government.
It is because of this only, that the cane supply from the ryots had to be accepted even up to May and that the company had to prolong its crushing season until the end of May, during the year 1961-62, though it was uneconomical to have such a crushing season.

The quantity of cane to be crushed is programmed mainly by taking into account the capacity of the plant. It is planned every year to crush so much quantity of cane which can be crushed within the most economical period, when the recovery will be high. Normally the quantity of cane to be crushed during a season is programmed at 600,000 tonnes. This is at the rate of 120,000 tonnes per month and 4,400 tonnes per day. The quantity of cane to be crushed is programmed on the basis of percentage of recovery to be achieved and the quantity of sugar to be produced.

Three varieties of sugar cane, as already discussed, are cultivated in the factory's farms, they are known as "Adsali", "Eksali" and "Ratoon". These three varieties of cane have a different maturing period. Adsali matures first, then Eksali and Ratoon. These early mid and late varieties are cultivated in the proportion of 35%, 35% and 30%. It is to be noted that, even within one variety of cane, for example, Adsali, Eksali or Ratoon, there is early, mid and late maturing cane. In the same way, contracts are entered into with ryots for supply of cane. The contracts are made on area basis for the supply of adsali at 30 tonnes per acre, Eksali at 20 tonnes per acre and Ratoon at 15 tonnes per acre.

Cane supply from the factory's farms is limited to 22,000 to 25,000 tonnes, which is grown on 5,500 acres. Therefore, the rest of the quantity, i.e., 350,000 tonnes is to be supplied by ryots. It can be seen that the period of cane
crushing is adjusted and controlled by cultivating different maturing varieties of cane.

Sugar is graded according to standards laid down by the Indian Institute of Sugar Technology, Kanpur, which is attached to the Ministry of Food, Government of India. The two indicators for grading sugar are its colour and the size of the crystals. The colour is indicated by nomenclature in numerical numbers, i.e., 27, 28, 29 and 30. The colour of 27 is a bit redish and that of 30 is extremely white. The crystal size is indicated by means of alphabets A, B, C, D and E. A denotes the biggest size of the crystal, and accordingly, E denotes the smallest size. The production of costly grade sugar i.e., E. 30 is controlled by the Government.

The period of crushing and the percentage of recovery are negatively correlated. The longer the period of crushing, the lower the percentage of recovery and the shorter the period of crushing, the higher the percentage of recovery. Therefore, efforts are made to limit the crushing period to the most economical season, i.e., November to March, so that the percentage of recovery may be maximum. In order to achieve both these ends, it is to be better planned to supply the cane from the factory’s farms and from ryots within and shortest time and regularity.

The cane Transporting Department is responsible for the supply of cane from factory’s farms and cane supply department for the supply of cane from ryots. These two departments are held responsible for any delays in the supply of cane and necessary action is taken against those responsible. Care is taken to see that the cane is crushed within 24 hours after harvesting. This is how control is exercised in getting
the cane to the factory on time. But it has been the constant problem of the factory, having had a long and uneconomical period of crushing. There have been times when the crushing season, starting in the month of November, ended only at the end of May. The reasons have been mainly transport bottlenecks, surplus cane due to underestimation and cultivation of late maturing varieties. The period of crushing could be controlled to the most economical season by taking necessary measures which would overcome the above difficulties.

The "recovery" of sugar means the actual amount of sugar that can be bagged after allowing for unavoidable losses in production process. The unavoidable losses of sugar are: (1) Sugar in Bagasse, (2) Sugar in Press-Cake and (3) Sugar in Mollases. The percentage of recovery as already seen above is closely linked to the period of crushing. The variety of sugar cane and its sucrose content also determine the percentage of recovery. The average recovery of the two plants for 1965-66 season was 9.025 percent as against 9.0% for 1964-65 season. This is a sign of better results for 1965-66 season.

Lastly, the planning of the quantity of sugar to be produced in N.S.F. is not limited by the demand factor. As sugar has almost become a necessity, the internal consumption has increased. To earn foreign exchange, the Government has set exports targets for sugar, therefore the demand is much more than the present supply of sugar.

Thus planning of production and programming processes of production will be carefully done in the Nizam Sugar Factory taking into consideration the above cited important factors. Necessary control is also being exercised to
Table 27.

PERFORMANCE OF THE N.S.F. LTD.

<table>
<thead>
<tr>
<th>Season</th>
<th>Recovery in Total cane Crushed, (In Tonnes)</th>
<th>Total sugar bagged, (In Tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plant I (in %)</td>
<td>Plant II (in %)</td>
</tr>
<tr>
<td>1950-51</td>
<td>9.68</td>
<td>8.25</td>
</tr>
<tr>
<td>1951-52*</td>
<td>10.13</td>
<td>9.45</td>
</tr>
<tr>
<td>1952-53*</td>
<td>10.40</td>
<td>10.87</td>
</tr>
<tr>
<td>1953-54</td>
<td>10.43</td>
<td>10.82</td>
</tr>
<tr>
<td>1954-55</td>
<td>11.51</td>
<td>10.78</td>
</tr>
<tr>
<td>1955-56</td>
<td>9.98</td>
<td>9.50</td>
</tr>
<tr>
<td>1956-57</td>
<td>9.74</td>
<td>9.36</td>
</tr>
<tr>
<td>1957-58</td>
<td>10.99</td>
<td>10.45</td>
</tr>
<tr>
<td>1959-60</td>
<td>10.49</td>
<td>10.37</td>
</tr>
<tr>
<td>1960-61*</td>
<td>10.24</td>
<td>9.94</td>
</tr>
<tr>
<td>1961-62</td>
<td>9.96</td>
<td>9.42</td>
</tr>
<tr>
<td>1962-63</td>
<td>10.64</td>
<td>10.26</td>
</tr>
<tr>
<td>1963-64</td>
<td>10.18</td>
<td>10.19</td>
</tr>
<tr>
<td>1964-65</td>
<td>8.90</td>
<td>9.04</td>
</tr>
<tr>
<td>1965-66*</td>
<td>8.87</td>
<td>9.13</td>
</tr>
</tbody>
</table>

**

The rate of recovery has a great bearing on the total production of sugar, as can be seen from a comparison of figures of 1952-53 and 1951-52. The quantity of cane crushed is lesser in 1952-53 than in 1951-52, but the sugar bagged is more because of high recovery rate. A comparison of the figures of 1960-61 with that of 1965-66 reveals the same fact that a high rate of recovery results in increased quantity of production.

Source:- The Nizam Sugar Factory.
avoid delays and bottlenecks which would adversely affect the whole working of the factory.

WAGES AND PRODUCTIVITY:

Without commenting on the presence of measurement of productivity, as an indication of effective organisation, or the absence of it as an indication of defective organisation, it needs to be said that productivity is not measured in the Nizam Sugar Factory. Wages are completely independent of the productivity of workers. Wages are paid to the workers according to the wage scales recommended for different categories of labour by the wage board.

But the generally accepted conception by most of the employees, if not the workers, is that the productivity is low. Though no satisfactory reasons were made available for not measuring the productivity, the reasons for this general low productivity were made clear. They are:
(1) The employment of too many persons in certain areas than is really required. (2) Low yield of sugar due to bad cane, and some other reasons. It is calculated that the average man hours per ton of sugar produced in India are 84, compared with five average man hours in some other sugar producing countries.

Since wages are not related to productivity in the Nizam Sugar Factory, it is likely that workers, who can put up a very good performance, are not encouraged. Furthermore, as the workers are assured of their monthly wages regardless of the amount of work they do, it is likely that some of them work with one eye on the clock and the other on the calendar. Consequently, the quality of work suffers.

One suggestion in this direction is that the management
should once experiment the technique of "Wages based on Productivity" and see the results. This will induce many of the workers to work more, and do better work, which will enhance the productivity and also their wages. If this technique is found beneficial, it can be retained, otherwise rejected.

QUALITY CONTROL:

One of the important objects of controlling production is to ensure the quality of the product. In this context quality control has two aspects, i.e., quality of the sugar-cane and the quality of sugar turned out. While it is true that it is the quality of sugar that matters, ultimately it is equally true that, in order to produce better quality sugar, the quality of the cane must also be controlled in addition to other factors.

A good quality cane is one which has the maximum sucrose, gives maximum percentage of recovery, has a reasonably mid-maturing period, and lastly, is not costly to cultivate. The quality of cane is controlled in the N.S.F. by cultivating three varieties of cane, i.e., Adsali, Ekali, and Ratoon. 

Adsali takes one year and eight months to be ready for harvesting, Ekali takes one year, Ratoon is the second crop of the Mother plant. After harvesting Adsali and Ekali, there will be small cane plants still growing and not matured for harvesting. All such growing cane is left after harvesting the main crop and is watered and made to grow until it matures. Maturity is a stage of growth after which cane does not have any further possibility of growth. After maturity it is also harvested. Therefore, Ratoon has a late maturing period.

1 Please refer also to Chapter IV.
All the fields are tested, and the ripeness of the cane is tested with an instrument called RERACTOMETER by a batch of workers. Relative priorities are drawn up for harvesting, then necessary transport arrangements are made to supply the cane to the factory in time.

As to how the quality of cane is maintained, can be understood more clearly by making a study on the Research Station at the factory. This is taken up by the plantation department. The quality of cane is maintained and improved by cultivating good varieties of cane and harvesting it on maturity, and also by seeing to it that harvested cane is crushed within 24 hours.

All the factories, producing sugar in India, are supplied with the standards indicating the quality of sugar, by the National Sugar Institute. As already noted, these standards are fixed, taking into account the colour and size of the crystals. The colour is indicated by numerical numbers like 27, 28, 29 and 30, and the size by means of alphabet letters A, B, C, D and E. Control is exercised on the quality of sugar with reference to these standards. The production of superior quality of sugar from the view point, of either the colour or the crystal size, involves excess expenditure on the Chemicals and higher steam consumption. Therefore, under scarcity market conditions, not much emphasis is placed on the quality of sugar. Now the production of grades of C 30 and C 29 are completely prohibited by the Government since they involve high cost of production.

During the season 1965-66, the total production of about 231,598 bags (of one quintal each) in plant I grade E 29 accounted for 92% and E 28 for 8%.

During the same season, of the total production of about
434,679 bags (of one quintal each) in plant II grade E 29, accounted for the highest percentage and E 30, D 29 and E 28, accounted for the percentage in the descending order.

The quality is dependent upon the quantity of Sulpher used in the production. Due to scarcity of Sulpher at present, the quality of sugar is suffering to some extent.

To sum up, the quality of the cane, uniform crushing to the rated capacity of the machinery, required quantity of steam generation, vacuum conditions in pans, the type of process adopted, etc., are the factors that need to be paid enough attention in the matter of quality control.

ECONOMICS OF SIZE:

It is difficult to define precisely an Optimum size that the Optimum size generally means that it is the best or the most desirable size. But the Optimum is flexible in the context of ever changing scientific, technological, managerial, financial, marketing and risk bearing factors. Today's Optimum size may not be the same after some time.

Whatever the economics of size, the Government today has laid down that a sugar factory will have a minimum daily crushing capacity of 1,250 tonnes with a recovery of about 10%. Even when the first plant of the Nizam Sugar Factory was started, it had a crushing capacity of 1,200 tonnes a day. Another plant with a crushing capacity of 2,000 tonnes a day was started in 1951-52 and further expansion of the combined crushing capacity by another 1,000 tonnes has been completed, bringing the total crushing capacity to 4,200 tonnes a day.

The size of the plant has a direct bearing on the cost of production. If the crushing operations are confined to
the most economical period, the rate of recovery will be higher. This will result in a reduction of costs. Of course one will have to weigh the relative advantages of shortening the crushing season against, on the other hand, the possible disadvantage of having to invest larger amounts in machinery or the other.

The cost of production in Plant I, for the 1965-66 season, was about Rs. 119.48 paise per bag of sugar. For the same year, in Plant II, the cost of production was about Rs. 112.38 paise per bag of sugar. Thus, one can see that the cost of production in Plant II, is lower than in Plant I by Rs. 7.10 paise per bag of sugar produced. The reasons, for the lower cost of production in Plant II, are mainly as follows:

(1) The size of Plant II is bigger.
(2) Plant II is erected with almost all modern machines.
(3) Being a relatively new plant, this plant is enjoying the laws of decreasing costs. Plant I is 24 years old and Plant II is 14 years.

The cost of production (Plant I plus Plant II), on the whole for 1965-66 season, stood at about Rs. 115.23 paise per bag of sugar produced.

The quantity of sugar, produced for the same year in Plant I, was 2,31,598 bags, and in Plant II, was 3,44,679 bags of one Quintal each. Therefore, the total quantity of sugar produced, was 5,76,277 bags of one Quintal each. The total cost of production, (of Plant I and Plant II), for 1965-66 season, was about (Rs. 115.23 x 5,76,277 quantity of bags) Rs. 66,406,355=00.
The quantity of cane crushed, the percentage of recovery for the year 1965-66 are respectively about 6.50,000 tonnes of cane, 0.025% recovery. Both, the quantity of cane crushed, percentage of recovery and quantity of sugar produced, are higher for 1965-66 season as compared with the previous year. Due to drought conditions, the 10% recovery could not be obtained for this season.

It is quite interesting to note the performance of the Nizam Sugar Factory from the point of view of production during the last fifteen years. The following Table No. 27 serves to indicate the performance since 1950-51 season.
BY-PRODUCTS:

The three principal by-products of the sugar industry are (1) Mollases, (2) Bagasse, and (3) Press Mud. In addition, a large amount of canetrash is left in the fields after the harvest of cane. The proportion of Molasses to cane averages between 2.5 and 4.0% and that of Bagasse between 32 and 35%. These by-products have several industrial and other uses.

Molasses:

Molasses is the most important by-product of the sugar industry and the considerable fall in its price has meant a substantial addition to the net cost of the production of sugar. According to the Molasses Control Order, 1961, Molasses means the Mother liquor produced in the final stage of manufacture of sugar by vacuum process from sugarcane or gur. It is a dark coloured viscous mass out of which further crystallisation of separation of syrup is not possible by ordinary means. However, it still contains 30 to 35% sucrose and 18 to 24% "reducing sugar" (glucose and fructose), the total sugar content (in terms of reducing sugar) being 45 to 54%.

Whereas Molasses produced as a by-product of white sugar through the sulphitation process is not edible and is used mainly by fermentation industries, Molasses produced as a by-product of raw sugar is edible and has a large market for cattle food. An important use of the sulphitation Molasses is in the manufacture of Ethylalcohol. Alcohol is produced by the Government Power Alcohol Factory annually to the tune of more than one million gallons in the Nizam Sugar Factory. In 1942 a Distillery was set up with an initial capital of Rs. 70,000 to process the waste product of Molasses for the production of alcohol, mainly with the idea of using it as a power alcohol which was in short supply during the second World War. The Co-2 gas also
world war. The power alcohol produced in the Nizam Sugar Factory was the best standard, being 99.9% pure. Sirsilk Ltd., an acetate rayon producing factory, was set up at Sirpur-Ka₆z₇màgar to utilise the alcohol produced in the factory.

With the easy availability of this important product, many other alcohol based industries have sprung up for the manufacture of pharmaceuticals, polishes, laminated sheet and acetic etc. Thus, the alcohol plant at Bodhan has given an impetus to the establishment of several small and medium sized industries in the State, i.e., paper and confectionery, etc.

Bagasse:

Bagasse is the other important by-product of the sugar industry. Bagasse is used exclusively for fuel, and very few factories have so far had sufficiently large surpluses of this to require any special methods for utilization, and the Nizam Sugar Factory is one of the efficient sugar factories that is utilising this material to a large extent.

Bagasse is the fibrous product remaining after the cane is crushed. The industrial uses to which Bagasses can be put are; (a) fuel, and (b) raw-material for the manufacture of paper, pulp, newsprint and insulation boards. Bagasse can also be used, after treatment, for production of plastics, moulding powder, cattle feed, bio-gas and manure etc.

Presently, Bagasse is almost entirely used as fuel in the boilers as stated above. It is fed into boilers directly as it comes out of the mills and the sugar factory boiler furnaces are especially designed to suit this moist fuel.

As there is a considerable shortage of Bamboo and Sabai grass, keen interest has been expressed in recent years, for
the utilisation of Bagasse for the production of paper and pulp on a much larger scale than hitherto. At present, the Government of India has granted an industrial licence for a chemical pulp and paper plant based on the Bagasse of the Nizam Sugar Factory.

There are two ways in which Bagasse can be produced from the sugar factories, (1) by supplying substitute fuel in the shape of wood, coal or furnace oil, to sugar factories, and getting the entire Bagasse released for the paper industry; (2) by making sugar factories more efficient in respect of fuel consumption and realising the surplus Bagasse. The major limiting factors are (i) lack of assured supply of alternate fuel at reasonable prices, (ii) conversion of existing boilers in the sugar factories, (iii) installation of de-pithing and equipment in the factories, (iv) non-availability of sufficient storage space and (v) higher railway freight on Bagasse as compared with that of Bamboo.

Press Mud:

During the course of clarification, most of the impurities of sugarcane juice gets precipitated. The resultant product is called Press Mud or filter cake. The production of Press Mud, with about 60% moisture, is around 3% on cane sulphitation factories and about 7% in carbonation factories. Practically all the sulphitation press mud is used as manure in the fields. The Press Mud obtained by carbonation process is used generally to fill up pits and, in some cases, for the production of lime for building purposes. Attempts have been made to extract wax from the sulphitation filter cake. Cane wax can be used in the place of imported carnauba wax in the manufacture of carbon paper, shoe and other polishes, wax
paper, emulsion for protective coating on fruits etc. Efforts are being made to develop the industry for the manufacture of cane wax from sulphitation Press Mud. Attempts are being made to make profitable use of the carbon-di-oxide produced in the process of alcohol manufacture, as carbon-di-oxide Plants have been set up to compress and bottle the gas in cylinders for use in the manufacturer of aerated water at the Nizam Sugar Factory. The necessary permission has now been received from the explosives department of the Government of India, and it expressed that this plant will go into production during the current year.

At present there are no facilities for developing the production of, and export market for, alcohol and cattle food, based on Molasses, when Molasses is such an important and useful material in the Nizam Sugar Factory. The State Government may consider this case.
7th Chapter.
In the preceding chapters, careful consideration and discussion has taken place on the various aspects of the sugar industry in the district of Nizamabad as well as Andhra Pradesh and India.

The irresistible conclusion is that the sugar industry in foreign countries is in a better position than a large part of the Industry in India, and in turn, in this district. To some extent, the present position of the Indian sugar industry is due to inadequate attention having been paid in the past towards increasing productivity. Now the demand for sweetening agents is rapidly rising, calling for corresponding increased production of sugarcane, not only for meeting internal needs but also for exports; sugar having become a very important earner of the much needed Foreign Exchange. Previously, attempts were made to augment the production solely to meet the domestic requirements, but the corner has now been turned and sugar is being produced in excess of their requirements; surplus production is available for export. Exports entail losses; it is, therefore, very important for the sugar industry to increase its productivity in order to cut down the losses. With this end in view, and for some other improvements, the under noted suggestions have been made;
The foregoing study of the position and problems of the sugar industry in the district of Nizamabad reveals that:

(1) The climatic and soil conditions of the Nizamabad district, particularly in Bodhan where the Nizamabad Factory is at present located, are very favourable for the sugar-cane crop. The yields per acre are quite high and the quality of the sugarcane grown is fairly good. There is, however, considerable scope for further improvement.

(2) Varietal position is fairly satisfactory and the new varieties being introduced are giving promising results as shown by sugarcane research carried out in the district.

(3) The expansion of the industry in the district has been quite substantial in the last few years, but when comparing with foreign countries, it is not an impressive one. For example, one of the factories in the Philippines has a capacity of 9,500 tons per day and a factory in Puerto Rico has a capacity of 7,000 tons per day. In view of these facts, the capacity in the Nizamabad Sugar Factory is very small and one should aim at increasing the capacities of the units wherever possible, up to, at least 3,600 tons per day in N.S.F. II (Plant).

Moreover, in the sugar industry the capacity of the unit alone does not make the unit economic or otherwise. It is the period of crushing, which along with the size of the unit determines the ability of the unit. A unit with a capacity of 100 tons per day will be an economic unit if it crushes for 120 days and gives an average recovery of 9.5 to 10 percent, whereas a bigger unit may give economic results even with slightly lesser crushing or lesser recovery.

Since sugar from this district, as well as from the State,
will have to be sent to areas outside the State, the need for reducing the cost of production is all the more. This will have to be achieved both by reducing the cost of cultivation of cane as well as bringing down the manufacturing cost.

Cost of Production:

The main ingredient in the cost of production of sugar is sugarcane. Considering the sucrose content, sugarcane prices are much higher in this district and in turn in this country. The high cost of sugarcane is due to the small holdings, large number of small cultivators, their poor resources, indebtedness and several other factors which are affecting both the yield and the quality of sugarcane, directly and indirectly. Steps will therefore have to be taken to improve both the yield and the quality of sugarcane. Considering the varieties of conditions in this region, intensification of the breeding for developing high yield and high sucrose content cane varieties suitable for the areas, is important. The success of the Hawaiian Sugar Industry is very largely due to the valuable work done in the field of sugarcane breeding. The absence of facilities for adequate manuring and irrigation, as well as inadequate crop protection measures, is also responsible for the poor quality of yield in this place. Facilities for soil analysis and evolution of scientific manuring and irrigation schedules have to be increased. To this end, it would be desireable to have a network of well equipped laboratories, preferably attached to sugar factories, for analysing the soils of various areas and advising on methods of soil preparation, optimum manuring schedules, irrigational requirements, and methods for timely control of weeds and pests and diseases. One important factor contributing to high yields and quality
in the foreign sugar producing countries is the large-sized holding which enables scientific agriculture. Efforts at consolidation of small holdings from the operational point of view, appear to be of very great importance for increasing productivity in the field.

Quality of Cane.

There is much scope for improvement in the quality as well as the yield both of sugarcane and the manufacture of sugar itself.

As far as sugar is concerned, the quality can be improved by resorting to the cultivation of imported seed only; scientific estimation of seed before planting, the use of weedicide and resorting to plant protection methods, mechanical ploughing and other preparations; scientific and proper use of chemical and indigenous manure.

As regards the improvement of quality of sugar, it can be said that scope to produce superior grades exists but it is not practised because the grades permitted by the Government of India are only E, D and C 29, 30 and 30 respectively in each. This restriction from the Government of India is presumably based on the absence of local market for higher grades.

High productivity of sugar can be achieved if the sugarcane that reaches the factory fulfills the following requirements:

(1) Cane must be fully matured.
(2) Cane must be free of acid producing extraneous matters like green tops, leaves, roots etc.
(3) Cane must be free from diseases.
(4) Water shoots should not be used as cane.
(5) There must not be a substantial time lapse between harvest and crushing.
To achieve these qualities, co-operation of the ryots and also active supervision and proper planning of harvest and clearance is necessary.

**Methods of Payment:**

Quality assessment and payment on the basis of quality are essential for progress in any field. This is particularly so in sugarcane where the absence of this approach would result in continuously falling quality of cane. In all the countries that have already been discussed in the fifth chapter, where cane is purchased from the farmers, the cane price is not paid on weight but on a quality basis. The farmers and processors work in close co-operation. It is therefore recommended strongly that a suitable system for payment of the cane priced on quality basis, should be enforced in the Nizamabad district at an early date. It is not possible to test the quality of an individual grower, but a beginning can be made with group or taluk-wise testing. This would make the grower quality conscious and increase the productivity. It would automatically lead to harvesting by cultivators on maturity basis and bringing the cane as fresh as possible to the factory. This will also enable the grower to plan his planting and harvesting programmes scientifically.

It is true that any new system always has some drawbacks and difficulties in the initial stages but hurdles and difficulties facing the sugar industry are also not unsurmountable. A change over to another system will necessarily be a revolutionary step, but if the sugar industry of the district as well as in India has to stand competition with more favourably situated sugar producing countries of the world, there is no alternative but to effect the change, no matter how difficult the task may be.
or how numerous the problems that may have to be faced in adopting the more rational and scientific system.

In regard to production, the fact that is obvious in foreign countries, is that the production of sugar is systematically planned. In this region, it is very distressing to see serious and frequent fluctuations in the production and the cost of sugar.

Every now and then the district is faced either with shortage or with over production. Both shortages and surpluses create problems for everybody. Therefore, it is advisable to give serious thought to avoid repetition of such conditions. Quotas can be fixed for the cane suppliers as well as for the producers, so that the growers know how much cane they have to grow and supply to the factories, and the factories know what quantity of sugar they have to produce. What is happening is that sometimes the factories work up to June and sometimes the factories shut down in March or April. This is not in the interest of either the growers or the factories. It not only leads to fluctuation of production costs but also creates problems among growers and the processors. Because of this fluctuation, the prices also keep varying to the annoyance of all concerned, including the consumer.

In order to limit the fluctuations in the district, one practical step that can be taken is to have the plantation area under the factory's control adequate enough to supply the entire requirements of cane. At present the factory farms are capable of supplying 2.5 lakh tonnes (2,50,000 tonnes) to 2.75 lakh tonnes (2,75,000 tonnes). In a good season the factory can crush between 45,000 to 50,000 tonnes. Increasing the potential ton produce requires huge capital outlay, as
land value in the area is increasing enormously. It is no
doubt evident that planned production of sugarcane will
stabilise sugar production but in the prevailing
circumstances such a planning is not possible. In the zone
there are seven to eight thousand producers, and all of
them have the freedom of adopting the crop pattern according
to their choice and ability. As stated above, diversion
of cane for gur production and Khandasari sugar units is
desirable in a good season and not in a bad one. However,
it is not possible to control the programme on these
diversions, as long as Khandasari units and sugar factories
exist simultaneously in this area.

Thus, this problem has assumed a serious proportion in
the district and is causing anxiety. However, in the
context of increase in crushing capacities on account of
expansions envisaged, the need for an assured supply of cane
is inescapable. It is suggested that assured supplies of
cane can be made by resorting to long-term bonding of cane
and seeing to it that the contracts are honoured by both the
contracting parties. As far as possible, gur and Khandasari
factories should not be allowed to operate in the reserved
zones of sugar factories. A certain amount of propaganda is
necessary to educate the growers supplying cane to sugar
factories, that their long-term interests lie in honouring
their commitments with the factories, and not in yielding to
temporary temptations afforded by occasional spurts in gur
price. If, however, they do wish to manufacture gur or
supply cane for gur manufacture, they should grow additional
quantities of cane, but not jeopardise the working of the
factories with which their own interests are permanently
linked.
Raw Sugar:-

In the interest of gaining a permanent foothold in the international trade in sugar, it is necessary to lay proper emphasis on research and standardisation of methods of manufacture so as to produce raw sugar.

In the district, the Nizamsugar factory should be given preference for the manufacture of raw sugar for export purposes as the State has three good ports, namely, Visakhapatnam, Kakinada and Masulipattam situated close to sugar factories in the State. If this is done, a considerable saving could be made in the transport cost and raw sugar could be exported at a cheaper price. The Committee agrees that this suggestion is reasonable and might be examined by the Government. If the factories in Nizamabad and Andhra Pradesh make raw sugar, their molasses would be suitable for cattle feed purposes as the district has a shortage of it.

Processing techniques, Modernisation & Instrumentation:-

The processing of sugar in foreign sugar producing countries is essentially similar to that adopted in the Nizamabad district and in India, inasmuch as sugarcane is the raw material. Juice is extracted by milling and sugar is extracted from juice after clarification, boiling under vacuum and crystal separation by centrifugal machines. The clarification process, however, is different because only raw sugar is produced directly and this is subsequently refined in refineries. The process of clarification is the simple defecation process, using only heat and lime as agents, whereas, in Nizamabad and India, since white sugar is produced from cane, more elaborate techniques of clarification, viz., sulphitation and carbonatation are followed. As a consequence,

1 Please refer to the Appendix.
the boiling, curing, washing, drying and grading operations have to be more elaborate in Indian factories. The special features of processing techniques in foreign countries are the use of automatic equipment, as far as possible, in order to save labour costs and process control by instruments. This feature is almost completely lacking in this region. The know-how of the operation and servicing facilities for instruments is also readily available in foreign countries, and the lack of it in this place has so far with held progress in this direction. However, in order to improve the efficiency further, here, instrumentation and automation, in respect of process control and operation have to be adopted in Nizamabad as speedily as possible.

Another aspect to which particular attention should be paid by the Nizamabad Sugar Factory, is to the handling of material at all stages from cane supply to sugar bagging. The installation of cane handling equipment in both the field and factory, specially in large sized factories, like the Nizamabad Sugar Factory, is of very great importance in improving efficiency. Mechanised feeding of the cane carrier not only provides a uniform feed to the mills but also increases capacity and reduces losses of pol in bagasse. Mechanised handling and feeding of the cane carrier at the factory is also necessary for proper lotwise testing of the quality of cane for the purpose of payment on quality basis.

Modernisation:

The manuring cost depends on various factors like the wages of manuaerial set up, cost of raw material, overhead expenses and efficiency of the plant etc. Some of these factors are under the control of management. Any reduction in the cost can only be achieved if there is efficient management covering
all aspects of production and also efficiency of the plant. Efficiency of the plant depends on timely replacements of worn out parts, proper maintenance and good upkeep of machinery. The cost of production can also be reduced by adopting time saving devices and also utilising as many by-products as possible.

The Nizam Sugar Factory, as already mentioned, consists of two units. The first unit came into production in 1938 and the second unit in the year 1948. Most of the equipment at the two units is original but there have been a few replacements also. At present there is a programme to take up development under a major scale providing quite a few replacements. The NSF.I has a capacity to crush about 1,650 tonnes of cane per day, and the NSF.II. has a capacity to crush 2,550 tonnes per day. The two plants can be said to be a hundred per cent efficient, but both of them are working with a fair amount of efficiency, and with the development, the efficiency will improve further.

There is certainly need and scope for modernisation of the machinery, but it depends upon the economic structure of the unit, availability of the modern machines and the ability to utilise them. With the import restrictions and a very tight money market, modernisation and expansion have their own limitations. If NSF is to be modernised and improved to the fullest extent, it requires, according to the factory's estimation, an outlay of not less than two crores of rupees. Even with this amount it may not be possible to acquire the required plants and equipment because of the manufacturing difficulties and import restrictions. Therefore, the factory needs to be self-supporting. They are often hard pressed by the inevitable delays in getting heavy parts from export due to foreign exchange difficulties. Hence, Report: Directorate & Annual Accounts. N.S.F.Ltd. Hyderabad 1966.
the more they can do for themselves, the better.

In this regard, one more suggestion is that a permissible cadre strength of man power to be employed in a factory is determined and up to 10 to 15 per cent of surplus labour can also be considered essential. It is quite possible that some of the factories have no surplus labour, and only at times, extra labour is employed on a casual basis. But in general, a little surplus labour is absolutely necessary replace ment in time of necessity due to absenteeism or mechanical breakdowns or increase in the pressure of work etc., will be possible. As described earlier and.

As far as the NBR is concerned, in the past it had some surplus labour. At present, it is being managed with the bearest minimum. As a matter of fact, in some cases, the labour employed is a little less than the minimum requirement.

Irrigation:

In a district like Nizamabad, where more than half percent of the population is intimately concerned with agriculture, one can see that the bursting of monsoon is uncertain. More than three-fourths of the total rainfall is confined to only four months of the year, with little or no rain in the Winter months. Even during the effective rainy season, which itself is short, rainfall is so erratic that sometimes the standing crops do not get water at a time when they require it most, and the harvests fall short of expectations, disappointing the rural community. Thus, to be free from the vagaries of rainfall, canal irrigation schemes as already discussed, first undertaken in the area under discussion in 1931, but with the increase of population and area, and the decrease in land productivity and the dam capacity, the need for developing and establishing irrigation facilities has

1 Please refer to Chapter III also.
become much greater. Therefore, the State's Government may:-

(a) Actively consider the case of the storage capacity of the dam, which can be increased by increasing the height of the dam, and

(b) prevent the surreptitious use of canal waters and to effect a more economic utilisation of these waters in the command zone. In this connection, it may also be profitable to suggest lining the main canal, and regularly maintaining its distributaries to prevent considerable losses that now take place due to seepage and percolation. At the same time, the problem of water logging in the district requires to be technically examined and countered to ensure a more economical use of irrigational facilities.

Transport Problem:-

Improvement of the transport and communication facilities in the district is necessary in order to cater for improved agricultural production.

Scientific harvesting is based on maturity and speedy transport to the factory is most important. Development of communications and introduction of payment on quality basis would ensure not only improvement in cane quality, but also prevention of losses during its transportation from the field to the factory.

Although there is a total mileage of 500 miles of roads in the Nizamabad district, one of the discouraging features is the scarcity of communicable roads for many villages. The P.W.D. from time to time has undertaken development of road building. To facilitate the transport of cane to the Nizam Sugar Factory, railway lines connect some of the villages in Bodhan and Nizamabad taluks, relieving the pressure on road transport. Even so, Nizamsagar Project site itself is
not on the railway line. The inadequacy of transport facilities is felt seriously more in the canal zone. These difficulties force the cultivators to sell their produce at the village itself, where the middleman offers them much less than the market price.

Hence the entire economy of cultivation holdings in sugarcane could be revolutionised by greater coverage of roads and transport facilities.

The Partnership Scheme.

The "Partnership Scheme" has many advantages. If the scheme runs for a few years in a zone, the farmers get into the habit of grouping voluntarily and carrying out by themselves, the operations in a spirit of co-operation. The officially sponsored co-operation farming has many inherent defects and the farming society is in the hands of men who have no direct benefits, and there are no incentives for work. They are too much officially guided, and this may prove to be inefficient due to personnel factors.

Initially, such a scheme may be worked in sugar factories, and later, such partnerships in cultivation may be extended to other intensively cultivated crops like cotton, tobacco etc; the introduction of this principle to food crops and also the introduction of registered limited companies in farming become possible. The limited companies, instead of owning lands, can enter into a partnership for cultivation in large blocks and improve the cultivation standards in the district as well as in the country.

In recent years, due to taxation policies and control on prices of sugar and cane, the factories are not coming forward with bold schemes for assisting ryots. Therefore, the introduction of such partnership schemes will develop cane. The trial of such a scheme is very much commended in the Nizam Sugar Factory and can be extended to scientific
cultivation of food crops.

Regarding the compacted blocks, there are certainly some advantages if the sugarcane fields are grouped into blocks of 50 or 100 acres. This will enable tractor operation to be introduced, and pest control being more efficient. If the fields are scattered in ½, 1 or 2 acre plots, the incidence of modern improvements is naturally poor.

**Long Term Problems:**

According to Sen enquiry Commission, any industry in bad shape cannot recover health without incentives. There are two kinds of fluctuation in the fortune of the sugarcane industry, i.e., man-made, and natural. Whereas it is noted that the man-made causes can certainly be tackled quickly so as to assist the industry in a short period. So it is advisable for the Government to adopt a policy of incentives based on long term basis. This would enable an early start, long crushing periods and also sowing of early and late ripening varieties of sugarcane, ensuring fuller utilisation of capacity.

In short, so far as agriculture is concerned, the Government does not seem to have touched the fundamental improvement arising from a substantial change in the pattern and practices of production. The only advance made in this direction in this district is the Agricultural Research Station at Rudrur and the Sugar Factory at Bodhan. Had the Government built up a dynamic organisation for the effective multi-purpose development in the area in earlier years after the completion of the Nizamsagar project, far greater benefits could have been gained at the close of thirty years of the supply of irrigational facilities. It may be appropriate at this stage for the district to take the following incentives:

(a) To ensure that every cultivation holding in the area
implemented greater cost-efficiency through the application of green manures, artificial fertilisers and the use of high yielding strains of sugarcane and to see that the major crop is made resistant to disease and pests.

(b) To encourage an increase in the rural and agro-industries in the region, so as to relieve the pressure on land and make the cultivation holdings more economic than they are.

Provisions of Credit:-

Provision of organised finance and credit plays a pivotal role in the implementation of the schemes of agricultural development. The provision of adequate, timely and cheap credit has continued to be recognised as the basis for agricultural progress for more than half a century. However, the progress made so far in this sphere of agricultural credit has hardly ever touched the fringe of the problem.

At present, there is no single organised agency that can meet the financial requirements of all types of credit needs. According to the Census of 1961, "The most important source of agricultural credit in India is the money lender. About 93% of the total agricultural credit in India is advanced by them. Institutional credit covers barely 6.4% of the advance loans to big farmers because there is not much risk in it." A large section on the small and uncreditworthy farmers are left without institutional credit and usually obtain the same from money lenders at an exhorbitant rate of interest. It is this hard fact that made the Committee of Director of the All-India Rural Credit Survey Report come to the inescapable conclusion that co-operative movement has failed to meet the challenge of the time.

In general, it can be said that sugarcane is the rich man's crop but the poor man's necessity. Sugarcane cultivation could become economic with increasing inputs.
Unfortunately, the poor economic conditions of the cultivators particularly in the large tracts of the district limit these inputs, resulting in low productivity. As already mentioned, indication of the resources are limited. It is necessary to augment the credit facilities to the cultivator through Co-operative Banks and other institutions in the area. Commercial Banks should also be brought into the field of credit operations on concessional finance flowing from the Reserve Bank as for the co-operative network. It will be necessary for the State Government to provide the necessary security for such additional facilities. While providing these credit facilities to the grower, it should be ensured that they are given strictly for productive purposes, as the cultivator, in view of his lean resources is prone to fritter away such facilities into non productive channels.

Research:—

The Research Station at Rudrur and the station at Belal are working satisfactorily, yet there is a need for very close co-operation.

In foreign countries, the planters directly associated themselves with research activities relating to the development of sugarcane. This active participation in sugarcane research has been responsible for improving the yields and quality of cane. In this district, as well as in India, such association is completely lacking. There is a suggestion that it should be desirable for associations of the growers to interest themselves in research and developmental activities. The sugarcane research station in the district and the cane growers of the region should be brought together on this plan. Such an institution would very much speed up the translation of the results of research into full practise. This step, if
adopted, should ultimately result in the growers themselves running associations, as is the practice in foreign countries.

Moreover, it is advisable for the Government to consider the case for establishing a big research station in the South, as there is none at present in this area.

Up to almost 1950, the sugar industry was mainly concentrated in the North, and in the North the factories had become considerably antiquated plants, while in the South they were comparatively new. Thus, the number of requests for advice from the Northern factories were very frequent, and the location of the Institute at Kanpur* was very conducive to attend to these, as well as to the somewhat few and far between requests from the Southern factories. The value of the Institute advice was also less known in the South than in the North.

With the new rise of industry in the South, and also the need for expansion, fuel economy, raw sugar manufacture, by-products etc., the Southern factories are making frequent demands on the Institute for advice. Due to the long distance by rail involved as well as the paucity of staff, considerably delays were unavoidable in attending to these requests from the South.

Therefore, it is necessary to have a Sugar Institute on parallel lines in that region or at least to have a nucleus in the South to attend immediate demands. The suitable location of this kind of sugar Institute is very genuine and urgent. Hyderabad is the best place for such a location.

* The National Sugar Institute at Kanpur is the only Institute in the Country which caters for the needs of the Indian Sugar Industry. It was established by the Government of India in 1936. In 1945, its control was transferred to the Indian Central Sugarcane Committee, but in 1948 it was again taken over by the Government of India and is since then under the Ministry of Food and Agriculture. The main function of the Institute is to carry out research on problems of the Industry.
There are several advantages in the establishment of this kind of research station in Hyderabad, (A.P.) from the point on view of the whole Country.

The twin cities of Hyderabad and Secunderabad are strategically located to cater for the main all-India markets. They are centrally situated and have excellent communication and transport relationships with the other major metropolitan centres of Bombay, Madras, Delhi and Calcutta, as also with other important cities. These cities are clean and attractive, with 'above average' community facilities of all types. They, therefore, provide a logical location also for the 'foot-loose' industries production commodities of high value per unit of weight or volume. Naturally, the sugar industry of the State will be benefitted with such a research Institute.

The above mentioned Research Institute will also be helpful in utilising the national resources with which the State is endowed. Moreover, it will be possible to engage the middle class people suitably in the production of the sugar industry. It will provide an excellent avenue for investment of money by small capitalists in the State.

Besides, as Andhra Pradesh is considered to be one of the largest markets for consumer goods in India, the establishment of such an Institute will not only enrich the State, but also the whole of the South of India and in turn the whole Country.

**PRICES:-**

As the sugar industry is an important agro-based industry and its smooth running has a tremendous influence on the economy of the Country, ups and downs in sugar prices during
the last three decades have been the subject of much public interest. The industry has many facets and any negligible or inadequate attention to any aspect, particularly in prices, reflect adversely on other aspects. Thus, the lessons drawn from the fortune of the industry in the past show that an extremely streamlined and co-ordinated approach to prices is necessary to solve the problems of the industry.

The outstanding feature of prices during the last fifteen years has been the instability, showing itself in the large and recurring imbalances between the demand for and supply of sugar. It is clearly obvious by the stated facts that there is no stability in prices, and stability is a vital need of sugar economy. Therefore, a minimum price, not a fixed price should be ensured.

In view of the perishability of the cane crops and the weather bargaining power of the sugar cane growers vis-a-vis the sugar manufacturers, the regularity of the sugarcane price is both desirable and necessary. However, again what needs to be ensured is only a minimum and not a fixed price. Decontrol of sugar policy by enabling the cane price to vary the prescribed minimum level, will help to maintain the above parity and thus reduce the fluctuations in sugar output.

A word about the dual market mechanism or partial control. The dual market mechanism under partial decontrol is indeed a new experiment and it will take some time to understand its full implications. The consumer may be hit hard in the first weeks after the commencement of partial decontrol. In order to make up for the shortfalls (owing to the small quantities of sugar on controlled price in rationed areas), the consumer may be obliged to buy from the free market at prices which range from two to three times the controlled prices. The consequence is obvious, the free market prices would not fall
in the first few weeks, as increased quantities of free sugar reached the market the prices are bound to drop.

In the new scheme, the sugar factories have to offer prices for sugarcane higher than the national price. (Rs. 2.75 per maund) fixed by the Government. The free market price of sugar, therefore, is bound to be higher than the regulated price. The beneficiary will be the cane growers because they will realise a price significantly above the national price fixed by the Government. It is wrong to conclude that the factories would be making huge profits, because they have to strike a balance between the free market price of sugar at which 40 per cent of their production will be disposed of. Thus, the free market sugar prices should be estimated on the high price paid by the factories for sugarcane. It can not be denied that fixation of remunera-tive price is a must for the healthy growth and development of any industry. It is really unfortunate that in this regard the sugar industry has not been receiving a fair deal in the hands of the Government. As the Economist Eastern said, "the sugar industry is tied up with politics - the politics of Government's anxiety to win over the farmer through increasing sugarcane prices and pampering gur and Khandsari producers, without regard to the interests of the industry and the consumer", is very true.

No doubt an unfortunate element of the new scheme is that increasing quantities of sugarcane will still be diverted to the production of Khandsari and gur which are known as the wasteful methods of obtaining sucrose from sugarcane. Whereas the sugarcane factories obtain 75 to 80

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percent of the juice from cane, the 'Kholus' extract only 45 to 50 per cent, and the power crushing crushers not more than 60 per cent. It is therefore, in the national interest that the sugar factories should be able to get all the sugarcane they require. Out of normal production of 100 million tons of sugarcane, the industry does not need more than 35 million tons and the other 65 million tons can be shared by gur and Khandsari producers. In actual practice what has been happening is that the factories have been starved of sugarcane on enhanced prices because they are able to dispose of their produce at high prices. Even after partial decontrol of sugar, this premium on efficiency will not be removed. The success or failure of partial decontrol will depend on the quantity of sugarcane which the sugar factories are able to obtain in the current season, i.e., 1967-68 to 1968-69.

An interesting element of the new sugar policy is that the Government is no longer adverse to a rise in sugar prices in the free market. Hitherto, it has hesitated to put a curb on gur prices while it has exercised rigid price control of sugar.

Moreover, one can see from graph 5 that the area under sugarcane did not fluctuate as the production of sugar in 1962-63, the main reason was nothing but the diversion of sugarcane to gur and Khandsari production. Hence, the flexibility of sugar prices is necessary to enable the sugar industry to compete with gur.

The sugar industry, in order to compete with gur and Khandsari for the available supply of cane, needs to be confined within certain limits. To enable the industry to pay the minimum price of cane to the growers, it is necessary
PRODUCTION

ACREAGE

GRAPH 5
to prevent sugar prices from falling below a certain level, just as to protect the interests of the consumers they must be prevented from piercing the ceiling. The above objectives can be realised through a buffer stock policy in sugar. Such a policy may allow sugar prices to fluctuate within a limited range, given by the maximum and minimum prices fixed for sugar, sugar will be acquired by the stock accumulated when sugar prices threaten to fall below the minimum, and it will be sold, depleting stocks, when prices threaten to rise above the maximum.

Although the trends of supply and demand for sugar have been largely imbalance, there are short-period fluctuations, and since these imbalances partake of a cyclical character, buffer stock policy seems an eminently suitable remedy.

**BY-PRODUCTS:** The by-products of the sugar industry are mainly molasses, press-mud, (CO2 gas) and bagasse. Molasses produced by the sugar industry is controlled by the Government orders and is sold at a fixed price to the Government for distillation. In the case of Khandsari units, somehow they are able to dispose of molasses without any restrictions, and perhaps this is the reason why Khandsari units are increasing in numbers in the country. Probably prohibition in this country is providing an additional source of income to the Khandsari units. A suggestion has been made that the molasses should be utilised for cattle feeding purposes. Experiments carried out abroad have shown that for every four lbs. of molasses fed to pigs, there is one lb. increase in weight. It further appears that there is a good market for pigs in South-East Asia and the possibility should therefore be examined for developing a proper molasses food for the pigs and rearing and exporting pigs to South-East Asian countries to earn foreign exchange.
As regards pressmud, it is a good source of manure for plantations. The entire by-product of the NSE is being utilised by the farms belonging to the factory. In the Nizamabad Co-operative Sugar Factory, pressmud is being sold to the ryots.

For bagasse, there is one belief that by effecting suitable measures of fuel and steam economy, there is considerable scope for saving bagasse. The surplus bagasse so obtained could be utilised for the production of pulp by individual factories, which could be supplied to a central paper factory of economic capacity.

A good quantity of Co2 gas is wasted by sugar plants, and therefore, NSF has recently started a Co2 plant.

The report highlighted the fact that the sugar industry has substantially contributed to the overall prosperity of the district of Nizamabad, mainly through the increase of the water supply at the Nizamsagar project, and to this region, and the establishment of the Nizam Sugar Factory at Bodhan. Moreover, this district is suited exceptionally well in regard to the manufacture of sugar from cane, from the point of view of physical and geographical conditions, and it is felt that if suitable encouragement is given to this industry, Nizamabad should be able not only to supply the quantity of sugar required by them which she has already practically done, but also to supply sugar to other countries of the world. The task is difficult due to financial conditions, but it is urgent, and things cannot be allowed to stay as they are. What is needed is a bold and continuous policy of encouragement of this industry, by the Government of the State of Andhra Pradesh as well as the Government of India, in appreciation of the importance and advantages of development of the industry in India.
The Nizam Sugar Factory Ltd., as already discussed, has two factories of 15,000 tons and 2,500 tons sugar cane crushing capacities per day and is one of the biggest units in India.

The process of manufacturing of white sugar in both the plants is known as "Double Sulphitation", which is distinct from the other process, namely the Double Carburetation process employed in some other factories in India. A brief description of Double Sulphitation process is as follows:-

The cane, delivered from ryots and also from the factory's own farms, undergoes 5 different operations before white sugar is produced. The operations are:-

(a) The Extraction of juice.
(b) The clarification of juice.
(c) Evaporation of juice syrup stage.
(d) Further concentration and production of sugar crystals, i.e., "Pan boiling" stage.
(e) Centrifuguing or separation of the crystals from the mother liquor, and lastly
(f) Drying and packing the sugar in gunny bags for sales and distribution.
The first stage is the milling operation where the sugarcane, which is dumped onto a cane carrier, is prepared for crushing by rotating knives fixed on the carrier, which cut the cane into bits. It is carried further on to be fed to the cane mills. There are five or six mills in a tandem. Each mill consists of three rollers. The prepared cane passes through all the five or six mills successively passing between one top roller and two bottom rollers. Sufficient hydraulic pressures are exerted on the top rollers of the mills so that when the cane passes after the last mill, the remnant, which is called "Bagasse" has the minimum amount of sugar moisture. The Bagasse which has excellent calorific value is used as a fuel in the boilers for production of steam. The steam is used for the running of the mill engines and other equipment like vacuum engines, turbo-generators and for the processing of sugar. The "Bagasse" has some other uses also, like the manufacture of newsprint and cardboards etc.

The Masceration process is adopted in the milling of cane, where the cane is sprayed with hot water before it enters the last mill, and the juice extracted in the last mill before it enters the third mill, and similarly the juice obtained in the third mill is sprayed on the cane before the second mill etc., in the counter current system which has its beneficial effects in the extraction of juice. The juice from the first mill or the crusher and the second mill are collected together and are sieved and sent
to the manufacturing house for further processing.

The second stage is the clarification stage. Here the cane juice from the mills is received in an automatic weighing tank (where the correct weight of juice entering the manufacturing house is recorded and which is necessary, to have a check on the quantity of sugar going into manufacturing process). The weighed juice is first heated to about 60°c. in juice heaters (the heating is done by steam) and passes through a vessel called the continuous liming and sulphitation tank, where it interacts intimately with a measured quantity of freshly prepared lime solutions and also sulphur di-oxide gas so that, as the juice emerges out of this tank, it is neutral in its PH value (or 7 PH). The two main chemicals used for the clarification are lime and sulphur di-oxide gas and occasionally superphosphate is also used where the cane juice is deficient in phosphate content. The juice, as it comes out of the liming and sulphitation vessel is again heated in another set of juice heaters to 215°f. or about the boiling point of the juice and is lead into continuous clarifiers (Dorr Clarifier or Graver Clarifier). By the treatment with the above mentioned chemicals, all the non sugar in cane juice flocculates into a form of a precipitate (called cane mud) and when heated to boiling point and led into the clarifiers, forms two separate layers of clarified juice and mud. The arrangements in the clarifiers permit the decanting of the "clear juice" or the "clarified juice" continuously and remove the muds separately to be treated in filters called Oliver Filters. The Oliver Filter performs the duty of separating the solid muds and filtrates which is pumped back to the process. The solid muds have manurial values and are sent to farms for spreading on the fields as
The decanted clear juice is sent to the third stage of sugar manufacture, i.e., evaporation. This is achieved by passing the juice through a set of four vessels heated under vacuum called Quadruple set of evaporators. This unit is a steam economy unit for concentrating the juice, where the juice is heated in first vessel by steam, a part-evaporation takes place. Then the vapour produced in the first vessel is led into the second vessel for heating and evaporation the juice, and simultaneously the vapour produced in the second vessel is used for heating and evaporating the juice as it passes through the third vessel, and so on, so much so that, when the clarified juice, which passes through the four vessels successively and comes out of the fourth vessel, it is sufficiently concentrated (about 75% of water is evaporated) and is called the syrup. The heating in the successive vessels is achieved by maintaining higher degrees of vacuum in the second to the fourth vessels which lowers the boiling point of juice in successive vessels.

The "syrup" coming out of the fourth vessel is taken into another tank where sulphur di-oxide gas is again passed for the purposes of bleaching (PH will be about 5.6 - 6.0).

This bleached syrup is taken into the next stage "Pan boiling stage" or crystal production stage. Here also, the syrup is boiled under vacuum. (For production of white sugar it is necessary to boil the sugar liquids under vacuum to prevent inversion and caramelisation of sugar on account of higher temperatures. Both the above phenomena have deleterious effects on sugar).

Here the syrup is boiled in the vacuum pans to a stage of supersaturation and a measured quantity of finely ground manures.
pure white sugar is introduced into the pan to form the nuclei for sugar crystals. Spontaneous small sugar grains are immediately formed in the pans, which are carefully developed to bigger sized crystals by feeding further doses of syrup. Normal sized sugar crystals along with syrup fills up the process. This combination of syrup and sugar crystals is called the "Massecuite" which is led into a container called the crystaliser. Usually three Massecuite system is adopted. The first Massecuite is boiled with syrup and is called 'A' Massecuite. The second boiling is called the 'B' Massecuite which is a combination of sugar crystals and a Molasses which is the rich sugar liquid that comes out when the sugar crystals are separated from the 'A' Massecuite. Similarly the third and final boiling is called 'C' Massecuite which is a combination of sugar crystals and the sugar rich liquid which comes when the crystals are separated from the 'B' Massecuite. All the three Massecuite, namely 'A', 'B' and 'C' are stored separately and sufficiently cooled before separating the sugar crystals from the molasses.

Next is the separation of the crystals from the mother liquor (called Molasses) whose operation is called curing. The centrifugal machine consists of a fast rotating basket with an outer casing and fine mesh attached to the side. When the Massecuite, which is a combination of crystals and syrup is spun in the machine, the liquid passes out through the holes of the mesh, leaving the white sugar in the basket. The liquid is collected in the outer covering which is taken out and pumped back into the process. The A & B Massecuite are spun and one set of machines and sugar crystals that remain in the basket are scooped out onto a hopper for
drying purposes. The 'C' Massecuite is spun similarly and emerging sugar is melted and taken back into process. The liquid which is separated from the 'C' Massecuite is called 'C' Molasses from which it is not easy to recover sugar, and as such is sent to the Distillery for the production of alcohol.

In the final stage, the sugar resulting from curing the A and B Massecuite is dried on the hoppers and graded according to prescribed sugar standards. Then it is filled into gunny bags, weighed, stitched and sent to the godown for storing. The grades are for colour and size of the crystals.

It takes about two days for cane to be converted into sugar. Supposing the factory starts today with cane feeding the final manufactured sugar will come out only after two days.
PLATE 1 - A front view of the Nizam Sugar Factory.

PLATE 2 - The Nizam Sugar Factory - Plant I and II in the district of Nizamabad.
PLATE 3 - A sugarcane field in Bodhan, Miramabad district.

PLATE 4 - The dumping of sugarcane on the carrier for the manufacture of sugar.
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I
SUGAR GRADE IN
THE NIZAM SUGAR FACTORY IN
1968 - 69

PLANT - 1.

(1) C - 30 Grade Sugar
(2) D - 30 Grade Sugar

(3) E - 29 Grade Sugar
(4) E - 30 Grade Sugar
(1) C. 29 Grade Sugar
(2) D - 29 Grade Sugar

(3) D - 30 Grade Sugar
(4) E - 29 Grade Sugar
PLANT - II (Contd.)

(5) E - 30 Grade Sugar

GUR in Nizamabad District