Chapter - II

REVIEW OF LITERATURE
In this chapter an attempt has been made to review the earlier research studies and the methods adopted there with a view to evaluate the objectives of the study. Review of literature related to the sugarcane crop and working and performance of sugar industry during pre and post liberalization era would throw up points of departure for future studies. The reviews are presented under the following heads keeping in view the objectives of the study.

2.1 Sugarcane crop
   2.1.1 Cost and returns structure of sugarcane
   2.1.2 Growth rates of sugarcane
   2.1.3 Resource use efficiency
   2.1.4 Marketing and general problems of sugarcane growers

2.2 Sugar industry
   2.2.1 Performance of sugar industry
   2.2.2 Management and financial aspects of sugar industry
   2.2.3 Cost of production of sugar
   2.2.4 Studies on compound growth rate analysis of sugar industry
   2.2.5 Ratio analysis
   2.2.6 Principal component analysis
   2.2.7 Problems and prospects of sugar industry
2.1. SUGARCANE CROP

2.1.1. Studies on Cost and Returns Structure of Sugarcane

Patil (1966) worked out the costs and returns in the production of sugarcane in Mandya district during 1962-63. The estimated cost of production of sugarcane was around Rs.1296.20 per acre. The average cost of production of sugarcane worked out to be Rs.27.50 /tonne. The gross return per acre was Rs.2697.53, the net return was Rs.1401.33 and return over direct cost was Rs.1843.95. He observed that labour cost accounting for 40.42 per cent of the total cost, of which human labour alone accounted for 32.97 per cent of the total cost. The variable and fixed costs accounted for 65.85 per cent and 34.15 per cent, respectively. The rental value alone accounted for 31.87 per cent forming a major share of the fixed cost.

Shukla and Pandey (1969) in their study on the costs and returns from the sugarcane farms of (66) nine randomly selected villages in the Arazilines Block of the Varanasi (UP), showed that the sugarcane was a comparatively profitable crop. The human labour was the main item of input cost, which accounted for 37.32% of the total cost per hectare. The estimated net income from sugarcane was around Rs.2296.23 per hectare. The study also indicated that the smaller farms were more labour intensive. The imputed value of family labour and input cost per hectare decreased with increasing farm size. The gross returns and net income were directly related to the size of the land holding.
Mukherji (1976) analysed economic aspect of growing sugarcane and sugar beet as mixed crops in Sri Ganganagar, Rajasthan. Mixed cropping of autumn planted cane and sugar beet gave higher yields for both the crops than spring planted cane and sugar beet crops. The returns from these mixed cropping systems were more.

Rebello et al. (1976) employed production function analysis to estimate and compare cost and returns of sugarcane crop for the periods 1972-73 and 1974-75 in Mandya district of Karnataka. They found that total operational cost of producing sugarcane was Rs.6065.21 per hectare in 1972-73 and Rs.9821.54 per hectare in 1974-75. The gross returns from sugarcane were Rs.14435.00 per hectare in 1972-73 and Rs.16517.36 per hectare in 1974-75. The operational cost of sugarcane increased by 62 per cent but the gross return increased only by 14 per cent during study period because of the large increase in prices of fertilizers and labour.

Vijayamma and Jagannath (1976) estimated the cost and returns of growing sugarcane in Srirangapatna taluk of Mysore district, Karnataka. The total cost of cultivation of sugarcane and the net returns from sugarcane were Rs.1500 per acre and Rs.3400 per acre, respectively. The cost of manures and fertilizer and their application accounted for 50 per cent of the total cost of sugarcane cultivation.

Krishna et al. (1977) compared the cost and returns per acre of sugarcane production, for the farmers who obtained the highest and lowest yields in Gowribidanur sugar factory area in Kolar district of Karnataka. The
average cost of cultivation of sugarcane per acre for the higher yield group and for the lower yield group were Rs. 1973.50 and Rs. 1480.70 respectively. The gross returns for the same group were Rs. 6002.70 per acre and Rs. 2065.10, respectively. The net returns per acre of sugarcane for farmers with higher yields and farmers with lower yields were worked to be Rs. 4029.20 and Rs. 580.40, respectively. The study suggests that farmers with low yields could increase their sugarcane production by applying more fertilizer along with better technical know-how.

Sastry and Ramanna (1978) conducted a comparative study on the economics of growing planted and ratoon sugarcane in the Krishnaraja Sagar area, Karnataka. The study was based on the cost accounting data for the period of 1971 to 1973 and supplemented by data collected from a sample of 18 farmers during 1973-74 by survey method. The per hectare total cost of cultivation of planted crop was estimated at Rs. 8057.49 and returns at Rs. 12106.54. The average yield of sugarcane was 108.82 tonnes per hectare. In the case of ratoon crop the total cost of cultivation, gross returns and yield per hectare were Rs. 5756.91, Rs. 9289.21 and 83.17 tonnes, respectively. The average cost per tonne of sugarcane worked out to be Rs. 74.04 in planted crop and Rs. 69.22 in the ratoon crop. The study showed that ratoon crop was more profitable than planted. The cost-return analyses also indicated that the ratoon crop was an economically sound proposition.

Patil (1984) worked out the comparative economics of planted and ratoon sugarcane crop in Hiranyakeshi co-operative sugar factory, Sankeshwar.
in Belgaum district of Karnataka. The study revealed that the average cost per
tonne of sugarcane and yield per acre were Rs.110.97 and 39.2 tonnes,
respectively in the planted crop and Rs.90.08 and 35.7 tonnes in the ratoon
crop. The cost-return analysis indicated that the profit per acre under the ratoon
crop (Rs 9817) was more compared to the planted cane crop (Rs.7409). The net
profit per tonne and marginal value productivity per rupee invested under
ratoon cane crop were Rs.209.92 and Rs.3.00 compared to Rs.189.03 and Rs.
2.7 under planted cane crop, respectively.

Gupta and Sharma (1985) conducted a study on comparative economics
of pure mentha, pure sugarcane and mentha-sugarcane mixed crops in the Saur
Tehsil of Moradabad district and Rampur sadar Tehsil of Rampur district of
Utter Pradesh. The data were collected from 60 sample farmers through direct
personal interview for three years (1977, 1978 and 1979). The average cost of
production of sugarcane was Rs.4655.44 per hectare and it was Rs.6114.61 per
hectare for mentha-sugarcane mixed crop during the period 1977-79. The
average net returns from sugarcane and mentha-sugarcane mixed crop were
Rs.2856.82 and Rs.6114.61 per hectare, respectively. The study clearly showed
that mentha-sugarcane mixed crop gave reasonably high net returns per
hectare.

Acharya and Lodha (1986) in their study estimated the cost of
cultivation and returns from cultivation of various crops (sugarcane and gram)
in Guda irrigation project area of Rajasthan. The cost of cultivation of sugarcane
was Rs.7814.00 per hectare and the gross income was Rs.7912.00 per hectare
with a net income of Rs.98.00. They observed that the net income from sugarcane was low due to low yield, which was the result of insufficient irrigation water. The total cost of gram cultivation, the gross income and the net income per hectare were Rs.3381.00, Rs.4443.00 and Rs.1062.00, respectively.

Rajmane (1987) conducted a comparative study at Purna Command Area of Maharashtra with the objective of comparing the per hectare physical input utilisation and cost of cultivation of major cash crops, viz., sugarcane and banana. He found that banana was a more labour intensive crop requiring 82.36 man days of labour as compared to sugarcane (47.37 man days). The total cost per tonne of sugarcane and banana were Rs.9187.33 and Rs.13419.68, respectively. Whereas the gross returns from sugarcane were Rs.15829.80 and Rs.34765.35 from banana. The per hectare profits at various costs were higher in banana compared to sugarcane. The cost of production and profit per tonne of sugarcane were Rs.121.87 and Rs.88.12 and for banana Rs.507.11 and Rs.732.87, respectively. The study revealed that banana production was more profitable compared to sugarcane crop.

Singh et al. (1988) analysed the economics of major rabi crops, viz., wheat, gram and sugarcane in Parua-Nala watershed of Madhya Pradesh. The required primary data were collected from three villages (Jharkheda, Baradi and Sonkatch) by survey method. The per acre cost of cultivation of sugarcane and gross returns were Rs.7604.01 and Rs.8175.60, respectively in all farms. It was found that maximum per rupee return from wheat crop was Rs.1.81,
whereas for gram and sugarcane, it was only Rs.1.48 and Rs.1.07 per rupee, respectively. The low returns in gram and sugarcane were due to pod borer attack in gram and non-availability of fertilizers and irrigation facilities in sugarcane. The study also listed the major constraints faced by the farmers in the production of rabi crops. Lack of capital was the main constraint and other constraints were high prices of fertilizers, lack of irrigation facilities, lack of high yielding seed and non-availability of fertilizers, etc.

Baliyan et al. (1991) studied the costs and returns in the production of sugarcane (planted & ratoon), in Muzaffarnagar district of western Uttar Pradesh for the period 1989-90. The data were collected from 90 cane growers of different size groups by personal interview method using pre-structured schedule. The study indicated that per hectare average cost of production and the gross returns of planted sugarcane were Rs.19676 and Rs.24373, respectively. In case of ratoon sugarcane, per hectare cost of cultivation and gross returns were Rs.16963 and Rs.28702, respectively. The net returns per hectare of planted and ratoon crops were Rs.4697 and Rs.11739 respectively. The results revealed that the net returns from ratoon sugarcane were about 2.5 times more than the net returns from planted sugarcane. This was due to the higher yield and lower cost of production in ratoon sugarcane. The profit margin per quintal of sugarcane produced was higher in ratoon sugarcane than planted. It was suggested that there was a need of educating the farmers (especially small farmers) to adopt new practices and advanced technologies of higher production.
Anonymous (1993) estimated the economics of planted and ratoon sugarcane for Bidar, Bijapur and Mandya districts of Karnataka. The total cost of cultivation of planted cane was Rs.40,139.55 per hectare in Bijapur district and Rs.21783.47 per hectare in Bidar district. Human and Bullock labour constituted a major share in the cost of cultivation. The gross income from planted cane was Rs.44,905.84 per hectare in Bijapur district and it was Rs.24,461.53 per hectare in Bidar district. The study revealed that the total cost of cultivation of planted cane and its gross income were maximum in Bijapur district and low in Bidar district. The average per hectare of cost of cultivation of ratoon crop was maximum (Rs.28,599.69) in Mandya district and minimum (Rs.13,397.67) in Bidar district. The gross income of ratoon crop was high (Rs.50,154.50) in Mandya district and low (Rs.19,873.41) in Bidar district.

Hiremath (1993) studied the economics of production and marketing of lime in Bijapur district of Karnataka. The study indicated that the establishment cost of lime per hectare for the four year gestation period was Rs.56,429.58 in small, Rs.49,179.62 in medium and Rs.47,143.09 in large orchards. The intercrops reduced the establishment cost by 58.82 per cent, 53.90 per cent and 46.88 per cent in these three sizes of orchards, respectively. The average yield of lime in small, medium and large orchards was 340.59, 366.98 and 395.58 bags, respectively. The yield was more in large orchards due to the application of more farm yard manure than the small and medium orchards.

Manmohan Reddy (1993) conducted a study to estimate costs and returns from the main and ratoon sugarcane crops in Gauribidnur Taluk of
Karnataka for the period of 1991-92. He selected 120 farmers of which 90 were growing main crop and 30 were growing ratoon. The net income of the main and ratoon crops were Rs.3662.20 and Rs.4235.06 per acre, respectively. He estimated the net returns per rupee of variable costs and total costs at Rs.0.38 and Rs.0.26, respectively in case of main crop and Rs.0.77 and Rs.0.46, respectively in case of ratoon crop. The study showed the profitability of ratoon crop over the main crop. The study also observed that all the respondents were not satisfied with the price paid by the factory for sugarcane.

Singh et al. (1993) studied the economics of sugarcane production in Bijnor district of Uttar Pradesh during 1990-91. The data were collected through personal interview by survey method. The study revealed that the cost of production per hectare of sugarcane was higher (Rs.8830.44) on big farms due to more expenditure on inputs. As a result of this the yield of sugarcane from big farms was also higher (550.21 quintals per hectare). The input output ratio in sugarcane worked out to be 1:1.49 on the big farms.

Maheshwarappa (1996) in his study estimated the costs and returns in the production of planted as well as ratoon crops of sugarcane in Bijapur and Belgaum districts of Karnataka. The study observed that the cost of production of a tonne of sugarcane was more in case of planted crop (Rs.366.29) as compared to first ratoon crop (Rs.271.87), second ratoon crop (Rs.297.93) and third ratoon crop (Rs.337.68). Where as the net returns per tonne of sugarcane realised by the sugarcane sellers were more in first ratoon crop (Rs.511.74) as compared to planted crop, second and third ratoon crops of sugarcane. The
same trend of net returns was observed in the case of Jaggery producers. The study found that the farmers who prepared Jaggery incurred Rs.2023.57 more costs than those who sold raw cane to sugar factory. The benefit-cost ratio was higher in ratoon crops as compared to planted crop despite low yields. The study suggested that the efforts should be made to divert the area towards the cultivation of ratoon crops as far as possible.

Chinnappa (1998) studied the costs and returns in the production of sugarcane in Bhadra command area of Karnataka. The study indicated that the per acre total cost of cane cultivation, gross income and net returns were Rs.21505.93, Rs.37772.08 and Rs.16266.15, respectively. The variable cost accounted for 76.06 per cent and fixed cost accounted for 23.94 per cent in total cost of cultivation. Higher cost of cultivation of sugarcane was due to higher cost of human labour, seeds and fertilizers.

Maheshwarappa et al. (1998) analysed the economics of sugarcane production in Karnataka. The analysis showed that 31 farmers directly sold their raw cane to sugar factory and nine farmers processed the sugarcane into Jaggery. The total cost, average gross income and net income for raw cane sellers were Rs.43341.28, Rs.87736.79 and Rs.44389.51 per hectare, respectively and for Jaggery producers the figures were Rs.45364.85, Rs.65449.15 and Rs.20084.30 per hectare, respectively. The net income of Jaggery producers (Rs.20084.30) was low compared to raw cane sellers (Rs.44389.51) due to the low price of Jaggery and high cost of Jaggery preparation. The results indicated that the variable cost accounted for 87.68 per
cent and fixed cost accounted for 12.32 per cent in the total cost of cultivation. Human labour (24.02%), seed setts (17.19%) and fertilizers (14.10%) were the main items of the variable cost.

Kameshwar Rao (2000) conducted a comparative study to estimate the cost of cultivation and returns from cultivation of banana and sugarcane for the period from 1978-79 to 1997-98. The study estimated that the average cost of cultivation for banana and sugarcane crops which were Rs.61175.68 and Rs.60470.50 per hectare, respectively. The per hectare gross income from banana was Rs.113746.21 and Rs.81610.41 from sugarcane. The study observed that the per hectare net returns at various costs were higher in banana compared to sugarcane. The study revealed that banana production was more profitable compared to sugarcane crop. But the study observed that the farmers on an average received only 56 per cent of the consumer's price in the marking of banana.

Narayanamoorthy (2005) conducted a comparative study on economics of growing sugarcane under drip and flood methods of irrigation in the Sivagangai district of Tamil Nadu. The data were collected by selecting a model farmer from Sivagangai district of Tamil Nadu. The production cost per tonne of sugarcane under DMI and FMI were Rs.379.35 and Rs.541.00, respectively. The yields under these methods were 85 tonnes and 55 tonnes per acre, respectively. The study clearly indicated the advantages of drip method of irrigation (DMI) over flood method of irrigation (FMI). The productivity gains (54%), water savings (58%) and electricity savings (73%) were the important
advantages of drip method of irrigation. He suggested that investment on drip irrigation in sugarcane cultivation is economically viable even without subsidy. The benefit cost ratio varied from 1.98 to 2.02 under without subsidy condition and the same varied from 2.07 to 2.10 with subsidy (30%) of different discount rates.

2.1.2. Growth Rates of Sugarcane

Lal and Bajpai (1984) studied the compound growth rates of area, production and yield of sugarcane for India as a whole, state wise and also region wise for the period 1950-51 to 1979-80. At all India level, area under sugarcane increased at 2.01, production at the rate of 3.16 and yield at 1.15 per cent per annum during this period. They also estimated the projected values of these three variables for the period of 1999-2000. During this period, area under sugarcane was 3.9 million hectares, production 247.5 million tonnes and productivity 63.30 tonnes per hectare. The study found that area, production and productivity of sugarcane for India as whole and in different states have been increasing significantly in recent years, with moderate year to year fluctuations.

Kundaswamy (1988) computed compound growth rates of area, production and yield of commercial crops like sugarcane in India for the period 1949-50 to 1985-86. The growth rates of area, yield and production were 1.9 , 1.15 and 3.0 per cent per annum, respectively during this period. He observed that growth rate of sugarcane yield was poor due to insufficient farm management; consequently production performance was not satisfactory.
Waghmare and Dashmukh (1988) analysed the trends in area, production and yield of sugarcane in the district of Marathwada in particular and Maharashtra state in general for the period 1960-61 to 1981-82. Time series data were used for the purpose of study. The results indicated that the trends in area, production and yield of sugarcane were positive and significant in case of all the districts of Marathwada and Maharashtra state. The study observed the shift in the average area, production and productivity of sugarcane after 1974-75 onwards for all the districts, region and the state.

Sidhu and Sidhu (1988) estimated the trends in area, production and productivity of sugarcane in Punjab for the period 1965-66 to 1985-86. They estimated that the compound growth rate of area under sugarcane which was low (3.21 per cent per annum), due to lack of long run (range) price policy and obedient (prompt) lifting of sugarcane. The growth rate of sugarcane yield was 3.40 per cent per annum and there was no impressive improvement in the production of sugarcane.

Singh et al. (1989) calculated compound growth rates of area, production and productivity of sugarcane in Uttar Pradesh for the period 1961-62 to 1986-87. The growth rates of area and production were 0.83 and 1.16 percent per annum, respectively. They found that the increase in production and productivity of sugarcane was associated with increase in irrigation facilities and higher use of fertilizer and other inputs.

Sale et al. (1992) computed region-wise compound growth rates of area, production and productivity of sugarcane for the Period 1956-57 to 1987-88 by
employing an exponential trend equation. The entire study period was divided into sub periods for the purpose of analysis Period I (1956-57 to 1965-66), Period II (1966-67 to 1975-76, Period III (19776-77 to 1987-88) and Period IV (1956-57 to 1987-88). The results indicated the significant increase in sugarcane area (7.2 per cent per annum) in western Maharashtra region during Period II (1966-67 to 1975-76) because of expansion of area under irrigation, establishment of new sugar mills and fair prices for sugarcane. The production and productivity of sugarcane increased at the rate of 9.12 and 5.88 per cent per annum, respectively in Marathwada region during Period I (1956-57 to 1965-66) because of introduction of high yielding varieties and increase in area under irrigation. The same situation was found in Vidarba and Konkan regions. The growth rates in area, production and productivity were highly significant in all the regions and in the state excepting the productivity growth in western Maharashtra during the overall Period (1956-57 to 1987-88).

Maheshwarapp (1996) studied the compound growth rates of area, production and productivity of sugarcane in Karnataka in general, Bijapur and Belgaum districts in particular for the Period 1960-61 to 1993-94. The study revealed that in Karnataka state, the area, production, and productivity of sugarcane grew at the rate of 4.33, 4.36 and 0.03 per cent per annum, respectively. The growth rates of area (11.56%) and production (11.36%) of sugarcane in Bijapur district were highly significant. The growth rates of area (6.12%) and production (6.23%) of sugarcane in Belgaum district were also significant. The growth rate of sugarcane productivity was negative (-0.14%)
and non significant in Bijapur district, while a positive and non significant growth rate of 0.19 per cent per annum was recorded in Belgaum district.

Kameshwar Rao (2000) computed compound growth rates of area, production and productivity of banana and sugarcane crops in Tungabhadra command area of Karnataka for the period 1978-79 to 1997-98. The results indicated that the growth rates in area, production and productivity of banana crop (in Raichur & Bellary districts) were positive (0.09, 15.58 and 14.45 per cent respectively). Whereas in sugarcane crop growth rates in area, production and productivity were negative (-3.26%, -3.68% and -0.42% respectively). He observed that the growth rates of sugarcane were poor and negative due to insufficient irrigation water, high price of fertilizers, lack of good quality seed sets and delayed payments.

2.1.3. Resource Use Efficiency

Azad and Garg (1974) analysed the impact of input utilization on yield of sugarcane and optimization of resource use in sugarcane in Meerut district of UP. They employed Cobb-Douglas production function to determine the productivity of various resources used in the production of sugarcane. The Marginal Value Product (MVP) of manures and fertilizers was Rs.5.28 in planted sugarcane and Rs.5.60 in ratooned sugarcane. The MVP of human labour was Re.0.60 and that of Bullock labour was Re.1.00. The results showed the possibility of increasing fertilizer and irrigation and of reducing human and bullock labour.
Sastry (1976) identified the excessive use of labour and fertilizers in both planted and ratoon crops in his study on resource productivity of sugarcane in Mandya district of Karnataka. The ratio of marginal value product to marginal factor cost showed that the marginal value productivity of these inputs did not cover the marginal cost. The returns from ratoon were more for every rupee spent on it than in planted sugarcane.

Hinge et al. (1986) analysed resource productivities in sugarcane production in Maharashtra. They found that there was an opportunity for maximising profit by increasing the area under sugarcane cultivation. They also found that farm yard manure, fertilizers and irrigation were highly used and the yield of sugarcane could be increased by increasing the use of these resources. Marginal value products of manures, fertilizers and irrigation were greater than marginal factor costs. The estimated elasticity of production showed an increasing return to scale in all size groups of sugarcane farms.

Koujalagi and Kunnal (1992) studied the resource use efficiency in the cultivation of pomegranate in Bagalkot taluk of Bijapur district (old) of Karnataka. Cobb-Douglas type of production function was used considering the variables like land, number of plants per acre, labour, plant protection chemicals, irrigation, manure and fertilizers. The regression co-efficient of land, labour, manure fertilizers showed that contribution of these inputs to gross income was significant, but it was negative and non-significant in the case of number of plants per acre and plant protection chemicals. The marginal value productivities (MVP) of inputs indicated that labour, irrigation and plant
protection of chemicals were used efficiently while manure and fertilizers were used optimally.

Venkataraman Rao and Parthasarathy (1992) conducted a study to estimate returns to scale, resource returns and resource use efficiency on both planted and ratoon sugarcane farms in coastal Andhra, Telangana and Rayalaseema regions of Andhra Pradesh. The data were collected from 216 sugarcane farmers during 1987-88 by survey method. Cobb-Douglas type of production function was used for planted and ratoon crops. The results indicated in general the working of diminishing factor returns and constant returns to scale on both planted and ratoon sugarcane farms in all the regions.

Maheshwarappa (1996) used Cobb-Douglas type of production function for analysing the various resources used in the production of sugarcane. The dependent variable was yield of sugarcane per farm in quintals. He considered land (hectare), human labour (man days), bullak labour (pair days), tractor power (per hour) seed setts (tonnes), farm yard manure (cart loads), irrigation (numbers) and value of fertilizers (in rupees) as independent variables which explained 98 per cent of the variation in sugarcane yield. The contributions of bullock labour (-9.064), tractor power (-0.360), fertilizers (-0.066) and irrigation (-17.564) to gross yield were negative and non significant. The study indicated over-utilisation of these resources. MVP to MFC ratios of these resources was negative. The ratios of land, human labour and seed setts were greater than one.
Naik et al. (1998) studied the resource use efficiency in onion cultivation in Bijapur district, Karnataka. The Cobb-Douglas type of production function was employed to determine the productivity of various factors used in the production of onion. He considered the yield of onion as dependent variable and other inputs as independent variables. The study observed that land and farm yard manure significantly influenced the yield of onion.

Kameshwar Rao (2000) used Cobb-Douglas type of production function to evaluate the resource use efficiency in the production of banana and sugarcane crops.

2.1.4. Marketing and General Problems of Sugarcane Growers

Jadhav (1984) studied the historical perspective and significance of sugarcane cultivation. The study observed that the shortage of labour during harvesting period which further lead to delay in farm operations. Fluctuations in electricity supply have caused irregular watering to sugarcane. The doses of fertilizer were not in accordance to the soil composition. The study found that sugarcane productivity largely governed by the combined effect of physical-socio-economic setting. The study suggested the optimum use of resources in the sugarcane cultivation.

Joshi (1986) examined the problems faced by the small farmers in the adoption of sugarcane production technology in (Kodinar Taluk) Amrdi district of Gujarat state. The data and opinion were collected from 120 small farmers
growing sugarcane crop. Improper application of fertilizers, non-availability of required fertilizers, non-adopting plant protection measures and lack of spraying equipments were the major difficulties. Lack of irrigation and costly inputs were the other major difficulties expressed by the respondents. The farmers feel that price of produce should be increased; fertilizers prices should be reduced, inputs should be subsidised and made available.

Lal (1989) studied the impact of research on sugarcane productivity and the problems faced by the farmers in tropical and subtropical India. The results indicated that sugarcane yields ranged from 37.7 to 70 tonnes per hectare in tropical sugarcane belt and from 27 to 55.5 tonnes per hectare in the subtropical state. The major constraint in sugarcane production was lack of advice and guidance. The other constraints were, ignorance about improved verities, non-availability of improved seed and high investment in plant protection measures.

Maheshwarappa (1996) assessed the constraints faced by the sugarcane growers in production and marketing of sugarcane in Bijapur and Bagalkot districts of Karnataka. The major constraints faced at the production level were, irregular supply of electricity, inadequate credit availability, and problems in adoption of plant protection measures, high prices of fertilizers, lack of technical knowledge and lack of good quality of seed setts. The major constraints in the marketing of sugarcane were disposing of sugarcane, lack of transport facilities and high transportation cost, very low price of cane and delayed payment by the sugar factory.
2.2. SUGAR INDUSTRY

2.2.1. Performance of Sugar Industry

National Productivity Council (1962) studied different aspects of the sugar industry namely production, growing of sugarcane, payment of cane price, capacity utilization, steam and fuel economy, utilization of by-products and research etc., in four countries namely Philippines, Hawaii, Louisiana and Puerto Rico. The study concluded that the sugar industries in the four countries were in better position than the industries in India. This was due to less attention on increasing productivity in the Indian industry. The team recommended that the production of sugar should be systematically planned, steps to improve both the yield and the quality of sugarcane, speedy transport to the factory, cane price not on weight basis but on quality basis, enlarging the capacity of existing units, meet the bagasse requirements of paper factories, careful attention to the location of the paper factory and active participation of planters in sugarcane research, etc. The study observed that the sugar factories did not pay adequate attention to sugarcane development work and the technical performance of the co-operative sugar factories was not satisfactory and thus there was a need for improvement. The study also observed that the co-operative sugar factories (CSFS) were not in a position to pay the purchase tax regularly. The team suggested that the policies of the management of the co-operative sugar factories should be improved on the aspects of investment of funds, recruitment of employees, cost reduction, sugarcane development
programmes, irrigation schemes with the help of various financing agencies, etc.

Raghawachari (1973) in her thesis entitled “The State and the Indian Sugar Industry” analysed the role of government in the development of sugar industry in India from 1956 to 1970. The study covered the policy of the state with regard to licensing, location, financing and control of the state on sugar industry. The author discussed the social and economic importance of sugar factories and the impact on the rural economy. Further the author also discussed the prospects of the sugar industry.

Kuchhal (1976) studied the performance and significance of major industries of India including sugar industry. The study observed the factors affecting the level of production in the sugar industry such as sugarcane production, its availability, installed capacity, recovery, duration of crushing season and government policy in regard to production, price and distribution. The study examined the problems related to statutory control, low yield of cane and use of by-products. It was suggested that central cess on sugar should be utilised for sugarcane development, proper attention for cane development activities, modernisation of sick sugar units and need for proper sugarcane price policy.

Jain (1980), in his study on ‘Regional economic planning in a sugar factory area- a case study of the Yashwant co-operative sugar factory in Pune district, Maharashtra, focused on the functions of the local planning agencies particularly assigned to co-operative sugar factories. Author discussed the
impact of co-operative sugar factory on irrigation facilities, agricultural development, generation of employment and infra-structure in rural areas.

Tupe (1980) studied the impact of sugar co-operatives on the rural economy with special reference to Sanjivani Sahakari Sakhar Karkhana Limited in Ahamadnagar district, Maharashtra. He examined the impact of sugar factories on agriculture, agriculturists, agricultural labourers, economic conditions of sugar factory workers and the overall development of the area. The study found that the sugar co-operatives accelerated the process of rural development and land-lords and rich got more benefits from the sugar co-operatives. Author concluded that the sugar factory in rural area had worked as a growth centre.

Kohak (1982) while studying the socio economic effects of a co-operative sugar factory, in Niphad Sahakari Sakhar Karkhana Limited, has discussed the impact of co-operative sugar factory on agriculture, business, infrastructure, employment etc.

Attwood and Baviskar (1987) in their article entitled “Why do some co-operatives works, but not others”?, explained why certain types of co-operatives in certain region had been highly successful whereas many other co-operatives had not been so successful. They opined that success of the sugar co-operatives depended on the alliance of internal and external factors. The internal factors related to technical performance and external factors related to the forces deep-rooted in the agrarian system of the region. They concluded that the success or failure of sugar co-operative depends on these twin factors.
Sinha (1988) critically examined different aspects of sugar industry, like economics of sugarcane, marketing and transport of cane, technical performance, cost structure, labour relations, utilisation of by-products, sale policy of sugar and fiscal and financial aspects of the sugar industry in Bihar. He recommended to adopt proper cane development activities and made suggestions regarding the flow of institutional finance, management and administration aspects and for reducing the cost of sugar production.

Hilage (1989) conducted a study on “Performance of sugar co-operative a comparative study of the two co-operative sugar factories in southern Maharashtra” for the period 1975-76 to 1985-86. He used the comparative method which enabled the researcher to discuss and explain the similarities and differences in the performance of the units. He compared Warna and Dudhaganga-Vedganga sugar factories in respect of operational performance, member oriented performance and development oriented performance. The study emphasized the significance of cane development, proper attention to harvesting and transportation of cane, greater facilities to lift irrigation and control of pests and diseases. He suggested that the liquidity position and working capital must be improved.

Mahajan and Pruthi (1989) studied the status, performance and problems of the sugar industry with respect to sugarcane, production parameters and performance parameters in India. The study examined the problems faced by sugar producing units and also some of the global socio-economic problems like energy crisis, depleting resources of fossil fuels and emergence of biomass
as an alternative source of energy. The main finding of the study indicated that in India, both Research and Development (R&D) and patenting activities in sugar industry were low. They suggested that sugar producing units should setup their R & D units to look into day to day problems, while at the national level, both government and industry should join hands and support R & D activities in areas such as development of better sugarcane preparatory devices, better harvesting techniques, evolving better mill extraction practices, efficient equipment for clarification of juice and newer methods of utilisation of by-products with a view to compete with other cheap sweeteners.

Joshi (1991) in his study analysed socio-economic impact of co-operative sugar factories on rural development. The study explained the multidimensional role played by agro-based-industries, particularly the sugar industry. The study observed that the sugar industry alone had the potentialities of considerable impact on socio-economic life of the surrounding areas. The study also observed that the survival of sugar factories depended mainly on timely, adequate and continuous supply of sugarcane and suggested that the factories should undertake concrete, effective and result oriented programmes for sugarcane development. The study also suggested that sugar co-operatives should achieve golden mean between internal and external sources of finance for attaining maximum financial efficiency.

Salunkhe (1993) in his study on “Performance appraisal of sugar industry in Sangli district” examined past and present position of Indian sugar industry. He analysed technical performance, cane development activities, cane
supply position, infrastructure and other developmental activities of sugar co­
operatives in Sangli district. He concluded that Maharashtra hold a pride place
on the sugar map of the country. He recommended that the factory should
prepare proper cane development programmes, motivate the members to
increase the area under sugarcane and generate its own funds for implementing
cane development programme. The factory should crush the cane within eight
hours after harvesting so as to get maximum sugar recovery. The factories
should improve their milling efficiency, install new and latest equipments and
train the workers properly.

Kakade (1995) studied the capacity utilization of co-operative sugar
factories in Maharashtra by using four methods, namely, the conventional
method, modern method, peak to peak method and average method for the
period 1980-81 to 1992-93. The study indicated that the high recovery zone
had utilised its capacity by 94.29 per cent, medium recovery zone by 91.58 per
cent and low recovery zone by 75.99 per cent. The present study considered the
economic contribution made by factories to different beneficiaries. The study
showed that there was a direct and positive relationship between the capacity
utilization and these benefits. He concluded that the capacity of co-operative
sugar factories increased by 34.11 per cent and the average capacity utilization
was 90.54 per cent during the five years period (1988-89 to 1992-93).

Darrynsell and Prasad (1999) conducted a study concerned with the
practice and methods of participatory development planning. It evaluated the
strategic plan adopted by the Fiji sugar industry in 1997 in response to
challenges that were attributed to the pressures of the globalization and international competitiveness. The study observed that about 90 per cent of the sugar produced in Fiji was exported and it maintained a number of markets for its sugar, namely, Malasiya, Japan, Singapore, Korea, Canada, United States, etc. The study assessed the structure of Fiji’s sugar industry by adopting Bench-marking methodologies, identified the problems and proposed the solutions such as implementation of a quality cane payment system, mechanization of cane loading, amalgamation of cutting gangs for reducing harvesting costs, implementation of a productivity pay system to reward mill employees.

Williams and Isham (1999) analysed the policies affecting commodities such as sugar and examined the welfare effects of sugar policies by adopting dynamic and static models. The study observed the production of both cane and beets in two regions. One was a cane producing region under a free trade regime and the other a beet producing region where guaranteed-price policy was implemented. They estimated the consumption demand and unit price of sugar. The dynamic model suggested that about 20 per cent of welfare losses may be misattributed to cane sugar producers instead of refiners.

Jayabal (2003) studied the cyclical nature of Indian sugar industry. The study estimated that the inefficiency and uneconomic nature of production in sugar mills, low yield and short crushing season, the high price of sugarcane and heavy excise duties levied by the Government, etc., were responsible for
high cost of production of sugarcane in India. The study observed that the price of Indian sugar was considerably higher than the world prices of sugar.

Kanaga et al. (2005) studied the performance and problems of sugar industry and also the trends in sugar industry during 1970-71 to 2003-04. The present study covered the growth of sugar industry during five year plans. They observed that inadequacy of cash credit hindered further growth of sugar industry. The study suggested that the lending banks should come forward to provide adequate cash credit to sugar industry, as they were the valuable customers of banks. The study also observed that sugar industry in India was not equipped to handle the higher level of production for its economic well-being. The study concluded that the twin objectives of agricultural development and industrialisation in India could be achieved by the successful operation of sugar industry.

2.2.2. Management and Financial Aspects of Sugar Industry

Baviskar (1980) conducted a study on political, financial and managerial aspects of co-operative sugar factory in Ahamadnagar district of Maharashtra. He analysed the factors responsible for the success of the factory and also inter-relationship between the co-operative movement and politics. The study highlighted that different groups of members tried to capture the power and prestige in the sugar factory. He concluded that the existing political power affects the development of co-operative sugar industry. The study refers to socio-political aspects of sugar industry in rural Maharashtra.
Kulkarni (1984) studied the problem of reducing various sugar losses at different stages of production by employing overall management skill in general and technical management skill in particular. He examined the factors affecting sugar losses and suggested that there should be proper coordination between the different departments such as cane development, cane supply, machinery maintenance and process operations for getting maximum sugar with minimum losses.

Nikam (1988) in his study on the “Inter-regional financial statements-Analysis of sugar co-operatives in Maharashtra”, selected nine sugar factories from different districts of Maharashtra. He analysed the cost structure, cost components, magnitude of total cost, financial strengths, cost trend and profitability. The study found that the share capital was very low and the sugar factories had to depend on borrowed capital. The administrative expenses of co-operative sugar factories were much higher as compared to the private sugar factories.

Ansari (1990) examined the existing working style of management of sugar mill in Uttar Pradesh. He also studied the organizational structure, status of employees and sugarcane activities. He recommended the professionalisation of management of sugar cooperatives for solving various managerial problems.

Ramachandra Reddy (1992) conducted a study on financial management in co-operative, to examine capital structure of sugar mills in Tamil Nadu. He studied working capital management and profit management in sugar co-
operatives. He suggested that the co-operative sugar factories must achieve self sufficiency in funds and co-operative sugar mills should effectively utilise the by-products for earning additional revenue.

Srinivasa Suresh et al. (1999) studied the simultaneous determination of investment, dividends and external financing decisions in Indian sugar industry. Data pertaining to assets, income and expenditure of large public limited sugar companies were obtained from Reserve Bank of India for the period of 1965-66 to 1986-87. The simultaneous equation model contained four behavioural equations, one each for fixed investment, inventory investment, dividends and external finance. They estimated cross section and pooled cross section results. The results revealed that complete inter-dependence among the three variables was absent. It was concluded that three way interactions did not exist between the three decisions. They also observed that the effects of accelerators in explaining both fixed and inventory investment were not serious in sugar industry in terms of their statistical significance.

Godbole (2000) in his study discussed the importance of the co-operative sugar industry for Maharashtra’s economy and the relevance of the expert committee’s recommendations for co-operative sugar factories in a number of other states. The study observed that the government of Maharashtra had appointed three committees since 1980 to look into the sickness of co-operative sugar factories (CSF). Mahajan committee reported that as on March 31, 1977, of the 237 CSF’s in the country, 157 were in loss, 74 were with negative net worth and 81 had negative, net disposable resources. In case of
Maharashtra, of the 113 CSF's, 60 were in loss, 20 had negative net worth and 23 had negative net disposable resources. The study also highlighted the recommendations of the committees and summarised important recommendations. The major recommendations were related to improving the financial management of CSF's, improving performance of machinery and equipments, audits through a panel of chartered accountants, increasing minimum distance between two sugar factories to 40 Kms, etc.

Abitkar (2002) carried out a study entitled “An evaluatory study of management process in sugar industry in Kolhapur district, Maharashtra”. Author, studied the application of the management principles at various levels in sugar factories and critically evaluated the management functions in sugar factories. The study pointed out the deficiencies in the management processes among the sugar factories. It was suggested that the areas where the cost could be reduced by proper management were, expenditure on transport of sugarcane, interest on fixed capital and working capital. Excess recruitment of the employees than required should not be done. It was also suggested that sugar factories should take effective, concrete and continuous programme of sugarcane development.

Ramanujam (2003) made a study on production management practices in co-operative sugar factories and also examined a sound production policy of the sugar industry in India in general and Tamil Nadu in particular. The study pointed out the elements of a sound production policy such as supply of adequate cane to mills, fixing minimum prices of cane to be paid to growers,
proper utilization of by-products, economic capacity for factories (1500 tonnes per day), modernisation of mills and production of sugar. He suggested that co-operative sugar factories should follow all management practices, then only they could function well.

2.2.3. Cost of Production of Sugar

Maruthi Pillai (1971) made a comparative study for three states namely, Andhra Pradesh, Karnataka and Tamil Nadu (including Pondicherry) and estimated the cost of production of sugar for the year 1970-71 at Rs.135.93, Rs.138.67 and Rs.142.60 per quintal, respectively. He compared these costs with the ex-factory levy price fixed by the Government. He opined that the Government did not provide adequate margins for certain items. This had caused heavy loss for the three states to an extent of Rs.15 per quintal. He also estimated that the overall loss ranged from Rs.4 lakhs to Rs.41 lakhs. He concluded that there was an urgent need for change in the price fixing formula especially in the south.

Anonymous (1973) prepared fresh cost schedule for the sugar industry, by selecting 59 sugar units out of 229 for enquiry. It had assumed 146 days of crushing and 10.34 percent recovery in Karnataka. The commission estimated the conversion cost at Rs.41.68. The total average conversion cost was estimated at Rs.41.40 after making allowance for by-products. It was observed that increase in cane price and implementation of recommendations of Second Wage Board had significantly affected the cost. The commission also observed the minimum cane price and opined that it tends to become purely national and
had some relevance only for theoretically working out the ex-factory cost of sugar. The commission recommended that no new sugar factory should be allowed to be established within the radius of 30 miles from an existing factory.

Muralidharan (1981) compared the processing of sugarcane into sugar, gur and khandisari in Mandya district of Karnataka. He estimated the establishment costs of the three processing units in the order of Rs.4,02,83,292.03 for sugar unit (of 1250 TCD crushing capacity), Rs.46,329.83 for gur unit and Rs.9,16,722.38 for khandisari unit. The share of fixed cost in the total processing cost of sugar, gur and khandisari were 64.24 per cent, 30.78 per cent and 17.29 per cent, respectively. The variable costs of these three units were 35.76, 69.22 and 82.71 per cent, respectively.

Katra (1984) conducted a systematic study on effectiveness of incentives for energy saving devices (under NCAER) NCAER received the filled-in-questionnaire from 21 units, out of which 11 units were under the co-operative sector (all from Maharashtra). The study considered the co-operative and private sector units which installed the energy saving devices. It was observed that the higher incidence of cost of energy in the private sector was due to variations in the source of energy mix for boiler firing and the ratio of power available from cogeneration and public utility. The study opined the sugar industry should spare bagasse for manufacture of pulp and paper and used alternative fuel, which was coal.

Nikam (1995) studied the managing cost and productivity of co-operative sugar industry in Solapur district, Maharashtra for the period of 1987-
The study selected four co-operative sugar factories and covered development aspects, cost management aspects and productivity management aspects. The study pointed out that an efficient management of all input resources contributed to reduce cost and improve productivity of co-operative sugar factories. The study found that higher crushing capacity and higher level of sugarcane crushing would reduce the percentage of conversion cost to total cost of sugar production. Thus management of cost and productivity was essential for achieving higher level of productivity in co-operative sugar industry. He suggested a proper cost accounting procedure for co-operative sugar factories. He concluded that there was a need to stabilise sugarcane supply and duration of crushing for reducing cost and increasing overall productivity of sugar industry.

Danekar (2000) conducted a study to measure returns to education in respect of manpower working in the sugar co-operatives in Sangli district, Maharashtra. Author observed that the sugar co-operatives emerged as growth centred employment generation opportunities and examined the economic role of education in the sugar co-operatives by using cross sectional technique for the academic year 1992-93. The study used multiple correlation and regression analysis to measure the impact of each independent variable on the earning of the worker. The study explained the relation between education and economic growth by referring three approaches, namely, the residual approach, the simple correlation approach and the returns to education approach. The study observed that a total disregard an attitude of careless and an unscientific and
biased policy regarding employment and promotion of the employees adversely affected the working of the sugar cooperatives and consequently reflected in the declining productivity. The sugar cooperatives need to incorporate professional management in order to survive and compete successfully in the market. Author concluded that the present system was ineffective and inefficient in terms of its output, quality of the output administration, management and financing, and traced for self-assessment and self-accountability. The subsidized higher education did not reach the truly deserving bonafide beneficiaries and expressed the need to restructure financing higher education.

Gurav (2003) made a study on the cost and productivity of co-operative sugar factories in Kolhapur district, Maharashtra. The researcher selected four sample co-operative sugar factories out of thirteen co-operative sugar factories namely Datta, Kumbhi, Gadlinglaj and Warana and reviewed cost and productivity of these sugar factories. The study found that the co-operative sugar factories were suffering from heavy losses due to high cost and low productivity. Higher cane pricing and level of efficiency at various work centres adversely affected the cost structure of co-operative sugar factories. The study suggested that all sugar factories should: 1) fix the standard conversions cost and maintain that standard, 2) adopt standard manpower structure, 3) start the ethanol plant and produce industrial absolute alcohol, 4) produce electricity by co-generation system, 5) install efficient and modern devices. It was the
study of four co-operative sugar factories and did not examine the cost and productivity of private or public sugar factories.

2.2.4. Studies on Compound Growth Rate Analysis of Sugar Industry

Shankarmurthy (1986) studied the performance of Karnataka Co-operative Marketing Federation by using the compound growth rate analysis. The physical variables considered, were membership, branches, employees, direct recruited and deputed officials and the financial variables, were share capital, owned funds, fixed assets, total assets, long-term investment, total working capital, total liabilities, inventories, sale of fertilizers, sale of other commodities, total sales and establishment expenses. The constant price was followed to measure the inflationary trend in the economy to get the real picture of the situation in case of financial indicators.

Sethi and Kanwar (1987) studied the annual growth rates of various factors influencing the sugar industry and analysed the relative importance of these factors in increasing sugarcane and sugar production in India. Data on cane price was available for the period 1950-51 to 1982-83. It was realised that compound growth rates in sugarcane acreage, production, productivity, recovery, cane price, cane crushed, number of mills and sugar production in India were all positively and directly correlated with the corresponding variable and all the characters were Interco related.

Narayanswamy and Ramachandran (1988) examined the growth and development of Amaravati sugar mill, Tamil Nadu and considered indicators like, area under sugarcane, membership, recovery, cane price, cost of
production of sugarcane, machinery utilisation, sale price, income, expenditure, profit, equity capital, etc. Compound growth rate was calculated for each indicator to study the growth of sugar industry. The study found that there was considerable increase in area under sugarcane, cost of production of sugarcane, membership, cane price and expenditure.

Tippesha (1997) used compound growth rate (CGR) analysis while studying the performance of two sugar factories in Davanagere district, Karnataka. The study used CGR to measure the annual growth of 11 performance indicators. The important physical indicators considered were sugarcane crushed, sugar produced, sucrose recovery, number of shares and total sales. The important financial indicators were share capital, owned funds, fixed assets, working capital total assets and total liabilities. The sugarcane crushed and sugar produced had registered an annual growth rate of 10.55 per cent for Bhadra SSK (BSSK) and 7.46 and 6.00 per cent, respectively for Davanagere Sugars (DS) during the period from 1985 to 1994. The financial indicators such as working capital, total assets and total liabilities grew at the rates of 29.78, 14.71 and 10.75 per cent, respectively for Bhadra SSK and 21.05, 17.21 and 5.27 per cent, in that order for DS during the same period. The growth rate with respect to share capital was very low (0.93%) in the case of BSSK and it was 2.46 per cent for DS.

Vilas (1998) studied the growth and performance of sugar industry in Karnataka by using compound growth rate (CGR) analysis of exponential form. The important physical indicators considered were installed capacity, cane
crushed, sugar produced, average recovery percentage of sugar and duration of crushing season. The important financial indicators considered were share capital, reserve funds, owned funds, current assets, fixed assets, total assets, borrowings, current liabilities, total liabilities, total sales, recovery percentage of sugar from sugarcane, gross income and total expenses. The study found that the physical indicators like installed capacity, sugar production and cane crushed grew at the rates of 2.55, 5.41 and 4.99 per cent, respectively and the financial indicators such as share capital, reserve funds, owned funds, assets and liabilities position, sales, income and expenditure grew at the rates of 2.24, 10.61, 8.69, 13.23, 14.88, 14.13, and 12.56 per cent, respectively of the selected sugar factories for a period of 16 years from 1979-80 to 1995-96.

Hosamani (2002) employed compound growth rate analysis while studying the performance of selected Regional Rural Banks (RRB) in Karnataka. The growth rates of physical and financial indicators were computed for the three sub-periods (PI-1976 to 1980, PII- 1981 to 94 and PIII-1995-98) and the overall period of existence (1976 to 98). The important physical indicators considered were branches, deposits, accounts and advance accounts. The financial indicators considered were credit disbursement, deposits, total business, income, total expenses, profitability, over-dues, recovery etc. The compound growth rates in respect of physical indicators had increased over the years and found significant in the overall period for MGB and TGB. In case of BGB, all indicators except advance account per branch and advance account per employee were non-significant. The financial
indicators such as profit or loss and recovery were found to be positive but non-significant and the C-D ratio registered a negative growth in all the selected RRBs.

2.2.5. Studies on Ratio Analysis

Subbarao (1985) analysed the financial position of the Central Areca nut Marketing and Processing Co-operative Ltd., Mangalore, Karnataka by using solvency ratio, liquidity ratio and profitability ratio for the period from 1973-74 to 1980-81. Various financial indicators like share capital, fixed assets, total assets, sales, purchases working capital and owned funds were employed. The study employed cluster analysis technique to examine the factors affecting the different aspects of the financial performance. The study observed that the performance of the co-operative throughout the working period was sound.


Joshi (1991) studied the financial aspects of sugar industry in Kolhapur district, Maharashtra by employing certain financial ratios. He selected all eleven co-operative sugar factories working in the district and applied seventeen ratios for this study. The study examined performance of the sugar factories in respect of their financial management and assessed on the basis of liquidity, solvency, efficiency and profitability ratios. The study revealed that
Group II B factories were better placed in liquidity and efficiency, Group I in solvency and Group II A in profitability.

Herekar (1995) studied the performance of ten selected sugar factories of Karnataka and Maharashtra states. Author also studied the correlation analyses of financial and operational factors of sugar industry. He employed liquidity ratios, profitability ratios, operational efficiency ratios, capital structure ratios, long-term financial strength ratios, etc. The study revealed that the age and capacity utilization had some positive impact on the financial performance. Whereas crushing capacity and sugar recovery percentage did not have much association with their financial performance. The study indicated that operational factors could not be totally isolated from the financial performance of sugar industry.

Vijay Kumar (1997) conducted a comparative study of working capital management performance in sugar industry of Tamil Nadu during 1982-83 to 1991-92, by using ratio analysis. He selected 13 sugar factories comprising of six co-operative and seven private factories on the basis of crushing capacity and the age. The study examined the structure, sources and utilisation of working capital and its components. The study also assessed the liquidity position and the impact of working capital ratios on profitability. The study used economic models to describe the demand for working capital and its various components by Tamil Nadu sugar industry. He suggested a long-term basis partial control and duel pricing system of the government so as to protect the interest of consumers and the industry.
Tippesha (1997) evaluated the performance of the Davanagere sugars and Bhadra S.S.K in Davanagere district, Karnataka by employing fourteen financial ratios during 1985 to 1994. These ratios were used under four groups viz, structural ratios, liquidity ratios, profitability ratios and turnover ratios and each group of ratios helped in decision making process of the performance of the factories. The study observed that the Davanagere sugars earned a net margin of eight per cent profit on fixed assets as against 0.1 per cent in Bhadra S.S.K over the study period and the study found that the Davanagere sugars was more efficient than the Bhadra S.S.K in utilizing the total assets.

Vilas (1998) analysed the financial performance of the selected sugar factories by employing ratio analysis for the period from 1979-80 to 1995-96. He used different financial ratios, viz, liquidity ratios, solvency ratios, turnover ratios, efficiency and profitability ratios, financial strength ratios and fixed assets ratios to evaluate the performance of selected private, co-operative and public sector sugar factories in Karnataka. The study found that the lowest gross ratio in private sector sugar factories indicating higher net profits and negative profitability ratios in co-operative sugar factories. The study also found that the co-operative sugar factories had better networth than public and private sector sugar factories due to creation of huge assets with less borrowing.

Hosamani (2002) evaluated the performance of selected RRBs (and their impact on rural) in Karnataka by using different financial ratios. The financial ratios relevant to the study are grouped under the categories of liquidity ratios,
solvency ratios, tests of strength, profitability ratios and efficiency ratios. The ratio of net profit to total assets of all the three banks was positive.

Shinde (2002) in his study on “Working capital management of sugar industry in Satara district, Maharashtra” examined the composition of capital structure and the trends of the current assets and current liabilities in seven sugar factories in the district by employing ratio analysis. He observed that the indices of the current assets and current liabilities of the sugar industry registered an increasing trend except the year 1997-98. The study revealed that the liquidity position of all sugar factories in the district was not satisfactory throughout the study period. As regards the cash management, it was observed that the size of cash balances held by all sugar factories in the district showed a variable trend during the study period. He suggested that every sugar factory must have efficient Sugarcane Development Department which would concentrate on improving the yield of sugarcane and the sugar recovery. The problem of under utilisation of capacities could be solved by proper management of working capital.

2.2.6. Studies on Principal Component Analysis

Chandra Reddy (1986) in his study of analysing the impact of sericulture industry on income and employment in rural area of Chittoor district, Andhra Pradesh used the principal component analysis technique to identify the most important variables influencing the silk cocoon production. The study identified only 12 variables out of 19, as having a strong relationship with silk
cocoon production. The study found that the first three principal components
together explained 84 per cent of the total variable.

Bhatt (1991) studied the agricultural credit absorption in selected
districts of Karnataka by employing principal component analysis. The study
found that the first four principal components explained 85 per cent of the total
variation and all the variables were found to be dominant in this component. The indicators like irrigation, fertilizer, Consumption and the number of bank
branches which were significant, influenced the short term agricultural credit
absorption.

Thippesha (1997) studied the performance of Davanagere sugars and
Bhadra sahakari sakkare Karkhane in Davanagere district, Karnataka in terms
of physical and financial indicators by using various financial performance
indicators and the principal component analysis (PCA). The Performance
assessment of two types of factories governed by different business principles
was the focus of this study. The PCA was employed to develop a composite
index of performance using 14 ratios considered in the study. Based on the
indicators presented in different principal components the first, second and the
third dimensions were termed as Leverage-cum Liquidity, Profitability and
Liquidity respectively in the case of Bhadra SSK whereas in the case of
Davanagere sugars the first three dimensions were termed as Profitability, Liquidity and the Solvency-cum-efficiency respectively. The weights for the
first and second component were used to develop performance index in the
case of both the sugar factories.
Vilas (1998) studied the performance of sugar industry in Karnataka by employing principal component analysis technique to identify the physical and financial indicators closely associated with the performance of the sugar factories under private, public and cooperative ownership for the period from 1979-80 to 1992-93. He selected only first three principal components explaining maximum amount of variation and the first three components together explained 90.80 per cent of the total variation. The indicators which closely associated with the first component were fixed assets, total assets, total expenses, current assets, total income, total purchases, total inventory, sugar inventory, sugar sales, total liabilities, reserve funds, total sales average inventory and equity.

Hosamani (2002) in his study on the “performance of selected Regional Rural Banks (MGB, TGB and BGB) in Karnataka”, employed the technique of Principal Component Analysis to isolate the influence of physical and financial indicators on the performance of the banks, using 9 physical and 17 financial indicators for a period of 22 years. This technique was adopted to identify the most important factors influencing the performance of the bank. The first three components were found to explain 68.10 per cent, 75.60 per cent and 72.30 per cent of the total variations for MGB, TGB and BGB, respectively. The study concluded that the financial variables were relatively more important than the physical variables and decided the performance of the bank.
2.2.7. Studies on Problems and Prospects (impact) of Sugar Industry

Anonymous (1974) made a study on problems pertaining to the viability of new sugar factories. The committee felt that, viability of a factory would mean the unit should not only break-even after meeting the working expenses, but should also be able to declare a reasonable dividend on equity capital. The study estimated the establishment cost of sugar factory of 1250 tonnes crushing capacity at Rs. 550 lakhs. It classified Karnataka under high recovery area and the estimated conversion cost was Rs.50.00 per quintal and the average depreciation allowance at the rate of 6 percent on the original cost of assets. The committee suggested that there was the need for regular rebate on excise duty and concluded that the incentive should be given on a long-term basis.

Bajpai (1978) examined that Indian sugar industry has been severely affected by the problems like low yield, uneconomic size, low efficiencies and high losses in production. The study found that the small size factories with low installed capacity, having no plan for their future expansion, were clustered in the areas of sugarcane availability.

Manohara Rao (1984) examined various operations of the sugar industry, such as, sugarcane cultivation, by-products, acts, rules and regulations applicable to the sugar industry. He has made valuable suggestions for improving the total working of the sugar factory, such as, quality cane development programme, effective utilisation of by-products and liberal policy.

Misra (1985), in his study on sickness in Indian sugar industry, analysed the cost realization and profitability of sugar factories in the country. He also
examined the impact of Government policies on the health of the sugar industries in various zones. He found out basic causes of sickness of the sugar industry some of them were lack of availability of good quality cane within a reasonable distance, high cost of conversion, pricing of sugarcane, pricing of sugar, lack of proper cane management, timely repairs and maintenance of plant and machinery, levy sugar and impact on sugar factory sickness. The important suggestions made by him related to labour force, cane management, quality cane pricing of levy sugar, etc.

Kharche (1885) in his research study on co-operative sugar factories in Maharashtra selected five sugar factories of Marathwada region on the basis of representative sampling method. He observed the problems of the selected sugar factories, such as, excessive staff, low recovery and under utilisation of capacity, etc. He examined licensing policy of the central government with reference to the economic size, sugar unit, policy of the state government towards the sugar industry, financial structure of sugar factories, cost of production of sugar, working results, efficiency of the factories and the role of sugar factories in area development.

Kasar and Tilekar (1989) studied the impact of sugar industry on the employment of seasonal migrants in Maharashtra. The study also examined the problems of seasonal migrants such as employment, medical, education job security, etc. The share of sugar factory employment in the total employment of an average male, female and bullock pair of the household was to the extent of 65.36, 45.51 and 75 per cent, respectively. The sugar industry on an average
constituted 57 per cent of the gross income of the household. The study found that the migrants who got seasonal employment in the sugar industry were able to increase their income and enjoy better position as compared to the non-migrants under study. The study suggested the organisation of labour cooperatives for getting continuous employment for seasonal migrants. Ration cards should be issued and open seasonal schools for the children of seasonal migrant families.

Salve (1990) studied the socio-economic characteristics of seasonal migrant workers of co-operative sugar factories in Kolhapur district, Maharashtra during 1983-84. The study revealed a wide diversity in the nature of seasonal contract basis migrant workers' practices followed in different factories, which had been analysed in five major dimensions, viz., economic, social, educational, health and cultural. The study found that about 70 per cent of the total migrants were dissatisfied about their jobs and only 30 per cent satisfied. The study suggested that local labour resources should be fully utilized as a way of reducing the need for migratory workers, setting up of a contract labour committee, introduction of group insurance scheme, issue ration cards and fix special quota for them, etc.

Rayudu (1998) studied problems and prospects of rural khand sugar industry towards policy implications. He identified the several issues for discussion. The major ones are- Change in dietary habits, Un-economic use of bagasse, Problem of molasses, Lack of integrated policy of the government, Diversion of cane, Farm linked problems, State advised cane price, Out live
process methods, Sugar rural roads, Idle capacity, Lack of consistent sugar policy. The study pointed out that the economic and effective use of bagasse and molasses would strengthen the economy of the agro-based rural industry like Khand sugar making factories and reduce the cost of products of this industry. The study stressed the necessity of forming a long-term integrated policy for all the three sweetening agents like white sugar, khandsari and gur because of using the same raw material i.e. sugarcane.

Gopalguru (1999) in his article on working class militancy in endangered sugar industry brought out the practical difficulties in the way of development of sugar industry and the policy of the government towards the sugar industry. The study analysed the problems of cultivators, factory workers and challenges before unions under the forces of privatisation and globalisation. He suggested that the agenda should be shaped not only by the top level leadership but also by the creative responses of the rank and field level sugar workers and to keep formal party politics out of trade union activism. The leaders should share information with the workers at grass root level. This would help the sugar workers’ movement to achieve strength, confidence and solidarity, both at national and international levels.

Wadhwa (2000) in his article examined the problems and prospects of zoning for sugar co-operatives with special reference to Maharashtra state. The study observed that zoning was introduced in the state in 1984 with the definite objectives but during 13 years of zoning (from 1984 to 1997), it utterly failed to achieve its objectives for which it was introduced. The factories had
accumulated heavy losses (Rs.69817.76 lakhs) and were in deep debt. They had failed to pay their employees salaries, wages and other dues in full, discharge their liabilities towards various financial institutions and the government and discharge their tax liabilities towards the government. He argued that ‘Note of Dessent’ on this recommendation that it was not the absence of zoning but the presence of deeply rooted financial and political involvement of the state government. He stressed the elimination of the financial and political involvement of the state government in the co-operative sugar industry.

Patil (2002) conducted a study on the seasonal workers working in the selected sugar factories of Kolhapur district, Maharashtra on the basis of proportionate stratified random sampling, by using simple statistical tools. The study mainly focused on the personal management policy followed in all sugar factories of the district with respect to seasonal workers. It also discussed the personal aspects of working force such as composition (i.e. age, caste, marriage, education) and family background. The researcher has made some modest solutions to meet the problems and made the suggestions regarding recruitment through employment exchange and selection committee, training to the seasonal workers, adopt satisfactory promotion policy, clear cut transfer policy, wages in accordance with the Central Wage Board, implement Factories Act, better factory canteen, periodical medical examination, form credit co-operative societies, appoint labour welfare officer, involve labour in management, etc.
Rangi and Sidhu (2002) studied the problems and prospects of sugar industry in Punjab. They observed that the duration and sugar recoveries at the national level were higher as compared to Punjab. The study found that fewer working days and lower sugar recovery in Punjab raised the total cost of sugar mills and these mills became unprofitable. Due to these factors the private sector hesitated to setup new sugar mills in Punjab. The study also found that the cane price was the major component of the cost of sugar. Higher the SAP higher would be the cost of sugar and vice-versa. The profitability of sugar mills was directly linked with such policy issues. Therefore Indian sugar exporters were not in a position to face international competition due to higher cost of production. They suggested that the ultimate solution lied in total decontrol and privatisation of sugar industry.

Singh et al. (2002) studied the significance of Jaggery and Khandtsari industry in India. The study pointed out many ill effects on health caused by sugar and the nutritional potential of Jaggery and Khandtsari. The study considered that by 2020 AD, the country would need at least 54 million tonnes of sweeteners of which about 40 per cent was assumed to be met by Jaggery and Khandtsari. Therefore the study concluded that there was a strong need to rehabilitate the Jaggery and Khandtsari industry in the country to help the cultivators and suggested that the manufacturing techniques in the existing Khandtsari units must be improved.

Srinivasan (2003) in his article entitled “Industry up beat on future” studied the problems and prospects of the sugar industry in two phases: the
period prior to 1995 (pre-WTO) and the post 1995 (post-WTO). He examined that until 1995; the sugar industry had been totally regulated and controlled for the past 50 years. The lope-sided policies of the government affected the viable operation of the industry and threatened the very existence of the industry. He suggested the action plan to liquidate the mounting surplus stocks, subsidy to cover ocean fright, proper sugarcane price policy and support to co-generation plants and quoted Brazil ethanol programme. He recognised and estimated the future prosperity of the sugar industry to record phenomenal growth and emerges as a key player in the international sugar market, saving substantial foreign exchange on imports of crude oil and also a dominant player in the renewable energy sector generating environment friendly power of 4000 mv.