

CHAPTER VI
PRACTICE IN FIXING THE COST OF BY-PRODUCT

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6.1. INTRODUCTION

Every Industry makes certain finished products from raw materials and in the process some waste arises. These wastes have no commercial value and hence are disposed with additional expenses. But when these waste take a commercial value, it is called as a by-product. The origins of by-products may vary from industry to industry. By-products arising from cleaning of the main product, such as gas and tar from coke manufacture, generally have a residual value. In some cases, the by-product is left over as scrap or waste, such as sawdust in lumber mills. In other cases, the by-product may not be the result of any manufacturing process but may arise from preparing raw materials before they are used in the manufacture of the main product. Separation of cotton seed from cotton, cores and seeds from apples and shells from coca beans are examples of this type of by-product.

In Sugar cane processing, it is possible to obtain one main product and four by-products (Chart.9) which are potential raw materials for the extractive, chemical and biochemical industry. The various sugar producing countries currently produce more than fifty commercial products from out of these by-products.

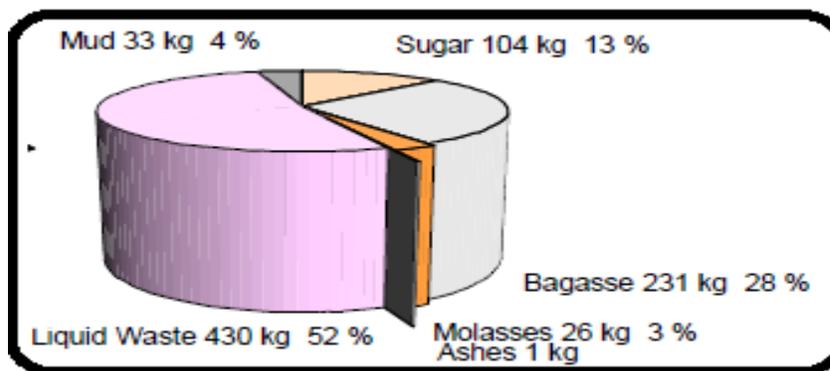


CHART .9 Main Product and Four By-Products of Sugar Mills

During the process of manufacturing of sugar, a sugar mill produces several wastes such as molasses, bagasse, mud (press mud or filter cake), waste water, boiler(bagasse) ash. Of these waste, mud (press mud or filter cake), molasses and bagasse have become valuable by-products of the sugar industry and cannot be therefore termed as wastes any longer. The present Chapter covers ANOVA technique and Comparison of Cost of by-product with their selling price.

6.2. ANALYTICAL FRAMEWORK

In Sugar Industries Bagasse, Mud (Press Mud or Filter Cakes) and Final Molasses are main by-products and they have some commercial value. In practice, we calculate cost of production only for main product of sugar not for these by-products. But it is necessary to find out the cost of by-product. Hence, in this Study two types of method for cost of by-product are taken for these by-products.

1. Total Variable cost is split up into 3% for Bagasse, 2.50% for Mud (Press Mud or Filter Cakes), 4.50% for Final Molasses and balance (90%) to the Main Product of Sugar cost. Then average cost per MT of particular by-product is calculated and then if this segregation of cost is affected to the profit or loss and cost of production are tested with ANOVA whether significance in overall cost of main product and profit or loss **is found or not**.

Two-way ANOVA technique is used when the data are classified on the basis of two factors. For example, the agricultural output may be classified on the basis of different varieties of seeds and also on the basis of different varieties of fertilizers used. A business firm may have its sales data classified on the basis of different salesmen and also on the basis of sales in different regions. In a factory, the various units of a product produced during a certain period may be classified on the basis of different varieties of machines used and also on the basis of different grades of labour. Similarly **in this chapter for all the co-operative sugar mills in Tamil Nadu are classified into two group that is before change in sugar cane price policy and after change in sugar cane price policy**. And the profit or loss of these co-operative mills in Tamil Nadu are also classified into before declaration new sugar cane price policy and after declaration new sugar cane price policy. Such a two-way design may have repeated measurements of each factor or may not have repeated values. The ANOVA technique is little different in case of repeated measurements where we also compute the interaction variation. It is now explained that the two-way ANOVA technique in the context of both the said designs.

ANOVA technique in context of two-way design when repeated values are not there: As we do not have repeated values, we cannot directly compute the sum of squares within samples. Therefore, we have to calculate this residual or error variation by subtraction, once we have calculated the sum of squares for total variance and for variance between varieties of one treatment as also for variance between varieties of the other treatment.

The various steps involved are as follows:

- (i) Take the total of the values of individual items in all the samples and call it T .
- (ii) Work out the correction factor as under:

$$\text{Correction factor} = \frac{(T)^2}{n}$$

(iii) Find out the square of all the item values one by one and then take its total. Subtract the correction factor from this total to obtain the sum of squares of deviations for total variance. Symbolically, we can write it as:

$$\text{Sum of squares of deviations for total variance or total } SS = \sum X_{ij}^2 - \frac{(T)^2}{n}$$

(iv) Take the total of different columns and then obtain the square of each column total and divide such squared values of each column by the number of items in the concerning column and take the total of the result thus obtained. Finally, subtract the correction factor from this total to obtain the sum of squares of deviations for variance between columns or (*SS* between columns).

(v) Take the total of different rows and then obtain the square of each row total and divide such squared values of each row by the number of items in the corresponding row and take the total of the result thus obtained. Finally, subtract the correction factor from this total to obtain the sum of squares of deviations for variance between rows (or *SS* between rows).

(vi) Sum of squares of deviations for residual or error variance can be worked out by subtracting the result of the sum of (iv)th and (v)th steps from the result of (iii)th step stated above. In other words,

$$\text{Total } SS - (\text{SS between columns} + \text{SS between rows}) = \text{SS for residual or error variance.}$$

(vii) Degrees of freedom (d.f.) can be worked out as under:

$$\text{d.f. for total variance} = (c \cdot r - 1)$$

$$\text{d.f. for variance between columns} = (c - 1)$$

$$\text{d.f. for variance between rows} = (r - 1)$$

$$\text{d.f. for residual variance} = (c - 1)(r - 1)$$

Where c = number of columns, r = number of rows

(viii) ANOVA table can be set up as shown in Table 6.1

TABLE 6.1
Model ANOVA Table

Source of variation	Sum of squares (SS)	Degrees of freedom (d.f.)	Mean square (MS)	F-ratio
Between columns treatment	$\sum \frac{(T_j)^2}{n_j} - \frac{(T)^2}{n}$	$(c-1)$	$\frac{SS \text{ between columns}}{(c-1)}$	$\frac{MS \text{ between columns}}{MS \text{ residual}}$
Between rows treatment	$\sum \frac{(T_i)^2}{n_i} - \frac{(T)^2}{n}$	$(r-1)$	$\frac{SS \text{ between rows}}{(r-1)}$	$\frac{MS \text{ between rows}}{MS \text{ residual}}$
Residual or error	Total SS – (SS between columns + SS between rows)	$(c-1)(r-1)$	$\frac{SS \text{ residual}}{(c-1)(r-1)}$	
Total	$\sum X_{ij}^2 - \frac{(T)^2}{n}$	$(c.r-1)$		

Source: wikipedia

In this table c = number of columns; r = number of rows and

SS residual = Total SS – (SS between columns + SS between rows).

Thus, *MS* residual or the residual variance provides the basis for the *F*-ratios concerning variation between columns treatment and between rows treatment. *MS* residual is always due to the fluctuations of sampling, and hence serves as the basis for the significance test. Both the *F*-ratios are compared with their corresponding table values, for given degrees of freedom at a specified level of significance, as usual and if it is found that the calculated *F*-ratio concerning variation between columns is equal to or greater than its table value, then the difference among columns means is considered significant. Similarly, the *F*-ratio concerning variation between rows can be interpreted. And then the hypotheses being tested by the *F*-test in simple regression are: $H_0: \beta_1 = 0$; $H_1: \beta_1 \neq 0$ that is if the *F* ratio is greater than 0.05, the results shows significance and the null hypothesis is rejected otherwise, the results show no significance and the null hypothesis is accepted

2. In this Second type of method One Co-Operative mill's say K-1 CSM's cost is taken as model into this study. In which, up to the split off point for Bagasse, Power cost, direct labour cost and interest for working capital are added to the Sugar cane (Raw material) cost and calculated the by-product (Bagasse) cost, balance cost is carry forwarded to the second stage. In the second stage, up to the split off point for Mud (Press Mud or Filter Cakes), Chemical expenses, Power cost, Direct labour cost and interest for working capital are added to the carry forwarded cost from the first stage, and calculated the by-product (Press Mud or Filter Cakes) cost, balance cost is carry forwarded to third stage. In the third stage up to the split off point for Molasses, Power cost, direct labour cost and interest for working capital are added to the carry forwarded cost from the second stage and then calculated the by-product (Molasses) cost,

balance cost is carry forwarded to the Main Product (Sugar). And finally from this second type method of cost of by product all the Cooperative Sugar mills are computed and anlyasis with Descriptive Statics .

6.3 BY-PRODUCT COST IN FIRST METHOD

In this study, yearly average selling price per quintal of Sugar (Main Product), only average variable cost are taken from secondary source of data, then from this variable cost 3% of Variable Cost as Bagasse cost, 2.50 % of Variable cost as Mud (Press mud Or Filter cake) cost, 4.50% of Variable Cost as Final Molasses cost and balance 90% of variable cost as Sugar (Main product) cost are segregated. Then fixed cost is added to this balance 90% of variable cost for Sugar and then revised cost of production for Sugar is calculated (Main product). And finally change in revised cost of production with original cost of production of sugar and the change in percentage of these cost production are also calculated. In this study, the Cost of by-product and main product is calculated for a period of ten years that is. From 2002-03 to 2011-12, for all the Fifteen Running Co-operative Sugar Mills in Tamil Nadu. Hence data are split up in five Tables from Table 6.2 to Table 6.6 with two year per Table. In Table 6.2 data for Cost of by-product, Selling Price of Main Product and Change in Cost of Main Product for all the Co-Operative Sugar mills are presented for the year of 2002-03 and 2003-04.

TABLE 6.2

Statement for Cost of by-product, Selling Price of Main Product and Change in Cost of Main Product for the year 2002-03 and 2003-04

TABLE 6.1.1	ACSM	AMCSM	SCSM	K1CSM	DCSM	NCSM	VCSM	TCSM	CCSM	TTCSM	NPKRCS	MRKCS	!CYSM	SSCSM	K2CSM	Avg.per MT
2002-03	(Rs.Per Qtls)															
1.sales revenue	1101.65	1103.24	1107.64	1092.63	1109.72	889.18	1067.45	1079.15	1000.94	1349.23	1144.54	1139.11	1199.58	1069.87	1130.69	
2.Variable cost	916.19	1013.47	878.16	954.46	928.98	925.43	926.02	906.27	899.28	980.85	959.69	910.85	946.97	895.95	918.41	
2.a.Baggase Cost(V	27.49	30.40	26.34	28.63	27.87	27.76	27.78	27.19	26.98	29.43	28.79	27.33	28.41	26.88	27.55	930.73
2.b. Mud Cost (V.C	22.90	25.34	21.95	23.86	23.22	23.14	23.15	22.66	22.48	24.52	23.99	22.77	23.67	22.40	22.96	930.73
2.c.Molasse Cost (V	41.23	45.61	39.52	42.95	41.80	41.64	41.67	40.78	40.47	44.14	43.19	40.99	42.61	40.32	41.33	930.73
2.d. Bal. Cost of Sug	824.57	912.12	790.34	859.02	836.08	832.89	833.42	815.64	809.35	882.77	863.72	819.77	852.28	806.35	826.57	
3.Fixed Cost	547.53	516.97	304.41	803.99	410.11	3490.50	506.86	535.04	397.34	660.23	711.81	296.45	247.19	349.49	403.93	
4.a.Original Cost of	1463.72	1530.43	1182.57	1758.45	1339.09	4415.93	1432.88	1441.31	1296.62	1641.08	1671.50	1207.30	1194.16	1245.44	1322.34	
4.b.Revised Cost of	1372.10	1429.09	1094.75	1663.00	1246.19	4323.39	1340.28	1350.69	1206.69	1543.00	1575.53	1116.21	1099.47	1155.84	1230.50	
5.Change in Cost of	91.62	101.35	87.82	95.45	92.90	92.54	92.60	90.63	89.93	98.09	95.97	91.09	94.70	89.59	91.84	
6.Change in Percent	8.32	9.19	7.93	8.74	8.37	10.41	8.68	8.40	8.98	7.27	8.38	8.00	7.89	8.37	8.12	
	Year wise Min		7.27 Max		10.41		Average		8.47							
2003-04	(Rs.Per Qtls)															
1.sales revenue	1904.19	1696.74	1530.15	1467.58	1289.02	0.00	1653.35	1517.41	1375.22	1388.02	1499.81	1419.07	1288.43	1728.54	1730.31	
2.Variable cost	1032.33	1207.61	1096.78	970.81	1077.91	0.00	925.31	1001.56	963.30	1022.70	1015.89	1010.44	917.49	1086.58	997.71	
2.a.Baggase Cost(V	30.97	36.23	32.90	29.12	32.34	0.00	27.76	30.05	28.90	30.68	30.48	30.31	27.52	32.60	29.93	955.10
2.b. Mud Cost (V.C	25.81	30.19	27.42	24.27	26.95	0.00	23.13	25.04	24.08	25.57	25.40	25.26	22.94	27.16	24.94	955.10
2.c.Molasse Cost (V	46.45	54.34	49.36	43.69	48.51	0.00	41.64	45.07	43.35	46.02	45.72	45.47	41.29	48.90	44.90	955.10
2.d. Bal. Cost of Sug	929.10	1086.85	987.11	873.73	970.12	0.00	832.78	901.40	866.97	920.43	914.30	909.39	825.74	977.92	897.94	
3.Fixed Cost	1973.10	698.38	949.85	671.17	578.19	0.00	797.88	1122.30	424.60	309.15	1373.98	295.53	254.17	869.45	637.76	
4.a.Original Cost of	3005.43	1905.99	2046.63	1641.98	1656.10	0.00	1723.19	2123.85	1387.90	1331.85	2389.87	1305.96	1171.66	1956.04	1635.47	
4.b.Revised Cost of	2902.20	1785.23	1936.96	1544.90	1548.31	0.00	1630.66	2023.70	1291.57	1229.58	2288.28	1204.92	1079.91	1847.38	1535.70	
5.Change in Cost of	103.23	120.76	109.68	97.08	107.79	0.00	92.53	100.16	96.33	102.27	101.59	101.04	91.75	108.66	99.77	
6.Change in Percent	5.42	7.12	7.17	6.62	8.36	0.00	5.60	6.60	7.00	7.37	6.77	7.12	7.12	6.29	5.77	
	Year wise Min		5.42 Max		8.36		Average		6.74							

Source: Secondary Data

From Table 6.2, it is observed that change in cost of production for sugar is in range from the lowest 7.27 % to the highest 10.41% for 2002-03. In this year average cost per MT of these by-product is Rs.930.73, And also, it is further observed that change in cost of production for sugar is in range from the lowest 5.42 % to the highest 8.36% for 2003-04 and the average cost per MT of these by-products is Rs.955.10 for 2003-04.

Data for all the Co-operative Sugar mills for variable cost, sales revenue and change in cost are shown in Table 6.3 for the year of 2004-05 and 2005-06.

TABLE 6.3

Statement for Cost of by-product, Selling Price of Main Product and Change in Cost of Main Product for the year 2004-05 and 2005-06

TABLE 6.1.2	ACSM	AMCSM	SCSM	K1CSM	DCSM	NCSM	VCSM	TCSM	CCSM	TTCSM	NPKRCS	MRKCS	1CYSM	SSCSM	K2CSM	Avg.per MT
2004-05	(Rs.Per Qtls)															
1.sales revenue	2494.40	4825.05	2366.16	1903.66	1910.61	0.00	2171.01	2042.76	1762.05	2397.75	2200.45	1794.89	1980.49	2008.47	1611.56	
2.Variable cost	1269.48	3306.59	1330.04	1150.18	1182.03	0.00	1248.44	1164.06	1180.62	1646.92	1136.32	1108.61	1365.70	1203.47	1146.64	
2.a.Baggase Cost(V	38.08	99.20	39.90	34.51	35.46	0.00	37.45	34.92	35.42	49.41	34.09	33.26	40.97	36.10	34.40	1295.94
2.b. Mud Cost (V.C	31.74	82.66	33.25	28.75	29.55	0.00	31.21	29.10	29.52	41.17	28.41	27.72	34.14	30.09	28.67	1295.94
2.c.Molasse Cost (V	57.13	148.80	59.85	51.76	53.19	0.00	56.18	52.38	53.13	74.11	51.13	49.89	61.46	54.16	51.60	1295.94
2.d. Bal. Cost of Sug	1142.53	2975.93	1197.04	1035.16	1063.83	0.00	1123.60	1047.66	1062.56	1482.23	1022.69	997.75	1229.13	1083.12	1031.98	
3.Fixed Cost	1937.89	2627.16	1477.91	681.08	506.93	0.00	807.45	1252.27	424.04	3576.97	2538.40	401.01	347.07	483.01	292.42	
4.a.Original Cost of	3207.38	5933.75	2807.95	1831.26	1688.97	0.00	2055.89	2416.33	1604.66	5223.89	3674.72	1509.62	1712.77	1686.48	1439.06	
4.b.Revised Cost of	3080.43	5603.09	2674.95	1716.24	1570.76	0.00	1931.04	2299.92	1486.60	5059.19	3561.09	1398.75	1576.20	1566.14	1324.40	
5.Change in Cost of	126.95	330.66	133.00	115.02	118.20	0.00	124.84	116.41	118.06	164.69	113.63	110.86	136.57	120.35	114.66	
6.Change in Percent	5.09	6.85	5.62	6.04	6.19	0.00	5.75	5.70	6.70	6.87	5.16	6.18	6.90	5.99	7.12	
	Year wise Min		5.09	Max	7.12		Average	6.15								
2005-06	(Rs.Per Qtls)															
1.sales revenue	1879.87	4357.26	1668.26	1745.67	1636.35	1768.88	1830.21	1853.35	1793.74	2115.31	1957.77	1874.99	1937.80	1598.82	1978.93	
2.Variable cost	1497.02	3621.53	1315.59	1398.51	1207.55	1404.79	1418.10	1351.23	1500.30	1779.61	1376.27	1422.46	1442.35	1300.52	1353.30	
2.a.Baggase Cost(V	44.91	108.65	39.47	41.96	36.23	42.14	42.54	40.54	45.01	53.39	41.29	42.67	43.27	39.02	40.60	1559.28
2.b. Mud Cost (V.C	37.43	90.54	32.89	34.96	30.19	35.12	35.45	33.78	37.51	44.49	34.41	35.56	36.06	32.51	33.83	1559.28
2.c.Molasse Cost (V	67.37	162.97	59.20	62.93	54.34	63.22	63.81	60.81	67.51	80.08	61.93	64.01	64.91	58.52	60.90	1559.28
2.d. Bal. Cost of Sug	1347.32	3259.37	1184.03	1258.66	1086.80	1264.31	1276.29	1216.11	1350.27	1601.65	1238.64	1280.21	1298.12	1170.47	1217.97	
3.Fixed Cost	770.44	5258.56	410.47	691.65	412.96	2536.05	462.84	731.57	559.31	1124.39	1882.93	440.28	333.61	332.68	379.82	
4.a.Original Cost of	2267.46	8880.09	1726.06	2090.16	1620.51	3940.83	1880.95	2082.79	2059.61	2904.00	3259.20	1862.74	1775.96	1633.21	1733.12	
4.b.Revised Cost of	2117.76	8517.94	1594.50	1950.31	1499.75	3800.35	1739.14	1947.67	1909.58	2726.04	3121.58	1720.49	1631.73	1503.15	1597.79	
5.Change in Cost of	149.70	362.15	131.56	139.85	120.76	140.48	141.81	135.12	150.03	177.96	137.63	142.25	144.24	130.05	135.33	
6.Change in Percent	7.96	8.31	7.89	8.01	7.38	7.94	7.75	7.29	8.36	8.41	7.03	7.59	7.44	8.13	6.84	
	Year wise Min		6.84	Max	8.41		Average	7.76								

Source: Secondary Data

From Table 6.3, it is inferred that the change in cost of production for sugar is in range from the lowest 5.09% to the highest 7.12% for 2004-05 and this year average cost per MT of these by-products is Rs.1295.94. Similarly, it is also further inferred that change in cost of production for sugar is in range from the lowest 6.84% to the highest 8.41% for the year 2005-06 and the average cost per MT of these by-product is Rs.1559.28 for 2005-06.

In Table 6.4 data for all the Co-operative Sugar mills for variable cost, sales revenue and change in cost are displayed for the year of 2006-07 and 2007-08.

TABLE 6.4

Statement for Cost of by-product, Selling Price of Main Product and Change in Cost of Main Product for the year 2006-07 and 2007-08

TABLE 6.1.3	ACSM	AMCSM	SCSM	K1CSM	DCSM	NCSM	VCSM	TCSM	CCSM	TTCSM	NPKRCS	MRKCS	CYSM	SSCSM	K2CSM	Avg.per MT
2006-07																
	(Rs.Per Qtls)															
1.sales revenue	1349.57	2326.31	1849.13	1412.53	1462.20	1402.12	1380.87	1454.55	1473.61	1265.34	1389.20	1435.75	1585.90	1551.45	1697.28	
2.Variable cost	1459.89	1744.27	1454.66	1366.41	1257.59	1383.39	1334.45	1299.81	1353.99	1474.58	1375.40	1344.73	1412.00	1288.64	1303.39	
2.a.Baggase Cost(V	43.80	52.33	43.64	40.99	37.73	41.50	40.03	38.99	40.62	44.24	41.26	40.34	42.36	38.66	39.10	1390.21
2.b. Mud Cost (V.C	36.50	43.61	36.37	34.16	31.44	34.58	33.36	32.50	33.85	36.86	34.38	33.62	35.30	32.22	32.58	1390.21
2.c.Molasse Cost (V	65.69	78.49	65.46	61.49	56.59	62.25	60.05	58.49	60.93	66.36	61.89	60.51	63.54	57.99	58.65	1390.21
2.d. Bal. Cost of Su	1313.90	1569.84	1309.19	1229.77	1131.83	1245.05	1201.00	1169.83	1218.59	1327.12	1237.86	1210.26	1270.80	1159.78	1173.05	
3.Fixed Cost	568.36	603.41	379.74	581.20	382.61	784.45	421.54	619.39	326.82	724.37	930.38	239.75	248.69	251.34	313.26	
4.a.Original Cost of	2028.25	2347.67	1834.40	1947.61	1640.21	2167.84	1755.99	1919.20	1680.81	2198.95	2305.77	1584.48	1660.68	1539.98	1616.65	
4.b.Revised Cost of	1882.26	2173.24	1688.94	1810.97	1514.45	2029.50	1622.55	1789.22	1545.41	2051.49	2168.23	1450.01	1519.48	1411.12	1486.31	
5.Change in Cost of	145.99	174.43	145.47	136.64	125.76	138.34	133.44	129.98	135.40	147.46	137.54	134.47	141.20	128.86	130.34	
6.Change in Percent	10.82	7.50	7.87	9.67	8.60	9.87	9.66	8.94	9.19	11.65	9.90	9.37	8.90	8.31	7.68	
	Year wise Min		7.50 Max			11.65		Average		9.19						
2007-08																
	(Rs.Per Qtls)															
1.sales revenue	1387.22	2251.92	1587.78	1496.33	1320.70	1319.05	1343.87	1405.41	1313.18	1299.19	1320.29	1339.08	1383.06	1327.64	1230.30	
2.Variable cost	1424.96	1731.08	1476.78	1500.52	1345.65	1486.03	1394.44	1371.24	1447.94	1561.73	1580.06	1493.08	1330.91	1320.57	1147.54	
2.a.Baggase Cost(V	42.75	51.93	44.30	45.02	40.37	44.58	41.83	41.14	43.44	46.85	47.40	44.79	39.93	39.62	34.43	1440.84
2.b. Mud Cost (V.C	35.62	43.28	36.92	37.51	33.64	37.15	34.86	34.28	36.20	39.04	39.50	37.33	33.27	33.01	28.69	1440.84
2.c.Molasse Cost (V	64.12	77.90	66.45	67.52	60.55	66.87	62.75	61.71	65.16	70.28	71.10	67.19	59.89	59.43	51.64	1440.84
2.d. Bal. Cost of Su	1282.47	1557.97	1329.10	1350.47	1211.09	1337.43	1255.00	1234.11	1303.14	1405.56	1422.05	1343.77	1197.82	1188.51	1032.79	
3.Fixed Cost	604.07	751.94	365.81	595.06	401.07	770.27	462.53	620.75	422.27	633.47	942.21	332.56	214.40	227.30	201.74	
4.a.Original Cost of	2029.04	2483.02	1842.58	2095.58	1746.73	2256.29	1856.97	1991.99	1870.21	2195.20	2522.27	1825.64	1545.31	1547.87	1349.28	
4.b.Revised Cost of	1886.54	2309.92	1694.91	1945.53	1612.16	2107.69	1717.53	1854.87	1725.41	2039.03	2364.27	1676.33	1412.22	1415.81	1234.53	
5.Change in Cost of	142.50	173.11	147.68	150.05	134.57	148.60	139.44	137.12	144.79	156.17	158.01	149.31	133.09	132.06	114.75	
6.Change in Percent	10.27	7.69	9.30	10.03	10.19	11.27	10.38	9.76	11.03	12.02	11.97	11.15	9.62	9.95	9.33	
	Year wise Min		7.69 Max			12.02		Average		10.26						

Source: Secondary Data

From Table 6.4, it is explained that change in cost of production for sugar is in range from the lowest 7.05% to the highest 11.65% for 2006-07 and the average cost per MT of these by-product is Rs.1390.21 for 2006-07. Similarly, it is also further explained that change in cost of production for sugar is in range from the lowest 7.69 % to the highest 12.021% for 2007-08 and this year average cost per MT of these by-product is Rs.1440.84.

Data for all the Co-operative Sugar mills for variable cost, sales revenue and change in cost are depicted in Table 6.5 for the year of 2008-09 and 2009-10.

TABLE 6.5

Statement for Cost of by-product, Selling Price of Main Product and Change in Cost of Main Product for the year 2008-09 and 2009-10

TABLE 6.1.4	ACSM	AMCSM	SCSM	K1CSM	DCSM	NCSM	VCSM	TCSM	CCSM	TTCSM	NPKRCS	MRKCS	CYSM	SSCSM	K2CSM	Avg.per MT
2008-09	(Rs.Per Qtls)															
1.sales revenue	2304.37	3057.11	2445.11	2203.71	2295.16	1824.29	1977.94	2552.87	1945.50	2171.11	2237.54	2116.96	1892.04	1775.15	1906.74	
2.Variable cost	1466.78	2077.51	1544.14	1398.04	1327.94	1516.86	1403.97	1384.99	1387.74	1521.92	1577.02	1550.04	1420.31	1323.23	1345.44	
2.a.Baggase Cost(V	44.00	62.33	46.32	41.94	39.84	45.51	42.12	41.55	41.63	45.66	47.31	46.50	42.61	39.70	40.36	1483.06
2.b. Mud Cost (V.C	36.67	51.94	38.60	34.95	33.20	37.92	35.10	34.62	34.69	38.05	39.43	38.75	35.51	33.08	33.64	1483.06
2.c.Molasse Cost (V	66.01	93.49	69.49	62.91	59.76	68.26	63.18	62.32	62.45	68.49	70.97	69.75	63.91	59.55	60.54	1483.06
2.d. Bal. Cost of Sug	1320.10	1869.76	1389.72	1258.23	1195.14	1365.17	1263.58	1246.49	1248.97	1369.72	1419.32	1395.03	1278.28	1190.91	1210.90	
3.Fixed Cost	791.56	952.41	519.14	578.38	558.91	811.90	595.39	979.06	492.40	1026.00	1163.16	462.75	289.19	307.56	322.76	
4.a.Original Cost of	2258.34	3029.92	2063.27	1976.42	1886.85	2328.76	1999.36	2364.04	1880.15	2547.91	2740.19	2012.79	1709.50	1630.79	1668.20	
4.b.Revised Cost of	2111.66	2822.17	1908.86	1836.61	1754.05	2177.07	1858.96	2225.55	1741.37	2395.72	2582.48	1857.79	1567.47	1498.47	1533.65	
5.Change in Cost of	146.68	207.75	154.41	139.80	132.79	151.69	140.40	138.50	138.77	152.19	157.70	155.00	142.03	132.32	134.54	
6.Change in Percent	6.37	6.80	6.32	6.34	5.79	8.31	7.10	5.43	7.13	7.01	7.05	7.32	7.51	7.45	7.06	
	Year wise Min		5.43 Max		8.31		Average		6.86							
2009-10	(Rs.Per Qtls)															
1.sales revenue	3166.66	4406.71	3864.15	3215.39	2931.90	3728.91	3280.41	4050.38	2659.17	3673.17	2920.13	3445.90	3586.93	2976.28	3403.83	
2.Variable cost	2217.65	2892.10	2345.67	1972.01	1722.18	2051.04	2077.62	2008.10	2058.26	2700.08	1960.94	2173.64	2245.89	1709.25	1879.28	
2.a.Baggase Cost(V	66.53	86.76	70.37	59.16	51.67	61.53	62.33	60.24	61.75	81.00	58.83	65.21	67.38	51.28	56.38	2134.25
2.b. Mud Cost (V.C	55.44	72.30	58.64	49.30	43.05	51.28	51.94	50.20	51.46	67.50	49.02	54.34	56.15	42.73	46.98	2134.25
2.c.Molasse Cost (V	99.79	130.14	105.56	88.74	77.50	92.30	93.49	90.36	92.62	121.50	88.24	97.81	101.07	76.92	84.57	2134.25
2.d. Bal. Cost of Sug	1995.88	2602.89	2111.10	1774.81	1549.96	1845.93	1869.86	1807.29	1852.43	2430.07	1764.85	1956.28	2021.30	1538.32	1691.35	
3.Fixed Cost	1741.22	1228.15	445.38	674.17	522.42	1830.84	951.86	1978.36	695.68	2825.34	1668.66	823.12	402.98	300.48	729.42	
4.a.Original Cost of	3958.87	4120.25	2791.05	2646.18	2244.60	3881.88	3029.48	3986.46	2753.94	5525.42	3629.60	2996.76	2648.87	2009.73	2608.70	
4.b.Revised Cost of	3737.10	3831.04	2556.49	2448.98	2072.38	3676.77	2821.72	3785.65	2548.11	5255.41	3433.51	2779.40	2424.28	1838.80	2420.77	
5.Change in Cost of	221.76	289.21	234.57	197.20	172.22	205.10	207.76	200.81	205.83	270.01	196.09	217.36	224.59	170.92	187.93	
6.Change in Percent	7.00	6.56	6.07	6.13	5.87	5.50	6.33	4.96	7.74	7.35	6.72	6.31	6.26	5.74	5.52	
	Year wise Min		4.96 Max		7.74		Average		6.27							

Source: Secondary Data

From Table 6.5, it is extracted that change in cost of production for sugar is in range from the lowest 5.43% to the highest 8.31% for 2008-09 and the average cost per MT of these by-product is Rs.1483.06 for 2008-09. Similarly, it is also further extracted that change in cost of production for sugar is in range from the lowest 4.96% to the highest 7.74% for 2009-10 and this year average cost per MT of these by-product is Rs.2134.25.

In Table 6.6 data for all the Co-operative Sugar mills for variable cost, sales revenue and change in cost are reported for the year of 2010-11 and 2011-12.

TABLE 6.6

Statement for Cost of by-product, Selling Price of Main Product and Change in Cost of Main Product for the year 2010-11 and 2011-12

TABLE 6.1.5	ACSM	AMCSM	SCSM	K1CSM	DCSM	NCSM	VCSM	TCSM	CCSM	TTCSM	NPKRCS	MRKCS	CSM	SSCSM	K2CSM	Avg.per MT
2010-11	(Rs.Per Qtls)															
1.sales revenue	2704.53	4002.81	3030.17	3237.87	3190.46	2990.01	2891.15	2897.37	3204.58	2871.55	2810.26	3030.95	3134.12	3117.85	2924.00	
2.Variable cost	2489.57	3268.75	2423.65	2558.15	2178.64	2425.48	2299.10	2159.26	2534.38	2667.12	2777.94	2839.94	2608.47	2206.65	2339.36	
2.a.Baggase Cost(V	74.69	98.06	72.71	76.74	65.36	72.76	68.97	64.78	76.03	80.01	83.34	85.20	78.25	66.20	70.18	2518.43
2.b. Mud Cost (V.C	62.24	81.72	60.59	63.95	54.47	60.64	57.48	53.98	63.36	66.68	69.45	71.00	65.21	55.17	58.48	2518.43
2.c.Molasse Cost (V	112.03	147.09	109.06	115.12	98.04	109.15	103.46	97.17	114.05	120.02	125.01	127.80	117.38	99.30	105.27	2518.43
2.d. Bal. Cost of Sug	2240.62	2941.87	2181.29	2302.34	1960.77	2182.94	2069.19	1943.34	2280.94	2400.41	2500.14	2555.95	2347.63	1985.99	2105.43	
3.Fixed Cost	1020.19	1164.47	352.32	601.41	609.13	1698.10	848.83	966.21	679.50	1237.67	2664.62	1063.80	484.56	705.03	389.94	
4.a.Original Cost of	3509.77	4433.21	2775.97	3159.57	2787.77	4123.58	3147.94	3125.47	3213.88	3904.79	5442.55	3903.74	3093.03	2911.69	2729.30	
4.b.Revised Cost of	3260.81	4106.34	2533.61	2903.75	2569.90	3881.04	2918.03	2909.54	2960.44	3638.07	5164.76	3619.75	2832.18	2691.02	2495.37	
5.Change in Cost of	248.96	326.87	242.37	255.82	217.86	242.55	229.91	215.93	253.44	266.71	277.79	283.99	260.85	220.67	233.94	
6.Change in Percent	9.21	8.17	8.00	7.90	6.83	8.11	7.95	7.45	7.91	9.29	9.88	9.37	8.32	7.08	8.00	
	Year wise Min		6.83 Max		9.88		Average		8.23							
2011-12	(Rs.Per Qtls)															
1.sales revenue	2857.45	3563.85	3170.60	2865.98	2789.11	2744.26	2956.21	2774.33	2804.96	2991.53	2839.14	2813.91	2934.32	2911.95	3029.81	
2.Variable cost	2477.98	3018.39	2782.82	2562.43	2304.53	2373.01	2573.06	2308.12	2522.99	2701.68	2721.39	2772.43	2666.30	2354.33	2361.94	
2.a.Baggase Cost(V	74.34	90.55	83.48	76.87	69.14	71.19	77.19	69.24	75.69	81.05	81.64	83.17	79.99	70.63	70.86	2566.76
2.b. Mud Cost (V.C	61.95	75.46	69.57	64.06	57.61	59.33	64.33	57.70	63.07	67.54	68.03	69.31	66.66	58.86	59.05	2566.76
2.c.Molasse Cost (V	111.51	135.83	125.23	115.31	103.70	106.79	115.79	103.87	113.53	121.58	122.46	124.76	119.98	105.94	106.29	2566.76
2.d. Bal. Cost of Sug	2230.19	2716.55	2504.54	2306.19	2074.08	2135.71	2315.76	2077.31	2270.69	2431.51	2449.25	2495.18	2399.67	2118.90	2125.75	
3.Fixed Cost	1418.53	1069.18	288.90	1069.01	512.03	1089.34	851.92	897.11	902.69	1193.60	2190.11	956.87	432.49	367.17	460.36	
4.a.Original Cost of	3896.52	4087.57	3071.71	3631.44	2816.56	3462.35	3424.98	3205.23	3425.68	3895.28	4911.50	3729.30	3098.79	2721.50	2822.30	
4.b.Revised Cost of	3648.72	3785.73	2793.43	3375.20	2586.11	3225.05	3167.67	2974.42	3173.38	3625.12	4639.36	3452.06	2832.16	2486.07	2586.11	
5.Change in Cost of	247.80	301.84	278.28	256.24	230.45	237.30	257.31	230.81	252.30	270.17	272.14	277.24	266.63	235.43	236.19	
6.Change in Percent	8.67	8.47	8.78	8.94	8.26	8.65	8.70	8.32	8.99	9.03	9.59	9.85	9.09	8.09	7.80	
	Year wise Min		7.80 Max		9.85		Average		8.75							

Source: Secondary Data

From Table 6.6, it is detected that change in cost of production for sugar is in range from the lowest 6.83% to the highest 9.88% for 2010-11 and this year average cost per MT of these by-products is Rs.2518.43. Similarly, it is also further detected that change in cost of production for sugar is in range from the lowest 7.80% to the highest 9.85% for 2011-12 and the average cost per MT of these by-products is Rs.2566.76 for 2011-12. And also it is detected that over all change in cost of production for Sugar ranges from very lowest 4.96% for the year 2009-10 to very highest 12.06% for the year 2006-07.

Year wise average cost of molasses, cost of bagasse and their average selling price for the study period are given in Table 6.7.

TABLE 6.7**Statement of Year Wise Average Cost and Selling Price for by-Product**

TABLE 6.1.6 Statement of Year Wise Average Cost And Selling Price for By -Product									
S.No	Year	Molasses				Bagasse			
		Cost Rs.	Sel.Price.Rs	Differ	%	Cost Rs.	Sel.Price Rs	Differ	%
1	2002-03	1861.47	802	-1059.47	43.08	930.73	683	-247.73	73.38
2	2003-04	1910.19	605	-1305.19	31.67	955.10	718	-237.10	75.18
3	2004-05	2591.88	1429	-1162.88	55.13	1295.94	750	-545.94	57.87
4	2005-06	3118.55	766	-2352.55	24.56	1559.28	750	-809.28	48.10
5	2006-07	2780.42	860	-1920.42	30.93	1390.21	587	-803.21	42.22
6	2007-08	2881.67	507	-2374.67	17.59	1440.84	435	-1005.84	30.19
7	2008-09	2966.12	2030	-936.12	68.44	1483.06	668	-815.06	45.04
8	2009-10	4268.49	330	-3938.49	7.73	2134.25	1168	-966.25	54.73
9	2010-11	5036.86	2654	-2382.86	52.69	2518.43	1483	-1035.43	58.89
10	2011-12	5133.52	1543	-3590.52	30.06	2566.76	1034	-1532.76	40.28
	Max			-936.12				-237.10	
	Min			-3938.49				-1532.76	
	Avg	3254.92	1152.60	-2102.32	35.41	1627.46	827.60	-799.86	50.85

Source: Secondary Data

From Table 6.7 it is perceived that if the Mud (Press Mud or Filter Cake) has no commercial value, then this Mud (Press Mud or Filter Cake) cost is added to the molasses cost. Hence Molasses cost per MT is Rs.1861.47 for 2002-03 and Rs.5133.52 for 2011-12, And the average selling price of molasses is Rs.802/- , which is 43.08% of cost price for 2002-03 and very lowest of Rs.330/- for 2009-10, which is 7.73% of cost price. Difference between cost price and actual selling price in 2009-10 is Rs.3938.49 which is very highest in this study period and which also affects the profit or loss of this co -operative sugar mills. Maximum average selling price is Rs.2654/- which is 52.69% of Cost price for the year 2010-11.It is also noted that there is an increasing trend of cost price of molasses in all the years of the study periods except in 2006-07.During this study period, Actual selling price of Molasses shows ups and down trend according to the demand and supply in market condition, which also affect the profit or loss and performance of co- operative sugar mills.

From Table 6.7 and also, It is examined that the Bagasse cost per MT is Rs.930.73 for 2002-03 and Rs.2566.76 for 2011-12 and the average selling price of Bagasse was Rs.683/- which is 73.38% of cost price for 2002-03, very lowest of Rs.435/- which is 30.19% of cost price in the year 2007-08. Difference between cost price and actual selling price in 2011-12 is Rs.1532.76, which is very highest in this study period, which also affects the profit or loss of this co-operative sugar mills. Maximum average selling price is Rs.1483/- which is 58.89% of Cost price for the year 2010-11.It is also seen that there is an increasing trend of cost price of

Bagasse throughout the study periods except in 2006-07, but in case of its selling price, there is ups and down in movement of its in throughout study period.

In continuation of this study first I take Molasses for this study which is one of the by-product of sugar manufacturing process. The selling price of Molasses (by-product) is not below the cost of Molasses (by-product) policy has adopted whether there is significant differences between the existing policy and new policy, during the study period, the following Table 6.8 is framed and compared with t-Test.

TABLE 6.8
Statement of Year Wise Average Cost, Selling Price and T-Test for Molasses

Year	Molasses Cost Rs.	Molasses Selling Price Rs.	t-Test: Two-Sample Assuming Equal Variances		
				Variable 1	Variable 2
			Mean	3254.918558	1152.6
			Variance	1376431.018	556019.16
			Observations	10	10
			Pooled Variance	966225.0868	
			Hypothesized Mean	0	
			df	18	
			t Stat	4.782383194	
			P(T<=t) one-tail	7.45105E-05	
			t Critical one-tail	1.734063592	
			P(T<=t) two-tail	0.000149021	
			t Critical two-tail	2.100922037	
2002-03	1861.47	802			
2003-04	1910.19	605			
2004-05	2591.88	1429			
2005-06	3118.55	766			
2006-07	2780.42	860			
2007-08	2881.67	507			
2008-09	2966.12	2030			
2009-10	4268.49	330			
2010-11	5036.86	2654			
2011-12	5133.52	1543			

Sources: Secondary Data

In this study of t-Test from the Table 6.8, it is observed that Variable 1 is Cost of Molasses, Variable 2 is Selling Price of Molasses, their means (3254.92, 1152.60) and variances (1376431.02, 556019.16) are unequal, t-Stat value is 4.78, P(T<=t) two-tail value is 0.000149, t-Critical two-tail value is 2.10. Since p-value = TDIST(t, df) = TDIST(4.78, 18) = .000149 < .05 = α . Hence it is rejected the null hypothesis due to this p-value is less than 95% significance level and also p-value is less than t-Stat value, concluding that there is a significant difference between the Molasses cost and Molasses Selling price.

In order to see, whether there exist significant differences between cost price and selling price for molasses, during the study period, the following hypothesis was framed and tested. And Test of ANOVA for cost and selling price is shown in Table 6.9

Ho: There is no significant difference between cost price and selling price for molasses

TABLE 6.9**ANOVA for Statement of Average Cost and Selling Price for Molasses**

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Rows	12491864.51	9	1387984.946	2.54926279	0.089755	3.178893105
Columns	22098716.59	1	22098716.59	40.5879301	0.00013	5.117355008
Error	4900187.05	9	544465.2278			
Total	39490768.16	19				

Sources: Secondary Data

From the ANOVA Table 6.9, it is articulated that there is the calculated F-ratio value is 40.5879, which is higher than the table value of 5.117, at one per cent level of significance and also calculated F-ratio is higher than p-value of 0.00013. Between cost and selling price of molasses Since the calculated values are higher than the table values between groups, it can be inferred, that there exists significant difference in the cost price and selling price of molasses during this study period. Hence, the hypothesis is rejected.

In continuation of this study second item I take Bagasse for this study ,which is one of the by product of sugar manufacturing process . The selling price of Bagasse (by-product) is not below the cost of Bagasse (by-product) policy has adopted whether there is significant differences between the existing policy and new policy, during the study period, the following Table 6.10 is framed and compared with t -Test.

TABLE 6.10**Statement of Year Wise Average Cost , Selling Price and T- Test for Bagasse**

Year	Bagasse Cost Rs.	Bagasse Selling Price Rs.	t-Test: Two-Sample Assuming Unequal Variances		
				Variable 1	Variable 2
2002-03	930.73	683	Mean	1627.459279	677.6
2003-04	955.10	718	Variance	344107.7545	222586.93
2004-05	1295.94	0	Observations	10	10
2005-06	1559.28	0	Hypothesized Mean	0	
2006-07	1390.21	587	df	17	
2007-08	1440.84	435	t Stat	3.99010844	
2008-09	1483.06	668	P(T<=t) one-tail	0.000473647	
2009-10	2134.25	1168	t Critical one-tail	1.739606716	
2010-11	2518.43	1483	P(T<=t) two-tail	0.000947294	
2011-12	2566.76	1034	t Critical two-tail	2.109815559	

Sources: Secondary Data

In this study of t-Test from the Table-6.10, it is observed that Variable 1 is Cost of Bagasse , Variable 2 is Selling Price of Bagasse ,their means (1627.46,677.60) and variances (344107.75,222586.93) are unequal, t-Stat value is 3.99 , P (T<=t) two -tail value is 0.000091, t Critical two-tail value is 2.11 . Since p-value = TDIST(t , df) = TDIST(3.99, 18) = .000094 < .05 = α . Hence it is rejected the null hypothesis, due to this p-value is less than 95% significance level and also p-value is less than t-Stat value , concluding that there is a significant difference between the Molasses cost and Molasses Selling price.

In order to see, whether there exist significant differences between cost price and selling price for bagasse during the study period, the following hypothesis was framed and tested. And Test of ANOVA for cost and selling price is shown in Table 6.11

Ho: There is no significant difference between cost price and selling price for bagasse

TABLE 6.11
ANOVA for Statement of Average Cost and Selling Price for Bagasse

ANOVA						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Rows	4159078.33	9	462119.8	4.419033	0.01869	3.178893
Columns	4511163.25	1	4511163	43.13812	0.0001	5.117355
Error	941173.862	9	104574.9			
Total	9611415.44	19				

Sources: Secondary Data

From the ANOVA Table 6.11, it is articulated that there is the calculated F-ratio value is 43.1381, which is higher than the table value of 5.117, at one per cent level of significance and also calculated F-ratio is higher than p-value of 0.0001. Between cost and selling price of bagasse. Since the calculated values are higher than the table values between groups, it can be inferred, that there exists significant difference in the cost price and selling price of bagasse during this study period. Hence, the hypothesis is rejected.

And also over all the selling price of by-product is not below the cost of by-product policy has adopted whether there exist significant differences between the existing policy and new policy, as well as between the years, during the study period, the following Table 6.12 is framed and compared.

TABLE 6.12

Comparative Statement of Profit or Loss -Before And After Adopting Cost of Production For By-product

		(Rs.Per Qnts)														
Group		2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Mean	Standard Deviation	Coefficient Variance	Average Growth Rate	
Original Profit or Loss	ACSM	-362.07	-1101.25	-712.98	-387.59	-678.68	-641.82	46.02	-792.20	-805.24	-1039.06	-647.49	339.99	-0.53	-174.25	
	AMCSM	-427.20	-209.25	-1108.70	-4522.83	-21.36	-57.99	27.18	286.46	-430.40	-523.72	-698.78	1397.41	-2.00	137.06	
	SCSM	-74.93	-516.49	-441.80	-57.80	14.72	-107.13	381.84	1073.10	254.19	98.89	62.46	449.11	7.19	-91.48	
	K1CSM	-665.82	-174.40	72.41	-344.49	-535.08	-599.25	227.29	569.21	78.30	-765.46	-213.73	441.46	-2.07	-194.72	
	DCSM	-229.37	-367.08	221.64	15.85	-178.01	-426.03	408.31	687.30	402.69	-27.46	50.79	369.10	7.27	-183.79	
	NCSM	-3526.75	0.00	0.00	-2171.95	-765.71	-937.25	-504.47	-152.97	-1133.57	-718.09	-991.08	1099.31	-1.11	38.42	
	VCSM	-365.43	-69.84	115.12	-50.74	-375.12	-513.11	-21.42	250.93	-256.79	-468.77	-175.52	258.04	-1.47	-136.32	
	TCSM	-362.16	-606.44	-373.57	-229.45	-464.65	-586.58	188.83	63.92	-228.10	-430.90	-302.91	260.56	-0.86	-47.68	
	CCSM	-295.68	-12.68	157.39	-265.87	-207.20	-557.03	65.35	-94.77	-9.30	-620.71	-184.05	257.37	-1.40	449.48	
	TTCSM	-291.86	56.17	-2826.14	-788.69	-933.61	-896.01	-376.81	-1852.24	-1033.24	-903.75	-984.62	825.59	-0.84	-502.25	
	NPKRCSM	-526.96	-890.06	-1474.27	-1301.44	-916.58	-1201.99	-502.65	-709.47	-2632.29	-2072.36	-1222.81	687.11	-0.56	31.61	
	MRKCSM	-68.18	113.10	285.27	12.26	-148.73	-486.56	104.17	449.14	-872.80	-915.39	-152.77	463.89	-3.04	-145.89	
	CYSM	5.41	116.77	267.73	161.84	-74.78	-162.24	182.54	938.06	41.08	-164.46	131.20	318.56	2.43	154.35	
	SSCSM	-175.57	-227.50	321.98	-34.38	11.47	-220.22	144.36	966.55	206.16	190.45	118.33	354.32	2.99	-219.63	
	K2CSM	-191.65	94.84	172.49	245.81	80.62	-118.98	238.54	795.13	194.70	207.51	171.90	264.82	1.54	-49.31	
Mean	-503.88	-252.94	-354.89	-647.97	-346.18	-500.81	40.61	165.21	-414.97	-543.55	-335.94	258.71	-0.77	-8.85		
Standard Deviation	854.90	376.46	875.15	1244.35	349.86	335.36	287.07	798.65	789.53	590.45	650.18	313.88	0.48	19.02		
Coefficient Variance	-1.70	-1.49	-2.47	-1.92	-1.01	-0.67	7.07	4.83	-1.90	-1.09	-0.03	3.24	-96.22	-151.63		
Revised Profit or Loss	ACSM	-270.45	-998.01	-586.03	-237.89	-532.69	-499.32	192.70	-570.44	-556.28	-791.26	-484.97	324.62	-0.67	-24.76	
	AMCSM	-325.85	-88.48	-778.04	-4160.67	153.07	-57.99	234.93	575.67	-103.53	-221.88	-477.28	1342.72	-2.81	65.10	
	SCSM	12.88	-406.81	-308.79	73.76	160.19	-107.13	536.25	1307.67	496.56	377.17	214.18	497.91	2.32	-404.11	
	K1CSM	-570.37	-77.32	187.43	-204.64	-398.44	-449.19	367.09	766.41	334.12	-509.22	-55.41	451.07	-8.14	-100.15	
	DCSM	-136.47	-259.29	339.85	136.60	-52.25	-291.46	541.11	859.52	620.56	203.00	196.12	391.71	2.00	-20.65	
	NCSM	-3434.21	0.00	0.00	-2031.47	-627.37	-788.65	-352.79	52.13	-891.02	-480.79	-855.42	1093.98	-1.28	-209.07	
	VCSM	-272.83	22.69	239.96	91.07	-241.67	-373.66	118.98	458.69	-26.88	-211.46	-19.51	259.28	-13.29	112.04	
	TCSM	-271.54	-506.28	-257.16	-94.32	-334.67	-449.46	327.32	264.73	-12.18	-200.09	-153.36	279.15	-1.82	148.65	
	CCSM	-205.75	83.65	275.45	-115.84	-71.80	-412.24	204.13	111.06	244.13	-368.41	-25.56	248.67	-9.73	-3.66	
	TTCSM	-193.77	158.44	-2661.45	-610.73	-786.15	-739.83	-224.61	-1582.24	-766.53	-633.59	-804.05	800.16	-1.00	-152.30	
	NPKRCSM	-430.99	-788.47	-1360.64	-1163.81	-779.04	-1043.98	-344.94	-513.38	-2354.50	-1800.22	-1058.00	639.74	-0.60	41.77	
	MRKCSM	22.90	214.15	396.13	154.50	-14.26	-337.25	259.18	666.51	-588.80	-638.15	13.49	422.25	31.30	271.29	
	CYSM	100.11	208.52	404.30	306.08	66.42	-29.15	324.58	1162.65	301.93	102.17	294.76	334.29	1.13	-95.12	
	SSCSM	-85.97	-118.84	442.33	95.67	140.33	-88.17	276.68	1137.47	426.83	425.88	265.22	377.76	1.42	-83.16	
	K2CSM	-99.81	194.61	287.15	381.14	210.96	-4.23	373.08	983.06	428.63	443.70	319.83	295.02	0.92	-920.30	
Mean	-410.81	-157.43	-225.30	-492.04	-207.16	-378.11	188.91	378.63	-163.13	-286.88	-175.33	269.33	-1.54	-3.12		
Standard Deviation	854.71	370.59	852.14	1194.01	349.85	304.67	282.50	786.55	777.07	583.92	635.60	305.19	0.48	18.37		
Coefficient Variance	-2.08	-2.35	-3.78	-2.43	-1.69	-0.81	1.50	2.08	-4.76	-2.04	-1.64	2.11	-1.29	-69.76		

Source: Secondary Data

From Table 6.12, it is noted that the average profit or loss of sugar for before changing present policy is Rs -335.94 per quintal of Sugar and after adopting the new cost price policy is Rs-175.33 per quintal of Sugar. The average profit or loss in before adopting new cost price policy is less than Rs -160.61 per quintal of Sugar compared with the adopting to the new cost price policy.

The Co-efficiency Variance of before change in present policy is -0.77 per cent and after adopting the new cost price policy is -1.54 per cent. The average Growth Rate for before change present policy is -8.85 per cent. Average Growth Rate after adopting the new cost price policy is -3.12 Salem CSM, Dharmapuri CSM, Cheyyar CSM, S.Siva CSM, K2 CSM have earned average profit for before change in present policy for the study period .If New cost price

policy is adopted all the Co-operative mills have earned profit during the entire study period. Year wise average profit or loss for both stages is presented in chart.10

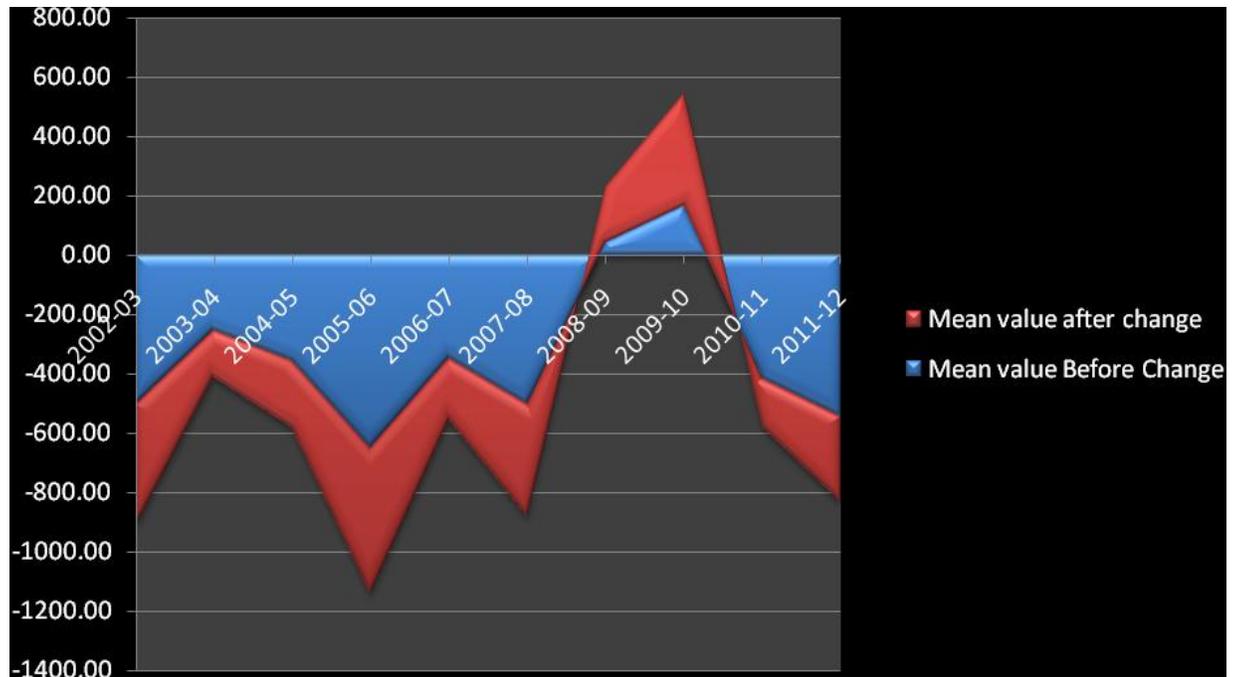


Chart .10 Year wise average profit or loss for both stages

From Chart 10, it is known, that in all the years during the study period, the average profit or loss after adopting new cost price policy is higher than the before adopting new cost price policy. Except in the years 2008-09 and 2009-10, in all the remaining years during the study period, it has shown only loss.

In order to see, whether there exist significant differences between before change of cost price policy and after the change of cost price policy, as well as between the years, during the study period, the following hypothesis was framed and tested. And Test of ANOVA for Profit or loss is shown in Table 6.13

Ho: There is no significant difference in the average of profit or loss between the before adopting new cost price policy and the after adopting new cost price policy and between years.

TABLE 6.13**ANOVA for Statement of Profit or Loss -before and after adopting cost of production for by-product**

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Rows	60189537.68	29	2075501.299	6.61616483	2.03E-18	1.511076931
Columns	18587156.55	9	2065239.616	6.58345322	1.81E-08	1.915855196
Error	81876109.92	261	313701.5706			
Total	160652804.2	299				

Source: Secondary Data

From the ANOVA Table 6.13, it is articulated that there is difference between the two stages, the calculated F-ratio value is 6.61616, which is higher than the table value of 1.51107, at one per cent level of significance and also calculated F-ratio is higher than p-value of 2.03. Between years, the calculated F-ratio value is 6.58345, which is higher than the table value of 1.915855, at one per cent level of significance and also calculated F-ratio is higher than p-value of 1.81. Since the calculated values are higher than the table values of both between groups and between years, it can be inferred, that there exists significant difference in the operating profit or loss between the before adopting new cost price policy and the after adopting new cost price policy, as well as between years. Hence, the hypothesis is rejected.

6.4. BY-PRODUCT COST IN SECOND METHOD

In this second type method of calculation, instead of split up over all variable cost, stage by stage calculation is made to find out this by-product cost. **Out of fifteen Co-operative Sugar Mills K1CSM's cost is taken into the study as sample and then overall analysis is made.** In this study, per day for Raw material cost as per Sugar cane price announced by Tamil Nadu Government for 2011-12 season's , Lubrication Expenses, Chemical Expenses, Direct labour Cost, Power Charges and Interest on working Capital are added and then calculated the by-product cost at split off point, balance carry forward cost according to the industry norms of sugar.

6.4.1 Cost of Bagasse at Split off point in First Stage in Second Method

In this Second Type Method under First stage in every Co-operative Sugar Mills ,over all 30% bagasse is left in Mill house from the Sugar cane, out of these 30% bagasse segregations, 27 % bagasse is used as captive consumption for power production and balance

3% only is saved to sell outsiders or used for other purposes. According to this Industries norms the total cost segregated into 3% for Bagasse cost and balance 97% for Raw juice cost, which is carry forwarded next (Second) stage. All the sugar mills are generated power from this 27% of Captive consumption of bagasse and used for their processing Activities .Hence Power charges are taken into this study as 0. In Table 6.14 Raw material cost, Lubrication Expenses, Direct labour Cost, interest on working Capital, Bagasse cost at split off point and balance of Raw juice cost are exhibited.

TABLE 6.14

Statement for Cost of Bagasse at Split off point in First Stage

S.No	Particulars			Total cost Rs.
	I Stage Cost of Production			
1	Raw Material Cost(including FRP price for 2011-12 Season)			5381250.00
2	Lubrication Expenses			16428.57
3	Direct Labour Cost			52816.48
4	Power Charges			0
5	Interst on W.C 13%			1941.27
6	Subtotal			5452436.32
7	Bagasse Cost at split of point	3.0%	163573.09	
	Per M T Cost		100	1635.73
8	Raw Juice Cost (Balance cost carry forward next process)	97.0%	5288863.23	5288863.23

Source: Secondary Data

Note: In this Split off point as per Industrial norms 30% bagasse and 70% juice are segregated. Out of 30% Bagasse 27% bagasse is used for Captive Consumption balance 3% bagasse only is saved to sell outsiders. Their Costs are also calculated accordingly.

From Table 6.14, It is expressed that that Lubrication Expenses Rs 16428.57, Direct Labour cost Rs 52816.48, Power Charges Rs.0.00 and Interest on working capital Rs 1941.27 are added with the Raw Material Rs 5381250/- (including FRP for 2011-12 season} and then calculated at split off point cost in this first stage for Bagasse Rs. 163573.09 (3% of 5452436.32) and Balance Raw Juice Cost Rs.5288863.23 (97% of 5452436.32) (which is carry forwarded to next process) and finally per MT of Bagasse cost at split off point is calculated which is Rs 1635.73. But in actual selling price was very lowest of Rs.435/- per MT of Bagasse

during 2007-08 and very highest of Rs 1483/- per MT of Bagasse during 2010-11 and also beginning of the study period is Rs 683/- per MT of Bagasse and end of the study period is Rs 1034/- per MT of Bagasse which are less than cost price particularly 36.79 percent less than cost price during 2011-12..

6.4.2. Cost of Press mud at Split off point in Second Stage

In this Second Type Method under second stage 2.5% Press mud are saved to sell outsiders. According to this Industry norms the total cost segregated into 2.58%(2.5% of 97%)for Press Mud cost and balance 97.5% for Clear juice cost which is carry forwarded next (Third) stage. Raw Juice Cost (Balance Processing cost brought forwarded from the first stage), Chemical consumption, Direct labour Cost, interest on working Capital, Press Mud cost at split off point and balance of Clear juice cost are given in Table 6.15.

TABLE 6.15

Statement for Cost of Press mud at Split off point in Second Stage

S.No	Particulars				Total cost Rs.
	II Stage Cost of Production				
1	Raw Juice Cost(Balance processing cost brought forward from first)				5288863.233
2	Chemicals				87705.16
3	Direct Labour Cost				65428.73239
4	Power Charges				0
5	Interst on W.C 13%				54.54
6	Subtotal				5442051.67
7	Press Mud Cost (at split off po	2.5%	2.58%	140259.06	
	Per M T Cost		100	1402.59	
8	Clear Juice Cost(Balance cost carry forward next process)	97.5%		5301792.60	5301792.60

Source: Secondary Data

Note: In this Split-off point as per Industrial norms 2.50 % of Mud (Press Mud or Filter Cake) arise, balance clear juice is separated. Their Cost is also calculated accordingly.

From Table 6.15, It is understood that chemical cost Rs 87705,16, Direct Labour cost Rs 65428.73, Power Charges Rs.0.00 and Interest on working capital Rs 54.54 are added with

the Raw Juice Cost Rs 5288863.23 (balance processing cost brought forwarded from the first stage) and then calculated at split off point cost in this second stage for Press Mud Rs.140259.06 (2.58% of 5442051.67) and balance Clear juice Cost Rs.5301792.60(which is carry forwarded to next process) and finally per MT of Press Mud cost at split off point is calculated which is Rs 1402.59.

Note: At present, which is practically not possible.

6.4.3 Cost of Final molasses at Split off point in Third Stage

In this Second Type Method under third stage, 4.5% final molasses are segregated to sell outsiders. In Table 6.16 Balance carry forwarded cost of Clear Juice from the second stage, Direct labour Cost, Interest on working Capital, Final Molasses cost, Balance cost of Sugar (Main product) are indicated.

TABLE 6.16

Statement for Cost of Final molasses at Split off point in Third Stage

S.No	Particulars				Total cost Rs.
	III Stage Cost of Production				
1	Clear Juice Cost(Balance processing cost brought forward from second Stage)				5301792.60
2	Direct Labour Cost				47560.56338
3	Power Charges				0
4	Interst on W.C 13%				16.94
5	Subtotal				5349370.11
6	Final Molasses Cost (at split off)	4.5%	4.62%	246894.00	
	Per M T Cost		112.5	2194.61	
7	Balance Cost of Sugar ((which is main product) carry forward next)	95.5%		5102476.10	5102476.10

Source: Secondary Data

Note: In this Split off point as per over all Industrial norms is 4.50 % final molasses, balance sugar 95.50% are segregated. Their Cost is also calculated accordingly.

From Table 6.16 it is explained that Direct Labour cost Rs 47560.56, Power Charges Rs.0.00 and Interest on working capital Rs 16.94 are added with the Clear Juice Cost of Rs.5301792.60 (balance processing cost brought forwarded from the second stage) and then calculated at split off point cost in this second stage for Final Molasses Rs.246894/- (4.62% of

5349370.11) and Balance cost of Sugar Rs . 5102476.10 (which is carry forwarded to next process) and finally per MT of Final Molasses cost at split off point cost is calculated which is Rs 2194.61. But in actual very lowest selling price of Rs.330/- per Mt of Molasses during 2009-10 and very highest of Rs 2654/- per MT of Molasses during 2010-11 and also beginning of the study period is Rs 802/- per MT of molasses and end of the study period is Rs 1543/- per MT of Molasses which are less than cost price particularly 29.69 percent less than cost price during 2011-12.

6.4.4 Cost of Final molasses at Split off point combined in Second and Third Stage

Suppose the press mud has no commercial value in the split off point at second stage, skip the second stage and only two stages (first and third stages) instead of second stage directly to final molasses stage calculated. In this stage 4.5 % final molasses are arrived to sell outsider.

In Table 6.17 Balance carry forwarded cost of Raw Juice from the second stage, Chemical expenses, Direct labour Cost, Interest on working Capital, Final Molasses cost, Balance cost of Sugar (Main product) are displayed.

TABLE 6.17

Statement for Cost of Final Molasses at Split off point combined Second and Third Stage

S.No	Particulars				Total cost Rs.
	II Stage Cost of Production				
1	Raw Juice Cost(Balance processing cost brought forward from first)				5288863.23
2	Chemicals				87705.16
3	Direct Labour Cost				112989.2958
4	Power Charges				0
5	Interst on W.C 13%				71.48
6	Subtotal				5489629.17
7	Final Molasses Cost (at split o	4.5%	4.64%	254673.52	
	Per M T Cost		112.5	2263.76	
8	Balance Cost of Sugar ((which is main product) carry forward next)	95.5%		5234955.65	5234955.65

Source: Secondary Data

From Table 6.17, it is stated that chemical cost Rs 87705,16, Direct Labour cost Rs 112989.30, Power Charges Rs.0.00 and Interest on working capital Rs 71.48 are added with the Raw Juice Cost Rs 5288863.23 (balance processing cost brought forwarded from the first

stage) and then calculated at split off point cost the in this second stage for Final Molasses Rs.254673.52(4.5% of 548629.17) and Balance cost of Sugar Rs.5234955.65(which is carry forwarded to next process} and finally per MT of Final Molasses at split off point cost is calculated which is Rs 2263.76. But in actual very lowest selling price of Rs.330/- per Mt of Molasses during 2009-10 and very highest of Rs 2654/- per MT of Molasses during 2010-11 and also beginning of the study period Rs 802/- per MT of molasses and end of the study period is Rs 1543/- per MT of Molasses which are less than cost price particularly 31.84 percent less than cost price during 2011-12.

From the above said second type method of calculation for cost of by-product of all the co-operative sugar mills are computed and submitted in TABLE 6.18

TABLE 6.18
Statement of Mill wise unit Cost of by-product

Statement of Cost of By-Product for the Year ended 31st March 2012					
Name of the Mill	Daily Rate of Crushing Capacity	Cost of Production for Bagasse (Ist Stage)	Cost of Production for Press Mud (IInd Stage)	Cost of Production for Final Molasses (IIIrd Stage)	Cost of Production for Final Molasses (Combined IInd & IIIrd stages)
Chengalrayan CSM	3000TCD	1642.72	1405.10	2197.56	2266.83
K1 CSM	2500 TCD	1635.73	1402.59	2194.61	2263.76
MRK CSM	2500 TCD	1640.73	1407.59	2199.61	2268.76
S.Siva CSM	2500 TCD	1633.73	1400.59	2192.61	2261.76
CheyaruCSM	2500 TCD	1636.73	1403.59	2195.61	2264.76
K2 CSM	2500 TCD	1653.58	1412.79	2204.70	2287.57
Salem CSM	2500 TCD	1648.58	1407.79	2199.70	2282.57
National CSM	2500 TCD	1712.89	1460.14	2280.46	2320.03
NPKRR CSM	2500 TCD	1724.89	1472.14	2292.46	2332.03
Tirthani CSM	2500 TCD	1730.89	1478.14	2298.46	2338.03
Vellore CSM	2500 TCD	1723.89	1471.14	2291.46	2331.03
DharmapuriCSM	2000TCD	1712.89	1460.14	2280.46	2320.03
Ambur CSM	1400TCD	1644.09	1392.69	2159.74	2228.30
Amaravathi CSM	1250TCD	1696.62	1436.46	2227.62	2298.34
Tirupathur CSM	1250TCD	1698.62	1438.46	2229.62	2300.34

Source: Secondary Data

It is understood that Mill wise Cost of production for Bagasse (Ist stage) in third column, Cost of production for Press Mud IInd stage in fourth column, Cost of production for final Molasses IIIrd Stage in fifth column and Cost of production for final Molasses combined IInd and IIIrd Stage in sixth column from Table 6.18 . Based on Table 6.18 Descriptive Statistical analysis is done and submitted the result in TABLE 6.19

TABLE 6.19**Statement of Descriptive Statics for by-product of Sugar**

Cost of Production for Bagasse (Ist Stage)		Cost of Production for Press Mud (IInd Stage)		Cost of Production for Final Molasses (IIIrd Stage)		Cost of Production for Final Molasses (Combined IInd & IIIrd stages)	
Selling Price	1034	Selling Price	0	Selling Price	1543	Selling Price	1543
Mean	1675.77	Mean	1429.96	Mean	2229.65	Mean	2290.94
Standard Error	9.98	Standard Error	7.97	Standard Error	11.91	Standard Error	8.37
Median	1653.58	Median	1412.79	Median	2204.70	Median	2287.57
Mode	1712.89	Mode	1460.14	Mode	2280.46	Mode	2320.03
Standard Deviation	38.66	Standard Deviation	30.86	Standard Deviation	46.11	Standard Deviation	32.40
Sample Variance	1494.77	Sample Variance	952.47	Sample Variance	2126.12	Sample Variance	1050.08
Kurtosis	-1.94	Kurtosis	-1.62	Kurtosis	-1.40	Kurtosis	-0.83
Skewness	0.26	Skewness	0.43	Skewness	0.42	Skewness	-0.11
Range	97.16	Range	85.45	Range	138.72	Range	109.73
Minimum	1633.73	Minimum	1392.69	Minimum	2159.74	Minimum	2228.30
Maximum	1730.89	Maximum	1478.14	Maximum	2298.46	Maximum	2338.03
Sum	25136.57	Sum	21449.36	Sum	33444.68	Sum	34364.14
Count	15.00	Count	15.00	Count	15.00	Count	15.00
Largest(1)	1730.89	Largest(1)	1478.14	Largest(1)	2298.46	Largest(1)	2338.03
Smallest(1)	1633.73	Smallest(1)	1392.69	Smallest(1)	2159.74	Smallest(1)	2228.30
Confidence Level(95.0%)	21.41	Confidence Level(95.0%)	17.09	Confidence Level(95.0%)	25.53	Confidence Level(95.0%)	17.95

Source: Secondary Data

From Table 6.19 It is interpreted for the First Stage that the cost of by-product goes up to a Maximum of Rs. 1730.89, a Minimum of Rs. 1633.73, the Range of Rs.97.16 ,the Median of Rs. 1653.58, the Mode of Rs.1712.89 and Average unit Cost of production of Rs.1657.77 and Standard Deviation of 38.66. But the actual selling price for the same in that year is Rs.1034/- which is less than Rs 623.77 from the mean. Kurtosis is a measure of whether the data are peaked or flat relative to a normal distribution. In this Calculation Kutosis is negative value (-)1.94 Data sets with low kurtosis tend to have a flat top near the mean rather than a sharp peak. And also Skewness is positive value 0,26 and this positive values for the skewness indicate data that are skewed right., which right means that the right tail is long relative to the left tail . Overall selling price of Bagasse is 62.33% of Cost of production which affect profit or loss account of these Co-operative Sugar Mills Hence It is advised to fix he selling price of Bagasse is not less than Cost of production .

From Table 6.19 It is interpreted for the Second Stage that the cost of by-product goes up to a Maximum of Rs. 1478.14, a Minimum of Rs. 1392.69, the Range of Rs.85.45 ,the Median of Rs. 1412.79, the Mode of Rs.1460.14 and Average unit Cost of production of Rs.1429.96 and Standard Deviation of 30.86. But the actual selling price for the same in that year is Rs.0 which is less than Rs1429 96 from the mean. Kurtosis is a measure of whether the data are peaked or flat relative to a normal distribution. In this Calculation Kurtosis is negative value (-)1.62. Data sets with low kurtosis tend to have a flat top near the mean rather than a sharp peak. And also Skewness is positive value 0.43 and this positive values for the skewness indicate data that are skewed right., which right means that the right tail is long relative to the left tail . Overall selling price of Press Mud is 0 of Cost of production which affect profit or loss account of these Co-operative Sugar Mills Hence It is advised to fix he selling price of Press Mud is not less than Cost of production (In Actual Which is not Practical).

From Table 6.19 It is interpreted for the Third Stage that the cost of by-product goes up to a Maximum of Rs. 2298.46, a Minimum of Rs. 2159.74, the Range of Rs.138.72 ,the Median of Rs. 2204.70, the Mode of Rs.2280.46 and Average unit Cost of production of Rs.2229.65 and Standard Deviation of 46.1. But the actual selling price for the same in that year is Rs.1543/- which is less than Rs 686.65 from the mean. Kurtosis is a measure of whether the data are peaked or flat relative to a normal distribution. In this Calculation Kurtosis is negative value (-)1.40 Data sets with low kurtosis tend to have a flat top near the mean rather than a sharp peak. And also Skewness is positive value 0.42 and this positive values for the skewness indicate data that are skewed right., which right means that the right tail is long relative to the left tail . Overall selling price of Molasses is 69.29% of Cost of production which affect profit or loss account of these Cooperative Sugar Mills Hence It is advised to fix he selling price of Molasses is not less than Cost of production .

From Table 6.19 It is extracted for combined Second and Third Stage that the cost of production goes up to a Maximum of Rs. 2338.03, a Minimum of Rs. 2228.30, the Range of Rs.109.73 ,the Median of Rs. 2287.57,the Mode of Rs.2320.03 and Average unit Cost of production for Rs.2290.94 and Standard Deviation of 32.40. But the actual selling price for the same in that year is Rs.1543/- which is less than Rs 747.94 from the mean. Kurtosis is a measure of whether the data are peaked or flat relative to a normal distribution. In this Calculation Kurtosis is negative value (-)0.83 Data sets with low kurtosis tend to have a flat top near the mean rather than a sharp peak. And also Skewness is negative value (-)0,11 and this Negative values for the skewness indicate data that are skewed left, which right means that

the left tail is long relative to the right tail. Overall selling price of Bagasse is 67.35% of Cost of production which also affect profit or loss account of this Cooperative Sugar Mills. Hence it is advised to fix the selling price of Bagasse is not less than Cost of production .

6.5. SUMMARY

In this study of first part, every year by-product cost is calculated only from variable cost according to the industrial norms and then calculated change in cost of production, their percentage and average cost for these by-products is arrived and finally if cost price is taken as selling of these by-product whether significance in overall cost of main product and profit or loss. In the second part of the study Kallkurichi 1 Cooperative Sugar Mills is taken as Model to determined the Cost of by-product .In the by-product cost is calculated in three stages. In the first stage, cost of production for Bagasse is calculated. In the second stage cost of production for mud (press mud or filter cake) is calculated and in the third and final stage cost production for final molasses is calculated. Suppose the mud (press mud or filter cake) has no commercial value the second stage is skipped and instead of the second stage directly into the third and final stage, cost production for final molasses is calculated. And finally from this second type method of cost of by product all the Cooperative Sugar mills are computed and analyzed with Descriptive Statics .