COST PRICE ANALYSIS IN SUGARCANE : A STUDY IN TAMIL NADU, SOUTHERN INDIA

J.P.Singh and K.H. Vedini***

Introduction

Indian sugar industry has a unique, intrinsic and symbolic relationship with the livelihood of the rural masses and contributes around 2 per cent to the national gross domestic product. It employs over 40 million cane growers and their families, constituting 7 per cent of the rural population and about 3.5 lakh skilled and unskilled labourers. As a raw material, sugarcane is transported from farms to sugar mills and hence the service sector like transportation is getting developed in addition to rural road development. Sugarcane is the basic raw material for gur making, and gur making is one of the important cottage industries that provides employment to the rural folk, particularly in harvesting, transporting by head load to crushing unit from the field, crushing and gur preparation. Thus, the sugar industry as a whole helps in uplifting the lives of the rural masses. Being the second largest agro-based industry, only next to cotton, it plays a dominant role in promoting the development of both agricultural and industrial economies of the country.

To keep producing any agricultural product, including sugarcane, there must be demand for the product, there must be a well developed marketing system and the farmers inturn must have confidence in the marketing system.

The growth rates in productivity in three southern states Tamil Nadu, Karnataka and Andhra Pradesh are also quite encouraging. Inspite of these positive trends, farmers are agitated due to late issuance of cutting orders by the sugar mills, high transportation costs, high harvesting costs and low profit margin in supplying cane to the sugar mills. Performance of these sugar mills is also not quite encouraging particularly in effecting prompt payment to the cane growers.

* *Director, National Institute of Agricultural Extension Management (MANAGE), Rajendranagar, Hyderabad-30*

** *Programme Officer National Institute of Agricultural Extension Management (MANAGE), Rajendranagar, Hyderabad-30*

In the present, an attempt has been made to analyze the time series of price analysis in sugarcane in Tamil Nadu state.

Objectives

The specific objectives set up for this study are as follows :

(i) Estimate the cost of production and study its relation with prices,

(ii) Analyze the time series data on market arrivals and prices of gur and Khandasari sugar in the selected markets of southern India,

Cost-price relationship in sugarcane

To keep farm business going, the farmer must get a reasonable profit in his business in raising the crop. Hence, he must get a price for his produce, that must cover not only the cost of production but also ensure a reasonable profit. Therefore, in this chapter the first–section deals with the cost of producing sugarcane and the second section deals with the cost-price relationship.

Cost of production of sugarcane

Each and every cultivation operation involves cost. Therefore, the details on the same in cultivating sugarcane is analysed and the results are presented in Table 1, below.

Table 1: Operation-wise Average Cost of Cultivation of Sugarcane in Sample Farms

Sl.No	Operation	Planted Crop		Ratoon Crop	
		Rupees per/ha	% total	Rupees per/ha	% total
1.	Preparatory cultivation	37000	7.14	750	1.95
2.	Seeds and sowing	11375	21.96	500	1.30
3.	Manures & Manuring	2925	5.65	1250	3.25
4.	Fertilizer & applications	6800	13.13	7850	20.40
5.	After cultivation	7250	14.00	7750	20.13
6.	Plant protection	1375	1.93	1650	4.28
7.	Irrigation	3750	7.24	3750	9.75
8.	Harvesting	15000	28.96	15000	38.95
	Total	52175	100.00	38500	100

From the table above, it can be seen that the total cost works out to Rs.52175 per hectare. Among the operations, harvesting alone accounts for 28.95 percent of the total operational cost, followed by seeds and sowing with 21.96 percent, after-cultivation with 14.00 percent, fertilizers and application with 13.13 percent etc and the least share was for sowing and plant protection with 1.93 percent.

In order to have an in depth analysis of the total cost, operational costs and fixed costs were also worked and the results are given in table 2.

Table 2 : Operational, Fixed and Total cost of cultivation of Sugarcane in Sample Farms

Sl.No	Costs	Rupees per/ha	% to total
1.	Operational cost		
2.	Value of setts	8750	12.40
2.	Value of human labour	29875	42.34
3.	Value of animal power	750	1.06
4.	Value of machine power	3875	5.49
5.	Value of workers	1875	2.66
6.	Value of fertilizers	5925	8.40
7.	Value of plant protection chemials	1125	1.59
8.	Irrigation (electricity*) change	-	-
	Total	52175	73.94
9.	Interest on (1 to 8) working capital	5218	7.39
	Total Variable cost	57393	81.33
10.	Rent/equipment for land	10000	14.17
11.	Depreciation on farm assets	1300	1.84
12.	Interest on fixed capital	1625	2.30
13.	Land revenue & other tasses	250	0.35
	Total fixed costs (B)	13175	18.67
	Total cost of cultivation	70568	10.00

* Free electricity for agriculture in Tamil Nadu State

It can be noted from the table above, that the total cost included, variable costs and fixed costs, and it works out to Rs. 70568 per ha. The variable cost was Rs.57393 accounting for 81.33 percent of the total cost, while the fixed cost worked out to Rs.13,175 accounting for 18.67 percent in the total cost. Among the inputs, human labour alone accounts for 42.34 percent, followed by seeds (setts) with 12.40 percent, fertilizers with 8.40 percent and the least percentage of 1.06 is for animal power.

Table3 : Operational cost, Fixed cost and Total cost of Cultivation of Ratoon Sugarcane Crop

Sl.No.	Costs	Rupees per ha	% Total
1.	Operation wise total cost	38500	69.34
2.	Interest on operation cost (on item 1) @ 10%	3850	6.93
3.	Total operational cost (1+2)	42350	76.27
4.	Total fixed cost	13175	23.73
	Total cost of production / cultivation per Ha	55525	100.00

As can be noted from the table, the total cost of production per hectare of ratoon crops works out to Rs.55525. In comparison with that of sugarcane planted crop, the total cost of cultivation for ratoon crop is considerably lower.

Gross Return

Returns from sugarcane is important because sugarcane is a commercial crop, that is grown by the farmers for the high profit it fetches. Therefore, an attempt has been made to work out the gross return and net profit per hectare of sugarcane. The results are given in the Table 4 below :

Table 4 :Average Gross Income, Net Income per Hectareof Sugarcane in Sample Farms

Sl.	Particulars	Rupees	
No.		Planted Crop	Ratoon Crop
1.	Gross return/ hectare 100 tonnes of cane @ Rs. 770 per tonne	77,000	77,000
2.	Direct / operational cost per hectare	52176	42350
3.	Net income while operational cost alone is considered of (1-2)	24825	34650
4.	Total cost of production per hectare	70568	55525
5.	Profit per hectare (1-4)	6432	21475
6	Price of one tonne of cane	770	770
7.	Cost production per quintal	706	555
	Profit / tonne of cane	64	215

From the table above, it can be seen that the gross income per hectare of cane works out to Rs.77,000 while operational cost was Rs.52176, and the net profit per hectare works out to Rs.24825. On the other hand when total cost of production of Rs.70568 is considered, the net profit per hectare is Rs.6432.

When compared with that of the main crop, the net income and profit per hectare in ratoon crop were markedly higher. Similarly the cost of production per tonne of ratoon sugarcane crop was Rs.555, while it was Rs.706 in planted crop. Above the cost and return analysis of sugarcane planted vs ratoon crop showed that the latter yielded more net-returns to the farmers due to less cost involved in ratoon crop.

Cost-price relationship

The cost of production works out to Rs.706 per tonne and the price received is Rs.770, leaving a net profit of Rs.64 per tonne, which works out to 9.07 percent. The benefit-cost ratio is also 1.091 ie., for every rupee spent on sugarcane production there will be a profit of just nine paise (ie., 9 percent).

Table 5: The Cost price - Relationship in Sugarcane Cultivation for the Period 1981-2000

Sl.No.	Year	Cost of production price in Rs/qtl	Procurement price Rs/qtl	Percent of profit in procurement price
1.	1981	10.60	13.00	18.461
2.	1982	11.40	13.00	12.31
3.	1983	10.60	13.50	21.46
4.	1984	14.00	14.00	-
5.	1985	15.10	16.50	8.48
6.	1986	13.40	17.00	21.18
7.	1987	15.00	18.50	18.92
8.	1988	15.30	19.50	21.54
9.	1989	16.20	23.00	29.57
10.	1990	16.60	23.00	27.83
11.	1991	24.40	26.00	6.15
12.	1992	30.90	31.00	0.32
13.	1993	31.70	45.00	29.56
14.	1994	33.60	52.50	36.00
15.	1995	34.60	56.00	40.25
16.	1996	34.50	59.90	42.40
17.	1997	50.00	60.00	16.67
18.	1998	57.50	68.80	16.42
19.	1999	-	-	-
20.	2000	77.00	77.00	9.09

Such a low profit (9 percent) in cultivating sugarcane is not encouraging the farmer in continuing the crop in the farm business. Compared to this, the profit in industrial activities is more than 20 percent. Even this nine percent margin is subject to high risk due to the vagaries of monsoons and attack of diseases like rust and red-rot. Probably these might be the reasons why farmers demand higher price for their cane supplied to the sugar factories.

An attempt was also made to compare the cost with prices and the margin obtained over a period of time. The results are presented in Table 5.

It can be inferred from the table above, that during the 20 years period considered, the profit was zero in 1984 and 0.32 per cent in 1992 and it was the maximum at 42.40 percent in 1996. Thus, the profitability was highly varying, and it was a measure of risk in sugarcane cultivation. In the most recent years (after 1997), the profit was less than 20 percent. These results again reinforce the claim of farmers for remunerative prices to sugarcane.

Time series price analysis in sugarcane

To understand and analyse the nature of inter-temporal behaviour in prices, time series data on prices are necessary. An annual or yearly price observation has three components:

Trend (T), cyclical (C) and irregular (I)

ie., $P_t = T+C+I$ (additive model)

$$P_t = T \times C \times I \text{ (multiplicative model)}$$

Where P_t is an observation on price for period t. the method of separating the effect of each component is also termed as decomposition of time series.

Trend or secular price movements

The tendency of prices to move up or down over a long period of time (in excess of 10 years) is termed as trend or secular price movement. A trend in prices is usually established on the basis of at least 10 to 15 years' data. The trend is not concerned with the movement in prices from one year to another, but for a large number of years, say 10 or more.

Cyclical fluctuations

A cycle is defined as a regularly occurring phenomenon. When this phenomenon occurs in movement of prices, it is termed as a price cycle i.e., cyclical fluctuations refer to the swings around a trend line. Regularly occurring upswings and downswings or oscillations in prices are termed as cyclical fluctuations in prices.

Irregular price fluctuations

Irregular and episodic price movements represent that part of the behaviour of prices which is not systematic. A particular price movement may not recur in the future.

No generalization can be made about such price fluctuations because of the diversity in their nature and irregularity of the cause and effect relationships in their occurrences. They may be of shorter or longer duration.

Table 6 :Time Series Analysis – Prices of Sugarcane Jaggery Powder in Kavundappadi Regulated Market.

Sl. No.	Year	Price (Rs/Q+1)	Trend	C+I (2-3)	C (1:@:wt. MA of 4)	I (4-5)
1	1978-79	109	73.25	35.75	-	-
2	1979-80	198	113.01	84.99	354	-269
3	1980-81	301	152.77	148.23	401	-252.7
4	1981-82	212	192.53	19.47	103	-83.41
5	1982-83	148	232.29	-84.29	-132	47.87
6.	1983-84	289	272.05	16.95	-64	81.15
7	1984-85	298	311.81	-13.81	-83	69.43
8	1985-86	279	351.57	-72.57	-229	156.71
9	1986-87	321	391.33	-70.33	-245	174.99
10	1987-88	399	431.09	-32.09	-269	237.27
11	1988-89	336	470.85	-134.85	-350	215.55
12	1989-90	462	510.61	-48.61	-276	227.83
13	1990-91	506	550.37	-44.37	-299	255.11
14	1991-92	428	590.13	-162.13	-440	277.39
15	1992-93	559	629.89	-70.89	-49	-22.33
16	1993-94	925	669.65	255.35	454	-199.1
17	1994-95	724	709.41	14.59	150	-135.8
18	1995-96	615	749.17	-134.17	-146	11.51
19	1996-97	897	788.93	108.07	461	-353.2
20	1997-98	1208	828.69	379.31	856	-476.9
21	1998-99	858	868.45	-10.45	277	-287.7
22	1999-00	827	908.21	-81.21	-274	192.63
23	2000-01	847	947.97	-100.97	-	-

From Table 6, it can be seen that the prices have followed an upward trend over the years at the rate of Rs. 40/qtl for a year. The cyclical variations isolated would not reveal a definite pattern of cycle although implied the presence of cycles in the price movement. The irregular movement is also not small. (Fig 1)

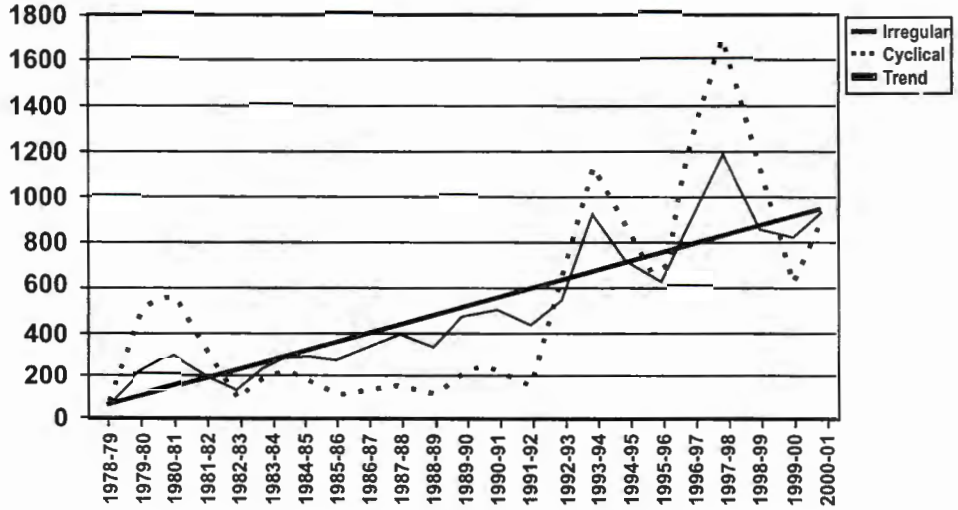

Fig.1 : Trend in Prices of Sugarcane Jaggery Power in Kavundappadi Regulated Market

Here, the trend pattern prevailed as the one in the jaggary regulated market. A definite upward trend to the tune of Rs.40/qtl per year could be seen in the price movements.

Table 7 : Jaggery Powder Price at Chithode Market

Year	Price (Rs/Q+1)	Trend	C+I	C	I
1990-91	470	532.64	-63	-	-
1991-92	440	575.78	-136	-403	267.34
1992-93	550	618.92	-69	-35.7	-33.24
1993-94	900	662.06	238	501.8	-263.82
1994-95	800	705.20	94.8	275.2	-180.4
1995-96	596	748.34	-152	-175	23.02
1996-97	826	791.48	34.5	226.1	-191.56
1997-98	1144	834.62	309	645.5	-336.14
1998-99	870	877.76	-7.8	171	-178.72
1999-00	798	920.90	-123	-380	256.7
2000-01	838	964.04	-126	-	-

The presence of cycles could be identified better if there are more number of years of data rather than 10 years. The irregular fluctuation was large here also.

Table 8 :Jaggery Wholesale Price in Tamil Nadu State

Sl.No	Year	Ws price (Rs 1 Q+1)	Trend	C +I	C	I
1.	1978-79	123.69	53.74	69.95	-	-
2.	1979-80	233.79	89.44	144.35	427.62	-199.98
3.	1980-81	194.11	125.14	68.97	268.95	-283.27
4.	1981-82	147.5	160.84	-13.34	-2.88	-199.98
5.	1982-83	151.37	196.54	-45.17	-70.45	-10.46
6.	1983-84	265.47	232.24	33.23	19.1	25.28
7.	1984-85	265.75	267.94	-2.19	-4.79	14.13
8.	1985-86	270.00	303.64	-33.64	-132.28	2.6
9.	1986-87	276.53	339.34	-62.81	-213.22	98.64
10.	1987-88	321.08	375.04	-53.96	-288.7	150.41
11.	1988-89	292.77	410.74	-117.97	-359.14	234.74
12.	1989-90	377.20	446.44	-69.24	-413.31	344.74
13.	1990-91	325.28	482.14	-156.86	-557.47	400.61
14.	1991-92	343.33	517.84	-174.51	-642.79	468.28
15.	1992-93	416.63	553.54	-136.91	-291.51	154.60
16.	1993-94	746.06	589.24	156.82	303.79	-146.97
17.	1994-95	752.00	624.94	127.06	539.30	-412.24
18.	1995-96	789	660.04	128.36	516.46	-338.1
19.	1996-97	829.02	696.34	132.68	-	-

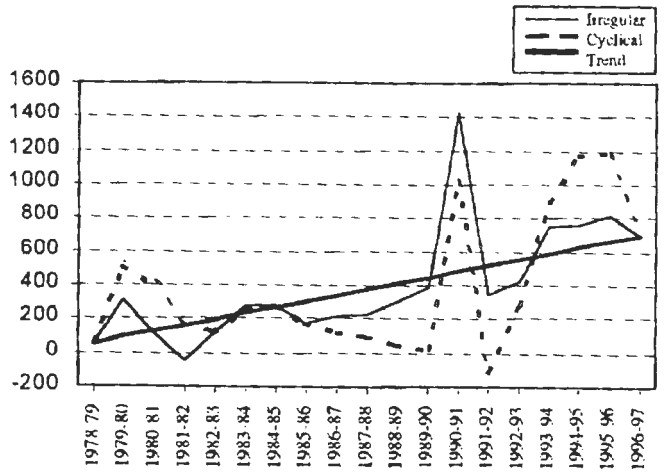

Fig –2 : Trend in jaggery wholesale prices in Tamil Nadu State

The jaggery whole sale price in Tamil nadu also showed an upward trend in their price movements over the years. An increase of Rs. 40 to 45 per year could be seen in the trend. It was not showing a clear cyclical pattern as to how many years of cycle prevailed in the price movement. The irregular component shows very wide variation among the years, revealing price risks in the jaggery wholesale market (Fig 2).

Table 9: Statutory Minimum Price for Sugarcane Announced by the Government of India

Year	SMP (Rs/ Q+1)	Trend	C+I	C	I
1978-79	10	3.22	6.78	-	-
1979.80	12.5	5.45	7.05	26.2	-19.15
1980-81	13	7.68	5.32	20.78	-15.46
1981-82	13	9.91	3.09	12.36	-9.27
182-83	13	12.14	0.86	3.94	-3.08
1983-84	13.5	14.37	-0.87	-3.94	-3.08
1984-85	14	16.60	-2.6	-8.40	5.80
1985-86	16.5	18.83	-2.33	-11.30	8.99
1986-87	17	21.06	-4.06	-15.20	11.18
1987-88	18.5	23.29	-4.79	-20.2	15.37
1988-89	19	25.52	-6.52	-23.6	17.06
1989-90	22	27.75	-5.75	-25	19.25
1990-91	23	29.98	-6.98	-25.9	18.94
1991-92	26	32.21	-6.21	-22.8	16.63
1992-93	31	34.44	-3.44	-15.3	11.82
1993-94	34.5	36.67	-2.17	-7.58-	5.41
1994-95	39.1	38.90	0.2	-0.40	0.60
1995-96	42.5	41.13	1.37	5.48	-4.11
1996-97	45.9	43.36	2.54	9.31	-6.77
1997-98	48.45	45.59	2.86	13.14	-10.28
1998-99	52.70	47.82	4.88	17.57	-12.69
1999-2000	55	50.05	4.95	20.50	-15.55
2000-2001	58	58.28	5.72	-	-

There existed trend in the SM price of sugarcane announced by the government. The price increased by about Rs.2/- per year over the period. The cyclical pattern showed the operation of cycles of about five to six years in the price movement over the years. The irregular variation ranged from (-) to (+) 19.25 and it

was small compared to trend (Fig 3). This result was expected because the SMP was policy determined and much analysis was involved in determining it.

Table 10 : Tamil Nadu State Advised Prices for Sugarcane

Year	SAP (Rs/Q+1)	Trend	C+I	C	I
1978-79	16	3.49	12.5	-	-
1979-80	17.5	6.80	10.7	40.3	-29.6
1980-81	16.5	10.11	6.39	25.6	-19.2
1981-82	15.5	13.42	2.08	9.32	-7.24
1982-83	15.5	16.73	-1.2	-4.42	3.19
1983-84	16	20.04	-4	-14.20	10.1
1984-85	18.5	23.35	-4.9	-20.90	16.1
1985-86	19.5	26.66	-7.2	-29.1	22
1986-87	20	29.97	-10	-33.2	23.2
1987-88	27.18	33.28	-6.1	-30.7	24.6
1988-89	28.06	36.59	-8.5	-28.9	20.4
1989-90	34.12	39.90	-5.8	-27.1	21.3
1990-91	36.25	43.21	-7	-28.9	21.9
1991-92	37.35	46.52	-9.2	-28.6	19.4
1992-93	46.58	49.83	-3.3	-13.2	9.97
1993-94	55.59	53.14	2.45	8.57	-6.12
1994-95	63.37	56.45	6.92	28.4	-21.5
1995-96	71.88	59.76	12.10	45.6	-33.5
1996-97	77.52	63.07	14.50	-	-

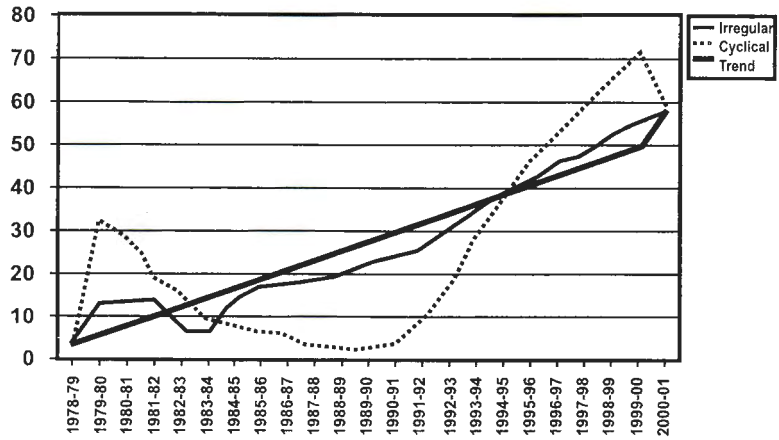

Fig .3 : Trend in statutory minimum price for sugarcane announced by the government of India

The Tamil Nadu state advised prices of sugarcane showed an upward trend of increase in prices over years of about Rs.3 each year. But in the cyclical pattern there was no definite number of years of cycle prevailing although changes in the prices could be seen. The irregular component showed some impact on the price movement.

Seasonal price index

The seasonal price index was worked out considering the 12 monthly prices for 25 years from 1976-77 to 2000-2001 for jaggery sugar. The results revealed that the indices during the months were ranging from a minimum of 93.24 in the month of February to a maximum of 95.52 in the month of May. On the other hand the price indices were ranging from the minimum of 101.32 in the month of June to the maximum of 106.68 in the month of October. Thus in general, the price indices were below 100 during the months of January through May and were above 100 during the months of June through December. This might be due to the coincidence of harvesting-processing-marketing season with the former months and the off-seasons with the latter months (Fig 4).

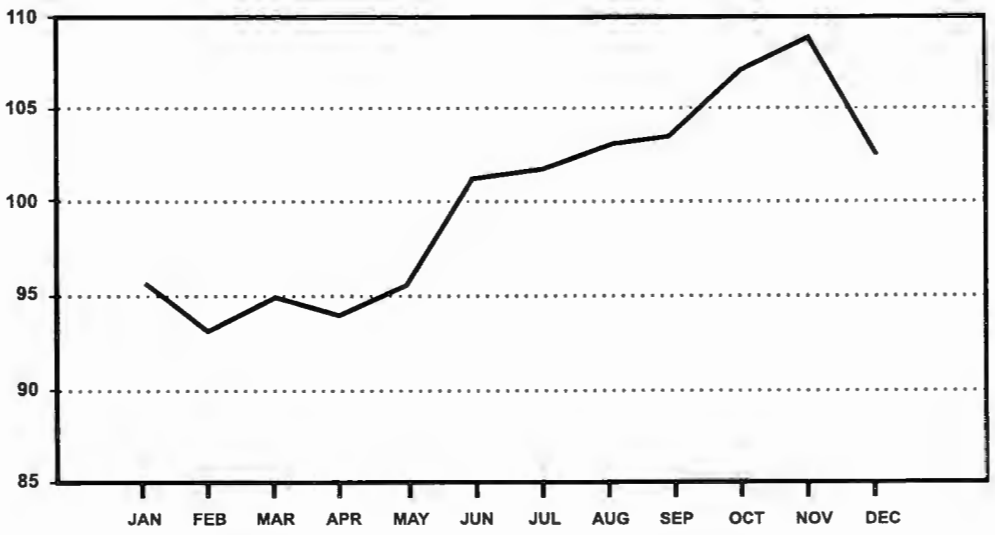

Fig.4 : Seasonal Index of jaggery powder prices.

Integration among spatially separated markets

The extent to which prices in spatially separated market move together or are related to transport costs reflects the degree of integration.

Price correlation; one of the indicators of pricing efficiency was the extent of the inter relationship in price movements between selected markets. Uma Lele defined the interrelationship between price movements in two markets as market integration. The degree of correlation between prices in various markets was taken as an index of the extent to which the two markets are integrated. A higher degree of the correlation coefficient indicates a greater degree of integration atleast in terms of pricing of the product between market centers and vice versa. Price correlation coefficient of 0.09 or more was a high degree of inter-market price relationship because, in such case 81percent or more variation in the prices in one market is associated with that in another market, and the remaining 19 percent variation may be assumed to stem from transportation, information and other bottlenecks.

So the two jaggery powder markets ie., the regulated market at Kavundappadi and the Chithodu market were highly integrated and had a high degree of inter-market price relationship with a correlation coefficient of 0.98.