

## CHAPTER IV

### DESIGN OF THE STUDY

In consonance with the objectives discussed in the first chapter, and the concepts defined in the next, the methodology for the study was finalised, regarding the selection of sample respondents, data collection, specification of the empirical models and analysis. This chapter presents a description of the methodology to the study, the economics of marketing of cane jaggery in North Arcot District. Market for Cane jaggery has all the major problems in marketing of semi-perishable farm products.

#### a. Choice of Markets:

Producers and consumers of jaggery were separated by long distances, and a chain of market functionaries facilitating the movement of jaggery between them. An efficient and non-exploitative marketing system can, therefore, augment the welfare of both producers and consumers. Over the years, there had come into existence in North Arcot District two well developed markets for jaggery at Vellore and Tirupattur. They were very important assembling markets, with trade channels extending to places outside Tamil Nadu. Jaggery produced in the Northern part of the district was marketed through Vellore market, and the jaggery produced in Southern part of the district was marketed through Tirupattur market. Therefore, Vellore and Tirupattur

assembling markets were purposively selected. It was from here, that market channels for jaggery both forward and backward were traced. The important trading centres in the states such as Madras city, Salem, Madurai, Coimbatore and Tirunelveli had trade links with these assembling markets. Outside Tamil Nadu, Ernakulam in Kerala, and Kolhapur in Maharashtra trade with Vellore and Tirupattur markets.

Therefore, the markets at Ernakulam, Kolhapur, Madras city, Coimbatore, Salem, Madurai and Tirunelveli, and the retail centres at Vellore and Tirupattur were also covered by the present study. In each of these centres, market functionaries were selected for the study, besides a sample of producers of jaggery in North Arcot District, to study supply response to price changes and cost price relationship for jaggery.

b. Selection of sample producers:

North Arcot District formed the universe for the study. Market channels began with the producers of jaggery (farms), who sold their produce in the assembling markets either directly by themselves, or through other agents. Therefore, the study began with a sample of farms. Multi-stage random sampling method was used to select the sample farms. There were 36 blocks (panchayat unions) in North Arcot District. At the first stage, all the blocks were

arranged in descending order of area under sugarcane crop in 1981-82, and 12 blocks from the top of the list were purposively selected to ensure sufficient number of sample farms in each of them. In the second stage, villages in each of the selected blocks were arranged in descending order of area under sugarcane, and the top two villages were selected in each block. The selected blocks and distribution of sample villages were indicated in Table: XIII and Map No. 3. In each sample village, five farmers growing sugarcane in 1982-83 were selected by simple replacement random sampling method. Thus there were 120 farmers in the ultimate sample.

The size distribution of sample farms presented in Table: XIV shows the predominance of marginal and small farmers in North Arcot district. Farm size with less than one acre (0.5 ha) was not commonly used for sugarcane cultivation which required larger size for economic cultivation. Hence there were only eight farms of this size in the sample. It may be seen that there was concentration of farms in the size group upto 2 ha; and the percentage share of farms in the total sample declined in the large size groups. This is in accord with the general distribution of landholdings discussed earlier (Chapter-III).

FIG. 3 SELECTED SAMPLE VILLAGES IN NORTH ARCOT DISTRICT

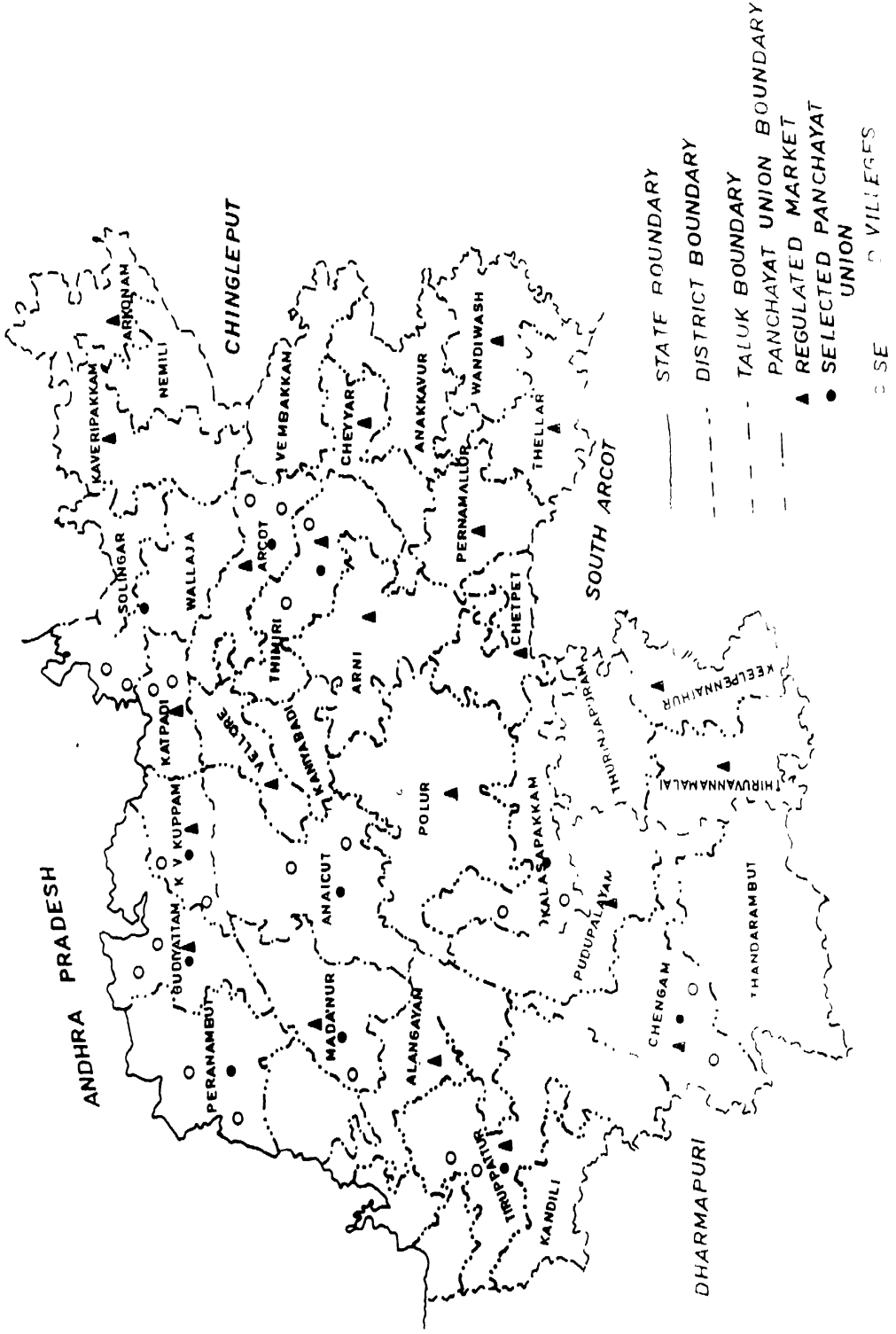


TABLE: XXIII

## BLOCKWISE DISTRIBUTION OF SAMPLE VILLAGES

Divisions (1)	Taluk (2)	Blocks (3)	Villages (4)	
North Development Divisions	Ranipet	Arcot	Kannikapuram Keizhminnal	
		Timiri	Melnai kenpalayam Anaimullur	
		Anaicut	Devichettykuppam Karungali	
		Sholingur	Ponnai Tempalli	
		Tirupattur	Tirupattur	Thathavalli Madavalam
			Pernampet	Azhinchikuppam Melpatti
			Gudiyatham	Motikuppam Kallapadi
	Katpadi		Ammundi Kugaianallur	
	K V Kuppam		Chinnamkuppam Kavanoor	
	Madanoor		Agaramcheri Devikapuram	
	South Development Divisions	Thiruvanna- malai	Chengam	Kariamangalam Chennasamudram
			Kalasapakkam	Thenpennathur Pillur

TABLE: XXIV  
SIZE DISTRIBUTION OF SAMPLE FARMS

Area (ha) (1)	No. of Farms (2)	Percentage (3)
Below 0.5	8	6.68
0.5 - 1.0	21	17.50
1.0 - 2.0	42	35.00
2.0 - 3.0	15	12.50
3.0 - 4.0	12	10.00
4.0 - 5.0	11	9.16
Above 5.0	11	9.16
Total	120	100.00

Besides, the selected farms represented various administrative and agro climatic regions of North Arcot district. One hundred of these sugarcane farms were from North Development Division, and 20 farms from the South Development Division of North Arcot. South Division was represented by a smaller number of sugarcane farms because of the importance being given for paddy cultivation in this region. Similarly, sample farms also had a fair representation of both dry areas like Tirupattur, and Anaicut and river basins like Gudiyatham, K V Kuppam, Pernampet and Arcot.

c. Selection of Traders:

As the focal points of the study were Vellore and Tirupattur assembling markets, all the sample farmers were reporting sales of their jaggery either at farm gate or directly to the traders in the two markets. Village traders who bought jaggery at farm level, or brokers who arranged sales, finally directed the produce to these markets. Therefore, the market channels between sample farmers and the two assembling markets were easily traced. A census of different marketing agencies operating along the channel was made to prepare the list of all traders operating therein. From the list, a representative sample was selected by simple random sampling method for each type of market functionaries.

Similarly the market channels from the assembling markets to the consumers in and out of the state of Tamil Nadu were traced. But it was not possible to take a census of all traders operating in the channels. Only different types of market functionaries were identified and for each type, ten traders were selected by simple random sampling method, allowing for replacement of any trader who did not fit into the type of trade for which he was selected. Still there was a problem in selection of retail traders within the district. There was a large number of them distributed in the towns and villages of the district. So, with a view

cost, and ~~winning~~ the co-operation of the traders, ten retail traders from Vellore market centre, and ten from Tirupattur market centre, were randomly selected with the help of the list of retail traders maintained by the sample wholesalers and commission agents.

The ultimate sample consisted of 50 jaggery traders, of whom 10 were wholesalers, 10 commission agents-cum-wholesalers, 20 retail traders, five brokers and five village traders.

d. Selection of consumers:

The analysis of market for jaggery would be incomplete without a study of demand for it. To identify the determinants and to assess their relative importance, elasticities of demand were estimated and studied. For estimating demand relationship, a sample of consumers was selected. In the demand for jaggery there were differences between rural and urban households, the latter having preference to cane sugar over jaggery. Therefore, rural and urban consumers were included in the sample. From the voter's list of each sample village, five households were randomly selected in each village. Households producing jaggery were omitted, because they generally used their own jaggery for consumption, and their response was already assessed while estimating marketable surplus for jaggery with sample



farmers. There were thus 120 rural consumer households in the sample.

In order to select urban consumers, all the municipalities in the district were listed in descending order of the size of population, and six municipalities were selected by simple random sampling method. They were Vellore, Arcot, Gudiyatham, Ambur, Vaniyambadi and Tirupattur. In each Municipality, wards were arranged in descending order of their human population and two wards were randomly selected. Five households were selected from each ward by simple random sampling method, with the help of voter's list. Therefore, there were 60 urban households in the sample. The sample households were post stratified into eight income groups. The distribution of households by income class was shown in Table:XXV. This was done to verify whether there was difference in demand for jaggery in different income classes. If there was a significant difference, the same might be taken into account in specifying demand functions. A few users of jaggery for the manufacture of confectionary were also included in the sample in order to find out their demand.

e. Collection of Data:

Both time series and cross section data were used to test the hypotheses of the study. Requirement of data,

their availability, mode of collection and their limitations are discussed below.

TABLE: XXV

## CLASSIFICATION OF SAMPLE HOUSEHOLDS BY ANNUAL INCOME

Income Group (Rs.) (1)	Number of households		
	Rural (2)	Urban (3)	Total (4)
below 1000	8	-	8
1001 - 2000	55	8	63
2001 - 3000	31	7	38
3001 - 4000	13	12	25
4001 - 5000	8	11	19
5001 - 8000	3	13	16
8001 - 10000	2	4	6
above 10000	-	5	5
	120	60	180

To estimate the cost, income and profit among farmers, farm level data were collected for the main crop, ratoon or both available on farms at the time of the study. The data collected related to the year 1982-83, and were gathered during the months: November to April 1983-84. Information collected included the size of the farm, area under sugarcane,

productivity, production and cost incurred operation-wise and fixed costs and related details. Farmers maintained no written accounts, but were able to give fairly accurate figures from memory. However, cross-checks were included in the schedule and the response of the farmers to these checks was found to be consistent. Estimates of costs, yield and input use were given on per acre basis or for the whole area under the sugarcane in the farm. These estimates were converted to per hectare basis for ready comparison. A pretested comprehensive schedule was used to gather necessary information by personal interview method (Appendix: XIII).

Data on monthly consumption of jaggery, its value and the value of close substitute for it were recorded through personal interview with the consumer households. The size of households, income, expenditure and preference for jaggery were particularly assessed.

Over and above the cross section data, a few case studies were conducted to assess the market structure, conduct and performance.

With a view to find out the marketing practices of jaggery in North Arcot District, a pilot study was first undertaken at the beginning of 1982 on the number of jaggery traders in each market in North Arcot District, data on the

volume of jaggery handled by the traders and the various methods followed in transferring ownership from the sellers to the buyers, and arrivals of jaggery in regulated markets were also collected.

Data on volume of business, costs and margins were collected for one year (1983) from the sample traders. The data relating to their fixed costs were recorded from enquiries and the details on business turnover and commissions were recorded through periodic inspection and observations. In three cases, the selected traders refused to co-operate, and they were replaced by fresh selection by the same method as discussed earlier.

Time series secondary data were collected from the District Agricultural Office (Marketing), Vellore, on weekly supply and price of sugarcane, jaggery and sugar for five years. The average monthly wholesale prices of jaggery for North Arcot District were collected for 20 years from the Commissioner of Statistics, Madras. Weekly wholesale price of jaggery in other markets like Salem, Coimbatore, Madras, Madurai and Tirunelveli were collected from the District Statistical Offices of the respective districts. The weekly wholesale and retail prices of jaggery in Ernakulam market were collected from the District Statistical Office at Ernakulam for the year 1982-83.

The weekly wholesale and retail price of jaggery in Kolhapur market was collected for two years from the Kolhapur Trading Company at Vellore which maintained the price data regularly.

f. Analysis of data:

Collected data were analysed with reference to each of the objectives. As already discussed, the objectives vary from estimation of production responses and elasticities of supply at farm level, to the analysis of structure and performance of the market for jaggery, inter farm differences in yield, and quality of cane, marketable surplus, mode of its disposal, with particular attention to storage and time of disposal, costs and returns, price received, profits earned, risks involved and problems in production and marketing of jaggery by farmers. Market power of the farmers, form of their organisation for selling and their own suggestions to improve prices received by them had received special attention. Simple tabular analysis and analysis of variance were used for the purpose.

Production Function

To assess the scope for improving yield of cane, a Cobb-Douglas type of production function was fitted, and efficiency in the use of critical inputs such as seed-

material, chemical fertilisers and irrigation was studied. On the basis of these results the scope for increasing yield of cane through optimization of resource use was evaluated. The production function was specified in the form of:

$$Y = \alpha_0 \beta_1 \beta_2 \beta_3 \beta_4 \beta_5 \beta_6 \mu$$

$$x_1 x_2 x_3 x_4 x_5 x_6 e$$

where Y = Yield of cane in tonnes/ha

$X_1$  = Mandays of labour applied/ha

$X_2$  = Seed material in '000' sets/ha

$X_3$  = Nitrogen in kgs/ha

$X_4$  = Phosphorous in kgs/ha

$X_5$  = Potash in kgs/ha

$X_6$  = Irrigation in  $m^3$ /ha

$\mu$  is the regression error term. The function was estimated in log linear form by OLS method with conventional classical normal assumptions:

$$Y = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \mu$$

where Y,  $\alpha_0$  and  $x_j$  were log values of Y,  $\alpha_0$  and  $x_j$  respectively for  $j = 1, 2, \dots, 6$ .

### Supply Response:

To estimate short run and long run elasticities of supply, time series data on production and prices of sugar

cane collected for the period from 1960-61 to 1981-82 were used. The following Nerlovian Adjustment Lag model was used for the purpose:

$$Q_t = a_0 + b_1 Q_{t-1} + b_2 P_{st-1} + b_3 P_{j,t-1} + b_4 P_{r,t-1} + b_5 R_t + b_6 t + u_t$$

where,

$Q_t, t-1$  were production of sugarcane in '000 tonnes in North Arcot for period  $t$  and  $t-1$ ,

$P_{st-1}, P_{j,t-1}, P_{r,t-1}$  prices of Sugarcane, jaggery and rice respectively were lagged by one year,

$R_t$  - deviation of annual rainfall in a period from the normal (average of 50 years),

$t$  - time variable for the trend  $t = 0$  for 1959-60,

$a_0, b_1 \dots b_6$  were parameters to be estimated, and

$u_t$  - regression error term.

This function was also estimated by the ordinary least square method with classical normal assumptions.

### Demand Function:

With the cross section data collected from 180 households a demand function for jaggery was estimated with the following log form.

$$\log C = a_0 + \log I + \log P_j + \log P_s + \log S + u$$

C = quantity of jaggery consumed in kgs per month per household.

I = income of the household per month in Rupees.

P<sub>j</sub> = Average price of jaggery paid by the household in Rs/kg.

P<sub>s</sub> = Retail price of sugar in Rs/Kg (weighted average price of levy and open market prices the weight being actual quantities purchased).

S = Size of families in number of persons.

u = error term.

This particular form was selected after the study of scatter diagram and on the basis of the study of Zarembka.<sup>168</sup> As estimated values of the parameters of variables income, own price and price of sugar were income, price and cross elasticity of demand for jaggery respectively, they were interpreted accordingly.

Data collected from the traders were analysed to study structure, conduct and performance of the market for jaggery. Specifically the following techniques were employed.

1. Four firm concentration:-

To study the structural characteristics of jaggery market, Bain's concept of market structure and his four firm concentration ratio were used.

<sup>168</sup> Paul Zarembka, "Towards a Theory of Economic Development", (San Fransisco: Holden Day Inc.), 1972, pp.199-211.



## 2. Gini ratio:-

To study industrial concentration and market imperfection if any, Gini ratio was estimated for wholesale-cum-commission agents, and wholesalers in Vellore and Tirupattur markets.

## 3. Correlation analysis:-

To assess the strength of integration between the two assembling markets at Vellore and Tirupattur, that between wholesale and retail markets, and between wholesale markets and farms, the correlation between prices prevailing in the markets was studied. Higher the value of correlation co-efficients (i.e. close to unity), stronger was the market integration.

## 4. Price analysis:-

Time series data on monthly average wholesale prices of jaggery were available for 18 years, from 1965 to 1983. The same were analysed to study trend, cyclical fluctuations and seasonal variations.

## 5. Risk analysis:-

Standard deviation of trend corrected prices was estimated and interpreted as a measure of price risk in marketing of jaggery by the wholesale traders in the district. Price received by sample farmers and paid by sample consumers were analysed for stability with the help of co-efficient of

variation. A value of less than 10 per cent for coefficient of variation was taken to indicate stability in prices and any value equal to or higher than 10 per cent was a sign of instability.

#### 6. Price spread:-

Price spread between retailer and farm gate was estimated for different market channels with details to show the cost and margin of each of the intermediaries. This was useful to identify most efficient channel and factors contributing to the cost of marketing of jaggery.

#### 7. Case studies:-

Where sufficient size of sample was not available as in the case of brokers, case studies of available agents were done to understand the rationale, cost and returns for their operation.

#### 8. Opinion survey:-

Sample producers, consumers and traders were requested to give their opinion on the problems experienced by them in buying and/or selling jaggery. These problems were analysed with the help of frequency tables and ranking techniques.

#### Limitations:

Though such an elaborate analysis was undertaken, the study had some limitations. First, it was a study on a small

scale, and the problem of generalization was indeed real. Therefore, much care was taken whenever generalisation of results was desired and attempted.

Quantitative data required for the study were admittedly difficult to come. Respondents did not maintain records of transactions, and where they were available, some refused access to them. So data furnished from memory were not completely free from bias, though efforts were taken to minimize it with adequate cross checks.

#### Statistical tests:

In this study all statistical tests were carried out for five per cent, and one per cent levels of significance for t, F and  $x^2$  tests. For coefficient of variation, the test criterion was 10 per cent. Estimated equations of various functions were evaluated by the value of  $R^2$  - the coefficient of multiple determination, F test and the sign of estimated co-efficients vis-a-vis theoretical expectations a priori.