

CHAPTER IV

METHODOLOGY

(Description and Measurement of the Variables)

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(Description and Measurement of the Variables)

4.1 Introduction:

This study is concerned with the impact of agro-based industries on the agricultural economy of Madurai District, with special reference to sugar industry. Since, every agro-based industry is a category by itself, sugar industry has been chosen for a detailed study. As such, the present study is mainly concerned with the impact or economic effects of the two sugar mills in Madurai District on the sugarcane economy of the district. The study covers the period between 1950-51 and 1980-81. Production side of the sugar industry is outside the scope of this study. Further, the study is concerned with only the direct impact of the sugar mills on the sugarcane economy of the district.

4.2 Methodology in Abstraction:

For the sake of simplicity in expression, the methodology is stated in abstract terms in the following two paragraphs, in terms of X and Y sectors. The word 'impact' is taken to mean the direct economic effects of a change in X on Y. To study the impact of X on Y,

it is necessary to take into account the various components of X and Y and then to choose the most powerful components of X and the most responsive components of Y. Here, X may be called 'inducing sector' and Y may be called 'responding sector.' The two sugar mills on the side of X may, in turn, be denoted as X_M and X_N . The various components of X and Y may be called 'inducing factors' and 'responding factors' respectively. A fundamental hypothesis of the study is that the growth of X leads to the development of Y. It is true that growth of Y also leads to the growth of X; however, it remains outside the scope of this study. In this study, X refers to sugar industry/mills and Y refers to sugarcane cultivation.

The factors taken into account on the 'inducing side' and 'responding side' are as follows:

X (Sugar Mills)	Y (Sugarcane Cultivation)
1. Price offered to the cane-growers by the Mill	1. Registered cane area
2. Daily crushing capacity of the mill.	2. Canes supplied to the mill (Canes crushed by the mill).
3. Other benefits offered by the mill to the cane-growers.	3. Other benefits received by the cane-growers.

4.3 Description of the Inducing Factors:

a) Price Offered to Cane-growers by the Mills (p):

Price offered to the cane-growers basically depends on the Central Government's sugarcane price policy. The Central Government fixes the cane price periodically taking into account changing cost of sugarcane cultivation in consultation with Sugar Mills' Association and Cane-Growers' Association. The mills are allowed to fix their own price higher than the price fixed by the Central Government.

Price offered to the cane-growers by the sugar mill is the most powerful inducing factor and it exerts a great influence upon the cane-growers in their decisions to cultivate paddy or sugarcane or any other crop in a year. Besides the government price and the mill price, the rival prices of paddy and jaggery also exert an influence upon farmers' decisions. The present study is based on the cane prices offered by the two sugar mills X_{T1} and X_{N} .

b) Daily Crushing Capacity (C_c):

Every sugar mill is allowed to have an authorised crushing capacity which may be increased from time to time depending on the cane potentialities of the area as well as

the performance of the mill. However, as the sugar industry happens to be a seasonal industry, the crushing season of the industry lasts only for about 6-8 months a year. Therefore, during the peak of the season, the sugar mill may even exceed the sanctioned crushing capacity to some extent. Next to price offered by the mill, its crushing capacity exerts an influence upon the farmers' decision to cultivate sugarcane or paddy.

e) Other Benefits Offered by the Mill to the Cane-growers:

Under this category, we may include various facilities offered by the sugar mill to member-growers in general, such as credit facilities, transport facilities, road development schemes, deepening of wells, supply of hybrid cane sets, supply of chemical inputs such as fertilizers and pesticides, technical advices and supervision by the mill's staff.

Of these various factors on the inducing side, the most important is the price offered by the mill and then the crushing capacity of the mill. Others can be considered as supporting factors. The cane-growers generally expect the price offered by the mill to adequately cover the cost of cane cultivation.

4.4 Description of the Responding Factors:

1) Registered Cane Area (a_r)

Registered cane area is a very important indicator of the impact of a sugar mill. This refers to the area that is registered by the mill for cultivation and supply of sugarcane to the mill, at the stipulated time, at a fixed price. Every sugar mill has a cane department under a Chief Cane Officer to look after the registration of cane areas, supply of inputs and supply of canes to the factory. The sugar mill maintains contact with the farmers through its field offices located in different areas. The mill starts registering the cane areas at the appropriate time.

Registered cane area reflects the decisions of the farmer and also the extent of 'area diversion', that is, diversion of the lands from sugarcane to paddy and from mill-canes to jaggery-canes. As stated in Section 4.1 (b), the areas covered by X_N in the Ramanathapuram District have been eliminated and corresponding adjustments have been made in the cane-supplied figures.

ii) Canes Supplied to the Mill:

Canes supplied to the mill is the same as canes crushed by the mill. There may be marginal difference between the two, but that can be ignored. The difference if any, between the two, is accounted for by such reasons as diversion of registered canes to jaggery production, supply of canes from unregistered areas, cane perished in the registered areas etc. Therefore, the actual cane-crushed figures are taken into account in this context. Relevant figures have been taken from the various Annual Reports of the two mills. As stated already in the previous paragraph, adjustments have been made in the figures relating to canes supplied to eliminate the cane figures from the Ramanathapuram area covered by X_N .

iii) Farmers' Income:

The net result of an increase in the cane price offered by the mill or an increase in the cane area as well as yield is reflected by the money income earned by the farmers. Therefore, cane-growers income is taken into account. This is only with reference to the income obtained from sugarcane cultivation. As the farmers get income by cultivating other crops also, the figures for income from sugarcane cultivation were first obtained by taking into

account the cash disbursement figures from the Annual Reports of the two mills. Secondly, the per hectare income of the cane-growers has been studied by combining the yield per hectare and mill-cane-price. Thirdly, the incomes of 100 member-cane-growers selected at random, have been studied taking into account the cost-price structure.

iv) Other Benefits:

The impact of the sugar mills on the sugarcane economy could also be seen in terms of certain other benefits and infrastructural facilities created by the mills. This includes credit facilities arranged by the sugar mill through the banks, transport facilities and transport subsidies, road development schemes undertaken by the Sugarcane Road Development Wing of the Highways Department, supply of cane-seeds and chemical inputs to cane-growers, technical information about cane cultivation, borewell facilities offered on loan basis to deepen the wells etc.

4.5 Measurement of the Variables:

Three methods are used in this study to measure and assess the 'impact.' They are:

- 1) Time-based comparison;
- 2) Area-based comparison; and,
- 3) Principle of Marginal Variation.

Time-based Comparison:

Time-based comparison refers to the comparison of two situations in X and Y in two or more time periods. Two approaches have been made in this regard.

In the first approach, the entire period of study is divided into three period-segments and in each period, the influence of mill-cane-price (p) has been taken into account as the inducing factor; on the Y side, total area under sugarcane (a_t), registered cane area (a_p), total sugarcane production (C_t) and cane crushed (C_p) by the mills have been measured in terms of index numbers. The trend in the relationship between the X factor and Y factors are compared in the three period-segments in terms of index numbers and growth rates.

In the second approach, the entire period of study is divided into two period-segments - one relating

to the period before, and another relating to the period after the emergence of X_{ij} . The combined crushing capacity of the two mills (C_c) is considered as the X factor and registered area under canes (a_p) and canes crushed by the mills (C_c) as the Y factors. Tabular and graphical analyses have been made supported by growth rates and coefficient of correlation of the X and Y factors.

Area-based Comparison:

Area-based comparison refers to the comparison of X and Y factors in two areas - one being an area which is close to the sugar mill; and another one being an area situated far away from the sugar mill. A cross section study has been made in this context, with the help of questionnaires. One hundred cane-growers were interviewed in the mill area in this connection. Besides, 25 cane-growers were interviewed in the non-industry area (Uthamapalayam) and 25 non-member cane-growers were interviewed in the mill area. Random sampling was done in this regard, selecting the two normal years i.e., 1979-80 and 1980-81. The selected samples of 100 member-growers were classified into three categories as Group I, Group II and Group III on the basis of the holding size. The 'impact' has been studied with reference to these three groups.

Nilakkottai taluk has been treated as industry area and Uthamapalayam taluk as non-industry area for the purpose of area based comparison.

Principles of Average Variation (A.V.) and Marginal Variation (M.V.):

The principles of average and marginal variations have been applied to find out the extent of the 'impact' as well as 'area diversion' as shown below:

Area Diversion:

$$A.V. = \frac{a_r}{a_t}$$

$$M.V. = \frac{\Delta a_r}{\Delta a_t}$$

where, a_t is total cane area of the district, and a_r is the registered cane area.

4.6 Measurement of the Impact:

Measurement of the 'impact' involves the measurement of both the inducing factors and responding factors establishing a correlation between the two. In short, variations in X and Y factors are to be measured and compared.

A. Measurement of the Inducing Factors:**i) Mill-Cane-Price (p):**

This is measured in terms of index. Till 1965-66 the price offered by X_M has been taken into account and from 1966-67, when X_N came into existence, the prices offered by both the mills are taken into account and their average figures are used for indexation. Different base years have been used for different time periods. The period of study is divided into 3 periods for this purpose.

ii) Approved Daily Crushing Capacity (C_c):

With regard to daily crushing capacity, till 1965-66, the crushing capacity of X_M has been taken into account and since 1966-67, the crushing capacities of both X_M and X_N have been combined and indexed for different time periods. The period of study is divided into 2 periods for this purpose.

iii) Other Facilities Extended to Cane-growers:

Under Impact-III, other benefits and facilities extended to member-cane-growers, such as credit, transportation of canes to the mill, improvement of roads, village adoption by the mill, supply of chemical inputs,

and cane sets, technical advice by the mill's cane officers etc. are included and given a descriptive account supported by tabular analyses wherever figures are available.

B. Measurement of the Responding Factors and the 'Impact':

It is obvious that the 'impact' is revealed by variations in the responding factors, to changes in inducing factors. The 'impact' is studied in this thesis with reference the influence of the two sugar mills, X_{E1} and X_{N1} , on the sugarcane economy of the district. The impact is classified into three categories, taking into account different variables of X and Y under each category, as shown below:

<u>Variables studied</u>		
	X	Y
1) Impact I	1) mill-cane-price (p)	Total cane area under (a_t) Registered cane area (a_r)
	ii) Crushing capacity (C_o)	Total cane output (C_t) Canes crushed (C_r)
2) Impact II	Cane-growers' income.	
3) Impact III	Other benefits.	

1) Impact-I:

a) Registered Cane Area:

Under the first category of Impact-I, the causal relationship between p and a_r , p and a_r , are measured and analysed in terms of indices, correlation coefficients and growth rates. Graphical representations of the trend are also given.

In order to have an aggregate picture of the district, a_r of X_{T_1} and X_{T_2} is combined. With regard to p , the price offered by X_{M_1} is taken into account from 1950-51 to 1965-66; from 1966-67 onwards, the prices offered by X_{T_1} and X_{T_2} are combined and their averages have been taken into account for indexation and for calculating the correlation coefficient.

The principle of time-based comparison is applied by dividing the period of study first into three segments as (i) 1950-51 to 1959-60, (ii) 1960-61 to 1969-70, and (iii) 1970-71 to 1980-81. Secondly, the period is segmented into two, such as (i) 1950-51 to 1965-66, and (ii) 1966-67 to 1980-81, covering 15 years in each segment.

The causal connection between X and Y factors are studied in each segment-period in terms of indices, growth rates and correlation coefficient. The principles of average variation and 'marginal variation' have been used to find out the extent of 'area diversion' between paddy and sugarcane cultivation.¹

b) Canes Crushed by X_M and X_N (C_r):

C_r is taken as the next important indicator of the 'impact.' As stated earlier, adjustments have been made to eliminate in C_t the quantity of canes corresponding to the cane area of Palani taluk, and also to eliminate that portion of C_r corresponding to Ramanathapuram areas covered by X_N . C_r figures reveal the 'impact' further more than a_p , because, the former shows the intensity of sugarcane cultivation by reflecting the variations in yield per hectare. In order to establish a causal connection between X and Y, first, a correlation is established between p and C_r , and then between C_c and C_r .

¹Janak Raj Gupta has used the principle of marginal variation in a different way to study the structural growth of the agro-based industries in relation to other industries. The formula used is,

$$M.V. = \frac{P_1 - P_0}{P_0}$$

where P_1 is production index in the current period, and P_0 is production index in the base period.

2) Impact-II:

Under the category of Impact-II, the per hectare money income earned by the farmers is measured in terms of index. This is done by simply multiply^{ing} the price and yield per hectare. The figures thus obtained indicate the gross income per hectare obtained by the farmers.

Then, average net income figures have been derived by collecting information about cost of sugarcane cultivation figures from the sugar mills and from the farmers through questionnaires. One hundred cane-growers were interviewed for the purpose as well as for getting other details. As the cost figures were available only for the years 1979-80 and 1980-81, the net income has been calculated for 1980-81 only.

3) Impact-III:

Under this category, other benefits extended to the farmers by the sugar mills are considered. The following items have been taken into account under Impact-III.

a) Credit Facilities:

Credit facilities are arranged by the two mills through many commercial banks in their respective regions. Figures obtained from X_N are given in this regard.

b) Transport Subsidy:

Both the mills are giving transport subsidy for canes brought from areas beyond 40 km. from the mill. Transport subsidy figures of X_N are provided to show the extent of this benefit.

c) Road Development Schemes:

As transport facilities and roads are very important for the transportation of the canes from the farm to the factory, special efforts are being taken by the Sugarcane Road Development Wing of the Highways Department. Figures have been obtained from this department regarding the length of the roads laid in the sugarcane areas.

d) Cane Subsidy:

Cane subsidies are given by the sugar mill to encourage the cane-growers to cultivate certain varieties of cane recommended by the sugarcane research centres. Subsidies are also given to the farmers of selected fields

where cane nurseries are developed for supplying canes to the farmers. Figures have been obtained from X_{11} regarding this from the various Annual Reports.

e) Borewell Facilities:

Number of wells deepened by deep borewell machines in the cane areas of X_{11} have been obtained.

f) Supply of Fertilizers:

Figures have been obtained from the Annual Reports of X_{11} regarding the value of fertilizers supplied to the farmers.

g) Village Adoption:

Under the village adoption scheme, X_{11} has adopted the village 'Oorseri' which is near the mill area. Details have been gathered regarding the developments introduced after the village has been adopted by the mill. Facts and figures are given in this regard.

4.7 Limitations of the Study:

The present study is subject to the following limitations.

a) Choice of Industry:

Sugar industry has been chosen for detailed study. This is because of the fact that, each agro-based industry is a category by itself, in terms of its inputs and outputs and linkage effects as well as marketing. Therefore, each agro-based industry requires a separate study. Sugar industry provides a clear example of agro-based industries.

b) Period of Study:

The study covers the period from 1950-51 to 1980-81. The subsequent period is not included because, the entire sugar industry of the country is faced with the problem of unprecedented surplus.

c) Data Analysis:

Due to extreme fluctuations in sugarcane cultivation, primary data analysis has been made with reference to Nilakkottai taluk as a sample study. This is given at the end of the Chapter VI. As such, the study mainly depends on secondary data.

d) Area of Study:

There is a serious limitation with regard to area of study. The present study is confined to Madurai District. But it was found that there are inter-district movements of canes. Palani taluk in Madurai District has been allotted to Amaravathi Co-operative Sugar Mills at Amaravathinsgar in Coimbatore District. The National Co-operative Sugar Mills, i.e. X_N , is covering certain adjacent areas in the neighbouring district of Ramanathapuram such as Sivagangai, Manamedurai, Tiruppuvanam, etc. As the inclusion of these areas will lead to unrealistic conclusions, these areas have been eliminated from the study. Therefore, on the sugarcane side, the figures relating to area under sugarcane and sugarcane production do not include the figures for Palani taluk. Similarly on the mill side, the figures relating to registered cane area and cane crushed do not include the figures corresponding to the Ramanathapuram District area.

4.8 Sources of Information:

The following were the main sources of information for this study.

1. Office of the Additional Director of Statistics, Madurai.

2. Office of the Inspector of Statistics,
Nilakkottai.
3. The two sugar mills in the district.
 - i) The Madura Sugars Ltd., Pandiarajapuram,
Madurai.
 - ii) The National Co-operative Sugar Mills Ltd.,
Alankanallur, Madurai.
4. Office of the Director of Sugar, Madras.
5. Office of the South Indian Sugar Mills
Association, Madras.
6. Sugarcane Road Development Wing of the Public
Works Department, Madurai.
7. Office of the Shakthi Sugars, Madras.
8. Office of the District Industries Centre,
Madurai.
9. M.D.C.C. Bank in the National Co-operative
Sugar Mill.
10. Agricultural College, Madurai.
11. Field Offices of National Co-operative Sugar
Mills Ltd., at Melur and Tiruppuvanam.
12. The Amaravathi Co-operative Sugar Mills Ltd.,
Amaravathinagar, Coimbatore.
13. Agricultural University, Coimbatore.

4.9 Primary Data:

Primary data were collected by interviewing 100 farmers at random in Nilakkottai taluk and 25 farmers in Uthamapalayam which is considered to be a non-industry area. Details were collected regarding cost of sugarcane cultivation, farmers' income, their attachment to the sugar mill, the benefits which they are obtaining from the sugar mill and also the problems they are faced with in sugarcane cultivation and with the sugar mill.

Some basic details have been collected about jaggery making also and its relative advantages over factory-canes. Some of the jaggery-making centres were visited to get first hand information by interviewing 25 jaggery-cane-growers. The primary data collected by interviewing the cane-growers have been analysed in percentage terms and also descriptively. However, the nature of the thesis is such that, it relies more on secondary data than on primary data, as it is concerned with the impact of the sugar industry over a period of 30 years from 1950-51 to 1980-81 at the district level.