

## CHAPTER IV

### SOURCE OF DATA AND MEASUREMENT OF VARIABLES

The Census of Indian Manufacturers (CIM) conducted from 1946 to 1958 was confined to only 29 of 63 groups of industries. The census covered all registered (under the Factories Act, 1948) factories employing 20 or more workers and using power. Annual Survey of Industries (ASI) is conducted since 1959 under the Authority of Collection of Statistics Act 1953 in accordance with the provision of the collection of statistics (central) Rules 1959 framed there under. Coverage of ASI extends to the entire 'Factory Sector' comprising all units (called factories) registered under sections (i) and (ii) of the Factories Act 1948. Establishments under the control of the Defense Ministry, Oil storage and distribution units, restaurants, cafes and technical training institutions not producing anything for sale or exchange are kept outside the purview of the ASI. The ASI census covers all registered firms employing 50 or more workers with the aid of power or 100 or more workers without the aid of power.

From 1973-74 onwards National Industrial Classification (NIC) is being adopted instead of ASI classification. In the NIC, the manufacturing sector is divided into 24 2-digit major groups which are further divided into 180 3-digit groups. Data on vacuum pan sugar industries are published under code NIC-206. The

reference period is accounting year of the factories closing accounts on any day during the 1st April and 31st March.

The basic data source for this study is the Annual Survey of Industries (ASI). This study covers the period from 1973-74, that is, the beginning year of the NIC to 1990-91<sup>1</sup> that is 18 years<sup>2</sup>. The year refers to crop year October - September for all variables except value of output and input factors, labour and capital. ASI have published data on gross fixed capital, working capital, number of employees, man days worked, inputs used, outputs, wages, salaries and money value of benefits, value added, etc. for the sugar industry at the regional and national levels. Data relating to the above variables are taken from various issues of this survey. The other related data like sugarcane yield, cane crushed, sugar production, recovery percentage, duration of crushing season, etc. are obtained from various issues of Indian Sugar, Indian Sugar Year Books, Sugar Enquiry Commission Reports, RBI Bulletins, Report on Currency and Finance, etc.

Information on productive Capital is provided with break-up into fixed and working capital. The fixed capital comprises land, buildings including those under construction, improvements to land and other construction plant, machinery, transport equipment and other fixed assets such as furniture, fixtures, etc. It includes fixed assets under construction, installation and assets.

ASI provides data on total employees. This is computed by taking total attendance of persons in all the shifts on all the working days and dividing it by the number of days worked. Break-up of 'total employees' is available into 'workers' and 'persons other than workers' . The latter category of employees includes supervisors, technicians, managers, clerks and other similar type of employees. ASI also provides information on 'man-hours' worked. This is calculated by multiplying the number of workers employed in each shift by 8 hours and aggregates the products for all shifts on all the working days in the year.

Payment to employees is given under three heads :

- i) Payment to workers,
- ii) Payment to other than workers and
- iii) Money value of benefits.

The money value of benefits includes net cost of the concessions in respect of supplies made or services rendered such as housing, food grains, medical, educational, transport, recreational facilities, etc., retrenchment and lay-off benefits; compensation to work injuries and occupational diseases; maternity and sickness benefits.

ASI separately provides information on materials consumed. Materials consumed represents the total delivered value of raw

materials, chemicals, packing materials and stores which actually entered into the production process.

ASI provides information on gross value of inputs. It is the sum of gross value of materials and fuels, electricity, light and lubricant, etc. consumed, work done by other concerns, products reported for sales last year but used for further manufacture, incidental expenditure on purchase of materials, etc., non-industrial services purchased, depreciation and purchase value of goods sold in the same condition as purchased. Non-industrial services include audit fee, accounts and bank charges, legal expenses, insurance charges, local rates, factory licenses, etc. Depreciation is calculated at the rates allowed by Income Tax Authorities for assessing taxable income.

Gross value of output is arrived at by adding the value of products and by-products manufactured for sale, work done for customers and sale value of goods sold in the same condition as purchased and is adjusted for the difference in stock of semi-finished goods at the beginning and at the end of the survey year. Ex-factory value (exclusive of taxes, duties, etc, on sale and inclusion of subsidies, etc., if any) of output is net of transportation charges from factory and selling agents commission.

Value added by manufacture represents that part of the value of the products which is created in the factory and is computed by deducting from the gross ex\_factory value of output, the gross value of input.

**Output:-**

For the measurement of productivity output is measured in three ways. 1) Real gross value of output 2) Real value added and 3) Physical quantity of production. The real gross value of output is arrived at by dividing the gross value of output by index of whole sale price of sugar<sup>3</sup>. Alternatively real value added is used as output. Gross value added is arrived by subtracting gross value of input excluding depreciation from the gross value of output. Even though net value added figures are more relevant for studying production characteristics it is decided to work with gross figures because of highly arbitrary nature of the depreciation charges in the Indian industries<sup>4</sup>. Value added is arrived at by subtracting gross value of input including depreciation from the gross value of output. The real value added is arrived at by dividing the value added by the wholesale price index of sugar. Physical quantity of output is also used for the measurement of partial factor productivity indices. In the Sugar Industry output is sugar production in lakh tonnes measured by multiplying the total cane actually crushed by recovery percentage. Source of data for output measure is ' Indian Sugar '

a publication of Indian Sugar Mills Association. It is worth mentioning here that these sources of output data are not strictly comparable with ASI coverage and classification. Even then we have used these sources for output as these data were not available in ASI.

For the measurement of total factor productivity and production function output is measured in real value added.

## **Inputs**

### **i) Labour Input**

Regarding the measurement of labour input four alternatives are available : 'Employees', 'Workers', 'Man-hours' and 'Total emoluments'. In the present study 'employees' and 'Man-hours' is used for the measurement of partial factor productivities. For the measurement of total factor productivity and production function employees is used as a measure of labour input. It has been argued that other than workers are as much important for getting the work done as the workers who operate the machines and therefore their services should be taken into account in the measurement of labour input. Data on man-hours are considered to be unsatisfactory on two grounds. One is that man-hour series covers only workers and leaves out persons other than workers and the other is that man-hour is arrived at by multiplying the number

of workers in a shift by eight and not the actual duration of the shift.

## ii) Material Input

Material input is measured in terms of value at constant base year price. Material input is equated to the residual after subtracting fuel, etc, consumed and depreciation from the gross value of input. The values of raw materials at current prices are converted into constant base year price (1973-74 = 100) by deflating them by sugarcane price index. For the deflators the source is the various issues of 'Indian Sugar ' a publication of Indian Sugar Mills Association.

## iii) Capital Input

Value of gross fixed capital stock at constant prices has been taken as the measure of capital input. We take the book value gross capital stock (fixed capital + depreciation ) reported in ASI 1973-74 as the base year capital stock<sup>5</sup>. Method of estimation of capital input of this industry is as follows :- To estimate the growth of gross fixed capital<sup>6</sup> in the subsequent period, annual additions are calculated by subtracting previous year fixed capital from current year fixed capital. These additions are deflated by the WPI of machinery and transport equipment. The series of gross capital stock has been obtained by adding to the

base year value of gross fixed assets, the annual deflated additions in subsequent years. Evidently, net capital stock (net of cumulated depreciation allowance ) is a better measure of its basic capacity to contribute to production and revenue than gross stock. For the reasons mentioned earlier, the amount of depreciation allowed for in each year does not form an economically meaningful category. In fact, George Rosen observes that " in under developed countries, a machine is probably more often used at approximately constant levels of output for a period far beyond the accountancy life of the machine measured by normal depreciation, until it is eventually discarded or sold for scrap."<sup>7</sup> Under these circumstances, gross rather than depreciated value of the stock would be more closely related to the capital services consumed by the industry.<sup>8</sup> The partial and total factor productivity ratios without correcting the capital figures for capacity utilization are carried out. For the estimation of production function the capital figures used are adjusted for capacity utilisation<sup>9</sup>.

### **Capacity Utilisation**

As far as the sugar industry is concerned, there is no direct data on capacity utilisation. In India there are very few studies which adjusted capital for capacity utilisation. According to Sankar, capacity utilisation is the ratio of the average number of days worked to 300 days for each region and industry <sup>10</sup>.



According to Gupta it is compiled on the basis of actual man-hours worked per worker in any year during the sample period<sup>11</sup>. Following Gupta, the index of capacity utilization is calculated by Subramaniyan<sup>12</sup>. We have seen earlier that the use of man-hours is considered to be unsatisfactory as man-hours calculation does not take into account of actual duration of shift and persons other than workers. As a result capacity utilisation will be either overestimated or underestimated respectively. Hence in the present study capacity utilisation is measured by the ratio of actual cane crushed to installed capacity. Installed capacity is the licensed capacity which means that all the licensed capacity has been installed. Then the capacity utilisation the way in which obtained is multiplied by the corresponding years fixed capital at 1973-74 prices to arrive at adjusted capital for each year at 1973-74 prices. We have also related capacity utilisation with productivity.

## FOOTNOTES

1. As the data were not published for the latest year 1991, the same were obtained directly from Central Statistical Organisation, (ASI Unit), Department of Statistics, Ministry of Planning, Govt. of India, New Delhi, in order to include the latest data.

2. Period of study is extended to 1992-93 to make use of recent data to bring out growth and estimate demand function for which related data are available from sources other than ASI.

3. A separate whole sale price index of sugar for the period 1973-74 to 1990-91 is worked out by taking 1973-74 as the base year.

4. Sinha and Sawhney (1970, Mukherjee (1975), etc have also used real value added as output.

5. The unadjusted base year capital figure for variations in prices at which it different components were acquired results in an under estimate of the base year figure of capital stock and, therefore, leads to an over estimation of increase in capital stock in the subsequent years.

6. The procedure for the estimation of growth of gross fixed capital is similar to Banerjee (1975).

7. Rosen, G, "Industrial changes in India", 1959, Asia Publishing House, P.42.

8. Working capital is excluded from the measure of capital as its relation to the growth of output is less influenced by technical factors than the relationship of fixed capital and output. Working capital used in a factory is determined by other than the technique of production, i.e., supply and production.

9. Whenever we use capital in production function, it must be adjusted for capacity utilisation because what ~~belongs~~ in a ~~production~~ function is capital in use, and not capital in place. Estimation of production function with out correcting capital for capacity utilisation did not yield satisfactory results.

10. Sankar, U (1970) P.102.

11. Gupta, G.S and Kirit Patel, (1976) P. 315.

12. Subramaniyan, G (1986) P. 95.