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CAPACITY UTILISATION, AVERAGE COST AND PROFITABILITY : A SECTOR-WISE ANALYSIS OF BLOCK RUBBER PROCESSING INDUSTRY IN INDIA

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Relationships among capacity utilisation, average cost and profitability in the block rubber processing factories in the estate and non-estate sectors have been examined based on a cross-sectional analysis of 12 units producing block rubber in 1987–88. In terms of capacity utilisation and average cost of processing, factories in the non-estate sector were performing better than their counterparts in the estate sector. However, the non-estate sector had a higher average unit over-head and administrative cost and a relatively lower profitability in spite of its higher capacity utilisation and lower average unit cost of processing. The strength of the inverse relationship between capacity utilisation and average unit cost in the industry was found to be insignificant. Results of the study showed the influence of various extraneous factors contributing to the divergence in the behaviour of selected parameters. Policy imperatives emerging from the study call for re-organisation in the existing combinations of machinery, mode of raw material procurement and nature of raw material processed.

Key words – Block rubber, Cost analysis, Profit analysis, Installed capacity, Capacity utilisation, Estate sector, Non-estate sector, Rubber processing industry.

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INTRODUCTION

Technically specified block rubber (TSR) is an important form of processed natural rubber (NR). A comparatively higher share of block rubber in the total NR production in Malaysia (53 per cent) and Indonesia (74 per cent) compared to India (4 per cent) is attributed to their export orientation. In India, commercial production of block rubber is of recent origin. During the year 1987–88 there were 16 TSR processing units in operation. The processing units belonged to both estate and non-estate sectors. Factories in the estate sector process raw-material (fresh field coagulum) available only from own sources and are owned by large planting companies. The latter group consists of factories in the co-operative and private sectors and are completely dependent on dealers and small rubber growers for raw material (dry field coagulum).

An important characteristic of the industry is wide variations among the individual units with regard to installed capacity (size), capacity utilisation and accessibility to raw material. In a strictly operational sense, average unit cost and rate of profit are dependent more on the extent of capacity utilisation than on the size or scale of production. Across different types of industries, a situation of excess capacity or uneconomic levels of capacity utilisation are usually identified with

factors such as inadequate demand for the product, managerial inefficiency and insufficient inputs including power.

The study was taken up with the objectives of (1) examining the extent of sector-wise capacity utilisation in the industry and identifying the contributing factors, (2) analysing the sector-wise average unit cost of production and major cost components, (3) assessing the strength of inverse relationship between capacity utilisation and average unit cost in the industry, (4) analysing sector-wise performance of the industry and (5) specifying policy options emerging from the observations.

MATERIALS AND METHODS

Information was gathered from all the sixteen block rubber processing factories in the country using a questionnaire designed for the purpose. The cross-sectional analysis, on which the study was based, covered the period 1987–88. Among the 16 units in operation, three had commenced commercial production only in 1987–88 and the only unit in the public sector was temporarily closed during the year. Hence the data collected from the remaining twelve units only were considered for the analysis. Apart from practical convenience, cross sectional analysis is more effective in eliminating the impact of technical changes which may have occurred over the time in the industry, compared to an inter-temporal comparison (Baru, 1988). Though TSR is processed from field coagulum and latex, the study was strictly confined to the former since about 92 per cent of TSR processed in India was obtained from field coagulum during the year under study.

To understand the installed capacity, extent of imbalance in the organisation of machinery and its influence on capacity utilisation, installed creping and drying capacities for all individual units were estimated. The estimate was based on the nature of raw material, number of passes required in the creping line, number and size of crepers, output of drier and average number of working days available. Factors affecting capacity utilisation were identified by quantifying major parameters contributing to the loss of available working days among the processing units.

Sector-wise cost analysis was based on a classification of major cost components into two, viz., operational cost and overhead and administrative cost. The strength of the inverse relationship between capacity utilisation and average unit cost was examined with the help of a regression equation:

$$y = a + bx$$

where y = average cost

x = capacity utilisation, and

a and b = constants to be estimated

Linear regression equation was found more suitable in explaining the inverse relationship compared to non-linear equation. Since two important variables influencing capacity utilisation could not be quantified, multiple regression equation was not employed for the analysis.

To assess sector-wise profitability, share of major components of the total value was analysed. Relative productive efficiency in the two sectors was examined by employing the standard tools of structural ratios and technical co-efficients.

RESULTS AND DISCUSSION

It was observed that during 1987–88, 91.94 per cent of TSR produced in the country was from field coagulum. In the non-estate sector field coagulum accounted for 93.13 per cent of the raw material processed, while in the estate sector the percentage was 86.22.

Operations

Commercially, among the various operations involved in the production of block rubber the two important operations having direct bearing on installed capacity and capacity utilisation are creping and drying (Fig. 1). Creping operation is an essential

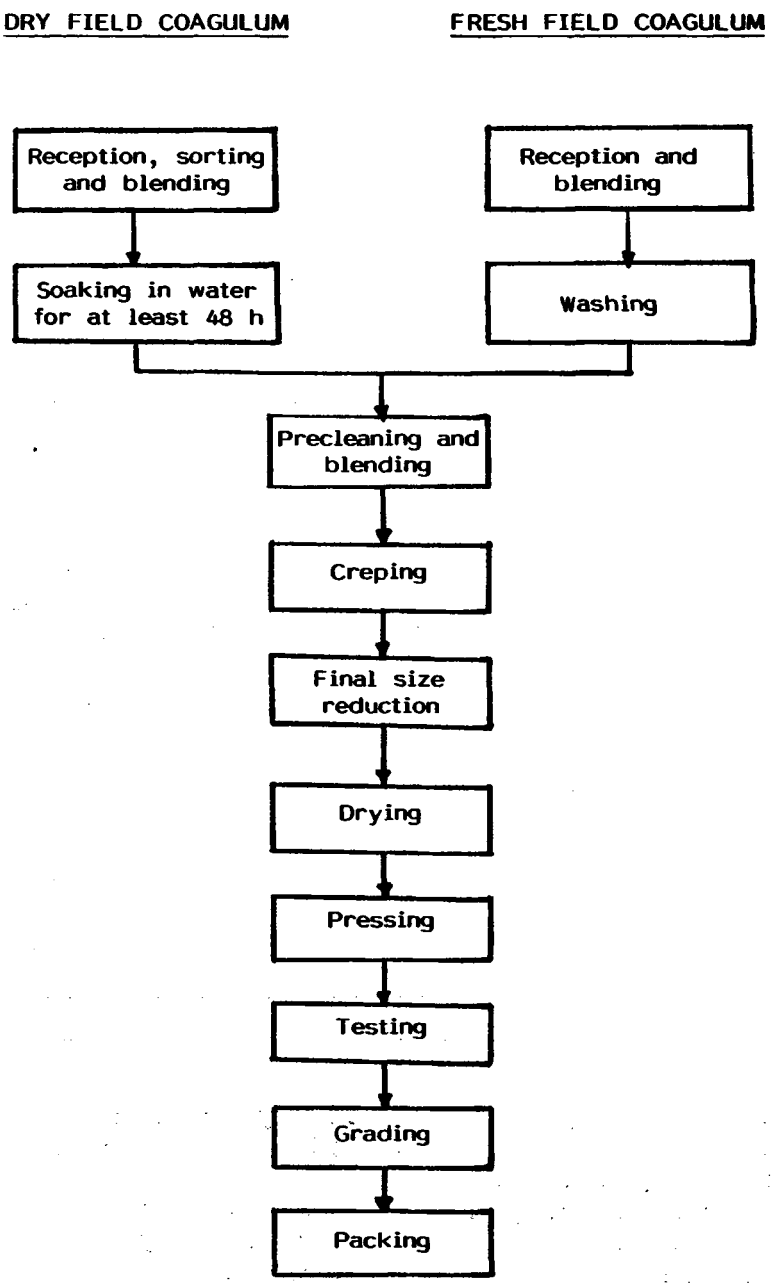

Fig. 1. Flow diagram of block rubber processing

step before final size-reduction to improve the softness of raw material by shearing action and to impart uniform drying. The number of crepers as well as the number of passes to be given in the creping line depend mainly on the installed drying capacity and the nature of raw material processed. As is evident from the information gathered, on an average, dry field coagulum processed in the non-estate sector requires at least 10 to 12 passes due to higher dirt content whereas fresh field coagulum from estate needs only 8 to 10 passes before final crumbling for ensuring a comparable softness to the crepe.

Apart from creping, two other important operations in the pre-drying phase are pre-cleaning and final size-reduction. The choice of machinery at each stage in the pre-drying phase depends mainly on the nature of raw material processed. Drying is the final step in the production process. Operationally, the most important characteristic of the drier is its indivisibility. Various combinations of machinery in the pre-drying phase are intended to ensure maximum utilisation of the installed drying capacity. Therefore, from an analytical point of view, installed drying capacity represents the installed capacity of a block rubber processing factory. The drying time of the existing driers in the industry varies from 3.5 to 4.5 hours. The cost of drying will be more with oil-fired driers than with electrically heated ones under normal circumstances. The average number of working days available to the industry was 300, during 1987–88.

Analysis of installed capacity and capacity utilisation

For producing a final product by one process, plants can be designed to achieve optimum unit cost of production by exploiting potential economies of scale. In block rubber processing where more than one process is involved, balancing of creping capacity and drying capacity is essential to achieve desired levels of capacity utilisation. Estimated creping capacity, drying capacity and capacity utilisation are shown in Table 1.

Table 1. **Sector-wise comparison of estimated creping capacity, drying capacity and capacity utilisation**

	No. of units	Installed creping capacity (MT year^{-1})	Installed drying capacity (MT year^{-1})	Drying capacity expressed as % of creping capacity	Production (MT year^{-1})	Capacity utilisation (%)
Non-estate sector	8	18780	19830	105.59	6982.245	35.21
Estate sector	4	6930	4800	69.26	1457.667	30.37
Total	12	25710	24630	95.80	8439.912	34.27

Table 1 shows an excess drying capacity in the non-estate sector (5.59 per cent) and excess creping capacity in the estate sector (30.74 per cent) and in the industry (4.20 per cent). The table also shows a higher capacity utilisation in the non-estate sector (35.21 per cent). The average installed capacity (MT day^{-1}) in the non-estate sector was 8.26 compared to 4 in the estate sector.

The excess creping capacity in the estate sector is historically rooted in one important reason. The existing factories in this sector were processing the estate fresh field coagu-

lum into crepe rubber on a single shift basis for which the number of crepers required were very large. Drying capacity was limited to the extent of availability of raw material from own sources at the time of conversion of these factories into block rubber processing units. This peculiar situation has resulted in excess creping capacity.

To examine the influence of excess creping capacity and excess drying capacity on capacity utilisation, correlation co-efficients were worked out after classifying the processing units into two groups viz., units with excess creping capacity and those with excess drying capacity. Results of the analysis showed a significant inverse relationship (–0.996**) between excess drying capacity and capacity utilisation, whereas the influence of excess creping capacity appears to be relatively insignificant (–0.325). It did not logically follow that capacity utilisation is exclusively dependent on the extent of excess drying capacity. In a strictly operational sense, lower levels of capacity utilisation in the industry represents the inefficient utilisation of available working days. Table 2 shows the total number of working days lost in the industry and the share of contributing factors.

Table 2. **Estimated number of working days lost and the share of contributing factors**

Total no. of working days available	Effective no. of working days	No. of working days lost	Contributing factors	Share of contributing factors (%)
300	103	197	Power cut/power failure	47.21
			Raw material constraint	18.27
			Excess drying capacity	14.72
			Mechanical break-down	10.15
			Labour strike/absenteeism	6.60
			Lock-out	2.54
			Water shortage	0.51
			Total	100.00

As is evident from Table 2, the industry could effectively utilise only 34.33 per cent of the total available working days. The most important factor affecting the capacity utilisation was non-availability of power. Raw material constraint and excess drying capacity were confined to the estate sector and the non-estate sector respectively. Mechanical break-down was common to both.

Cost analysis

All components of the processing cost were classified into two broad groups, viz., operational cost and administrative and overhead expenses. Table 3 shows sector-wise comparison of major heads of cost, average unit cost and capacity utilisation. The non-estate sector with a higher capacity utilisation had a lower average unit cost (Rs. 3.29 kg^{-1})

compared to the estate sector (Rs. 3.42 kg^{-1}). While the non-estate sector had a lower average unit operational cost (Rs. 2.33 kg^{-1}), the average unit administrative and overhead cost was lower in the estate sector (Rs. 0.77 kg^{-1}). The major cost components of the industry were fuel and power (Rs. 0.75 kg^{-1}), wages and allowances (Rs. 0.54 kg^{-1}), depreciation (Rs. 0.51 kg^{-1}) and interest and bank charges (Rs. 0.51 kg^{-1}).

A higher unit cost of interest and bank charges in the non-estate sector was due to dependence on external sources of funds both for long term and short term requirements. Conversely, working capital requirements of the estate sector were negligible since production was limited to the extent of availability of raw material from own sources. A comparatively higher unit cost of wages and allowances in the estate sector was due to higher earnings per employee and labour intensity (Table 6). The unit cost on account of depreciation was higher in the non-estate sector since factories in this sector were of relatively recent origin.

A further decomposition of cost analysis based on ownership-wise classification showed that four units in the private sector performed better than the estate sector and the co-operative sector in terms of capacity utilisation (35.56 per cent) and average unit cost (Rs. 2.56 kg^{-1}). The share of operational cost in the total cost of this group was more than 82.98 per cent suggesting lower administrative and overhead expenses compared to other groups. The co-operative sector had the highest average unit cost (Rs. 3.69 kg^{-1}) and the highest share of administrative and overhead expenses (35.93 per cent).

Regression analysis

The influence of capacity utilisation on

Table 3. Sector-wise comparison of major heads of cost, average cost (Rs. kg^{-1}) and capacity utilisation (%)

	Raw material procurement	Wages & allowances	Fuel and power	Repairs & maintenance	Depreciation	Others	Total operational cost	Salary & allowances	Interest and bank charges	Rates & taxes	Others	Total administrative & overhead expenses	Total cost	Capacity utilisation
Non-estate sector	0.06	0.48	0.74	0.21	0.54	0.30	2.33	0.20	0.61	0.03	0.12	0.96	3.29	35.21
	(1.83)	(14.59)	(22.49)	(6.38)	(16.41)	(9.12)	(70.82)	(6.08)	(18.54)	(0.91)	(3.65)	(29.18)	(100.00)	
Estate sector	0.04	0.82	0.83	0.18	0.34	0.44	2.65	0.23	0.06	0.05	0.43	0.77	3.42	30.36
	(1.17)	(23.98)	(24.27)	(5.26)	(9.94)	(12.87)	(77.49)	(6.73)	(1.75)	(1.46)	(12.57)	(22.51)	(100.00)	
Total	0.06	0.54	0.75	0.20	0.51	0.33	2.39	0.21	0.51	0.04	0.17	0.93	3.32	34.27
	(1.81)	(16.27)	(22.59)	(6.02)	(15.36)	(9.94)	(71.99)	(6.33)	(15.36)	(1.20)	(5.12)	(28.01)	(100.00)	

Figures in brackets represent percentage share of different cost components.

average unit cost was examined by fitting a regression equation on average unit cost:

$$y = 5.03 - 0.04x$$
$$SE = (0.02)$$
$$\text{'t' value} = 1.94$$

where y = average unit cost, and
x = capacity utilisation.

As is evident from the equation, the strength of the inverse relationship between capacity utilisation and average cost is trivial since 't' value of the equation was significant only at 10 per cent level (Fig. 2). The major factors affecting the inverse relationship among the units with comparable levels of capacity utilisation were, differences in labour intensity, earnings per employee, sources of power, establishment charges, existing combinations of machinery, nature of raw material processed and sources of funds. For instance, among the individual units, maximum capacity utilisation recorded was 69.61 per cent. However, in terms of average unit cost, the factory could attain only seventh rank due to higher wages and allowances, fuel cost, establishment expenses and an obsolete combination of machinery. Fuel and power being the most important cost component of the industry, the incidence of power cut as well as dependence on alternative sources of power have considerably influenced the inverse relationship between capacity utilisation and average unit cost.

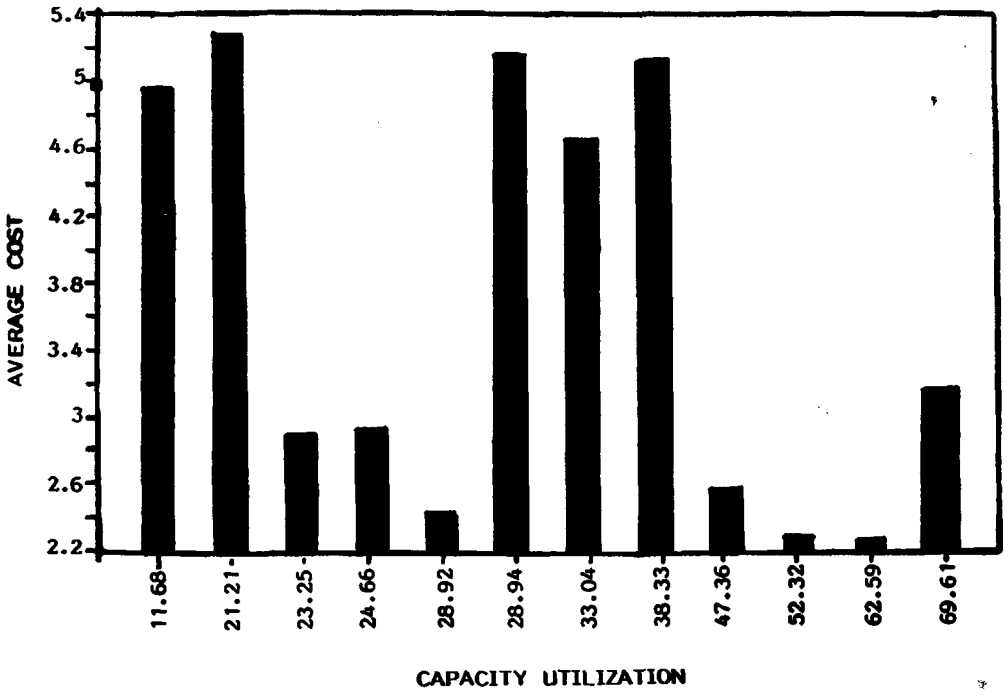

Fig. 2. Relationship between capacity utilization and average cost.

Performance of the industry

The cost analysis did not clearly show the sector-wise performance of the industry. Therefore, a sector-wise comparison of the major components of total value of output was attempted (Table 4) which shows that 76.24 per cent of the total value of output of

the industry was constituted by raw material cost. Transportation charges and the margin of the middlemen accounted for the higher share of raw material cost in the non-estate sector. The estate sector had a relatively higher share of profit, inspite of its higher average unit cost. Two important factors contributing to a higher share of profit in this sector were self-reliance on raw material and a higher unit value of sales realisation. Table 5 shows the result of varying accessibility to raw material reflecting in sector-wise differences of grade-wise production.

Table 4. **Sector-wise share of major components of total value of output (%)**

	Raw material	Fuel & power	Emoluments	Interest	Depreciation	Others	Profit	Total
Non-estate sector	77.59	4.22	3.69	3.43	3.23	4.14	3.70	100.00
Estate sector	70.47	4.68	5.90	0.35	1.90	6.42	10.28	100.00
Total	76.24	4.31	4.11	2.84	3.00	4.45	4.95	100.00

Table 5. **Grade-wise production of block rubber from field coagulum in the estate and non-estate sectors (MT)**

	ISNR 10	ISNR 20	ISNR 50	Off grade	Total production of field coagulum grades
Estate sector	769.042	359.350	118.725	9.750	1256.867
	(61.19)	(28.59)	(9.45)	(0.77)	(100.00)
Non-estate sector	15.717	5865.685	434.207	186.950	6502.559
	(0.24)	(90.21)	(6.68)	(2.87)	(100.00)
Total	784.759	6225.035	552.932	196.700	7759.426
	(10.11)	(80.23)	(7.13)	(2.53)	(100.00)

Figures in brackets represent relative share of each grade.

The estate sector which is exclusively dependent on fresh field coagulum from internal sources, had the highest share of ISNR 10 (61.19 per cent) which is qualitatively superior to other grades. The share of ISNR 10 in the non-estate sector was only 0.24 per cent and 90.21 per cent of the total production in this sector was accounted for by ISNR 20. As a result, the average sales realisation in the estate sector was Rs. 17.86 kg^{-1} compared to Rs. 17.08 kg^{-1} in the non-estate sector.

To assess the sector-wise productive efficiency, certain basic structural ratios and technical co-efficients were examined. As is evident from Table 6 the non-estate sector was characterised by higher capital-output ratio and capital-labour ratio. This shows a relatively lower capital productivity and higher capital intensity. The co-existence of a higher capital productivity and lower capital intensity coupled with a comparatively poor labour productivity suggests the need for modernisation and re-organisation of machinery and mode of raw material procurement in the estate sector. Labour productivity and emoluments per employee in the two sectors also showed conflicting trends. The net value added per unit of output was higher in the estate sector compared to the non-estate sector.

Table 6. **Basic indicators of productive efficiency (Rs.)**

	Fixed capital	Net value added	Net value added	Fixed capital	Total emoluments
	Net value added	Labour*	Output	Labour	Labour
Non-estate sector	0.86	58529.35	0.22	50333.50	9634.35
Estate sector	0.40	50581.05	0.30	19928.80	10111.32
Total	0.75	56423.75	0.24	42278.92	9760.71

* Labour includes factory labour and supervisory and managerial staff.

CONCLUSIONS

Operation-wise analysis showed that there were differences in the levels of technology and efficiency among the processing units. In the pre-cleaning line, pre-breaker was found to be ideal for fresh field coagulum while a combination of pre-breaker, macerator and hammer mill was more suitable for dry field coagulum. In the final size-reduction line, performance of creper-hammer mill was found to be superior to shredder and extruder in terms of output, dirt removal and relative cost. An electrically heated drier appeared to be more economical than oil-fired driers under normal circumstances.

The excess drying capacity in the non-estate sector calls for creation of more creping capacity by installing additional crepers depending on the specific problems of individual factories. Increasing the existing drying capacity to match the excess creping capacity supplemented by procurement of raw material from external sources seem to be one plausible policy option for the estate sector.

In the industry, the average capacity utilisation was only 34.27 per cent and it could utilise only 34.33 per cent of the total available working days. The major constraints for the unutilised days were shortage of power and raw material, excess drying capacity and mechanical breakdown.

Sector-wise analysis of the capacity utilisation and average unit cost of processing showed a higher capacity utilisation and a lower cost of processing in the non-estate sector. The major cost components of the industry were fuel and power and wages and

allowances. The non-estate sector was characterised by a relatively higher share of administrative and overhead expenses in the total cost, while the estate sector had a higher share of operational costs. Strength of the inverse relationship between capacity utilisation and average unit cost was adversely affected by a variety of factors ranging from availability of power, raw material and funds to differences in the level of technology.

An analysis of the major components of the total value of output of the industry showed that 76.73 per cent of its value was constituted by raw material cost. Share of profit is higher in the estate sector due to captive supply of raw material and a higher unit value of sales realisation. In terms of productive efficiency, the non-estate sector was characterised by a relatively poor capital productivity, higher capital intensity and a higher labour productivity compared to higher capital productivity, and lower capital intensity and labour productivity in the estate sector.

The policy implications emerging from the study call for both short-term and long-term measures for improving the performance of the industry. In the short-period, the non-estate sector has to increase its creping capacity for improving its capacity utilisation even if it demands dependence on alternative sources of power. Alternatively, the estate sector factories have to take steps to ensure sufficient supply of raw material from external sources. In the long run, modernisation and expansion of creping and drying lines deserve attention of the estate sector while the non-estate sector factories have to tackle the delicate problem of procuring a major share of raw material directly from the growers.

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