TILE INDUSTRY IN KERALA - ECONOMICS, PROBLEMS AND PROSPECTS

Thesis submitted to the Cochin University of Science and Technology forthe award of the Degree of Doctor of Philosophy in Economics under the Faculty of Social Sciences

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CERTIFICATE

Certified that the Thesis, **TILE INDUSTRY IN KERALA - ECONOMICS, PROBLEMS AND PROSPECTS** is the record of bonafide research carried out by Mr. Mani, K.P. under my supervision. The thesis is worth submitting for the degree of Doctor of Philosophy in Economics.

Cochin,

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(Dr. Jose T Payyappilly)

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CHAPTER I

INTRODUCTION

When India became free, Kerala was made up of two princely states, Travancore and Cochin, and Malabar which was under the direct administration of the British. Under the States Re-organization Act of 1956, Travancore-Cochin State and Malabar were united to form the State of Kerala on Ist November, 1956. Some territorial adjustments had necessary to be made on re-organization. In this adjustment, Kerala lost the taluks of Thovala, Agasteeswaram, Kalkulam and Vilavancode in the far south and Shencotta in the east, while it gained the Malabar district and the Kasargod taluk of South Kanara district in the north. The Lacccadive, Minocoy and Amindivi islands lying off the coast of Malabar were detached from Kerala and declared as Union Territory.

1.1. Industrialisation in Travancore-Cochin and Malabar

From the days immemorial, traditional industries like mat weaving, handlooms, bamboo products etc. were popular in different parts of Travancore, Cochin and Malabar. But concrete attempts for industrialisation were started only by the middle of the 19th century. The first factory, a textile factory was started at Quilon in 1881 by an American group.[1] Subsequently, coir, tea and rubber factories flourished in different parts.

While we trace the industrial development of Travancore, Sir C.P. Ramaswamy Diwan deserves special mention. He realised the fact that capital and skilled labour are not sufficiently available in Travancore or nearby states and hence he invited outsiders to start industries in Kerala. Even foreign companies reacted favourably to the call given by him. For instance 'Alakan', a Canadian Company expressed their willingness which led to the starting of 'Indian Aluminium Company' at Eloor. The other major industries started during the days of Sri C.P. were Travancore Sugars and Chemicals Limited, Ogale Glass Factory, Fertilisers and Chemicals Travanore Limited, Rayons, Perumbavoor and Travancore Titanium Products Limited.

The important industries flourished in Cochin state were coconut oil and textiles. One of the important textile mills in Cochin state was Pushpagiri Weaving Mills

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1. Rajan, K.A. (1987), Keralathilay Vyvasayangal, Kerala Language Institute, Trivandrum, Vol. I, p.l.

started at Trichur in 1908, the present Sitaram Textiles. An industrial survey was conducted in 1909 by Cochin state government, followed by an economic survey in 1920. The survey committee suggested the starting of an Industrial Advisory Board. As per this recommendation, the Board was constituted but soon after it was merged with the Economic Development Committee formed in 1925.

Just like Cochin state, Malabar also earned good amount of foreign exchange from the export of coconut oil. Another important industry popular in Malabar was soap industry. While we trace the industrialisation of Malabar or even North Kerala, the works of Basel Mission deserves special reference.

1.2. Basel Mission activities

Basel Evangelical Missionary Society, or Basel Mission, a missionary organisation established in Basel, Switzerland started operating in the Madras Presidency from 1834 onwards. The activities of the mission concentrated in Malabar and South Canara (Karnataka state) may be chronologically placed under[2]

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2. Jai Prakash Raghaviah (1986), "Basel Mission Industries in Malabar and South Canara (1834-1914)", M.Phil desertation submitted to the Centre for Development Studies, Trivandrum (unpublished), p.35.

early phase	1834 - 1852
middle phase	1852 - 1882
final phase	1882 - 1914

The early phase begins with the arrival of missionaries in the Malabar coast in 1834. Initially, the missionaries organised various industrial activities mainly based on local crafts. This phase was characterised by the initiatives undertaken by the industrial missionaries on their own.

During the middle phase (1852-1882) industrial activities became increasingly under the control of the industrial commission. This period was characterised by the establishment of factory type of production organisation. Handloom weaving establishments at various centres were set up beginning with Mangalore. The first tile factory, printing press and mechanical workshop were also established at Mangalore during this period. The phase also witnessed considerable diversifications of trading activity of the mission.

The final phase started from 1882 when the Industrial Commission was amalgamated with the missionary joint stock company. It enabled higher capital investment and expansion of industrial activities in Malabar coast.

However, in 1914 with the outbreak of the world war I, the missionary involvement in the industrial activities came to an end. In 1914, the Basel Mission sold their entire enterprises to the Common Wealth Trust.

1.3. Industrial Development in the state of Kerala

Kerala constitutes only 1.2 per cent of the entire land surface of India, but at the same time has to support about 3.8 per cent of the total population of the country (1981)[3]. This disparity between land and population lies at the root of her many economic problems especially those of mounting unemployment and chronic poverty. This problem cannot be solved by agricultural and social services alone unless it is supplemented by speedy industrialisation in which small, medium and large industries will have to play their legitimate role. The progress made by the state in the growth of factories, employment and production is presented in table 1.1:

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3. Sankaranarayanan, K.C. and Karunakaran, V. (1985), Kerala Economy, Oxford & IBH, New Delhi, p.153.

Table 1.1. Growth performance of industries in Kerala

Sl. No.	Particulars	Unit	1961	1971	1981	1987-88
1.	Number of registered working factories	No.	2475	3024	9099	11489
2.	Estimated average daily employment	000s	172	208	303	300
3.	Number of registered small scale industrial units	000s	-	8.6	18.4	47.2
4.	Annual index of industrial production (1970 = 100)	-	-	100	187	171

Source: Government of Kerala (1989) Kerala Economy 1960-61 to 1987-88, Department of Economics and Statistics Trivandrum.

From table 1.1, it was found that the number of registered working factories recorded 364.20 per cent increase during 1961-88, while during the same period registered small scale industrial units showed 448.83 per cent increase. The total number of registered working factories in Kerala constituted 4.99 per cent of total registered working factories in India in 1961 which went upto 8.34 per cent in 1987-88. In the case of registered small scale units, the share fall from 3.59 per cent in 1971 to 2.97 per cent in 1987-88. Also it was observed that the maximum growth in the number of working factories occurred during 1971-81 (299.89 per cent).

Investment in Industrial Sector

Industrial development in the state sector did not receive much attention in majority of the five year plans due to resource constraint. Because of the social, political and economic compulsions, the state had to give more emphasis to other sectors like social services sector during the five year plans. The plan outlay/expenditure for the industrial sector includes mining is given in table 1.2 as a percentage of the total outlay/expenditure incurred by the state government during the plan periods. From table 1.2, it is evident that the industrial sector of the state did not attract adequate investment in the earlier plans. This calls for heavy investment in the vital sector of the economy by the central government, national term lending institutions and private entrepreneurs. On the other hand, the share of the state in the central sector investment is coming down since 1971-72. Though in absolute terms it has shown

Table 1.2. Planwise expenditure/outlay provided for industrial sector, large and medium industries and small scale industries as a percentage of total outlay/expenditure under state plans

(in percentages)

Five Year Plans	Outlay/expenditure for industry and mining	Outlay/expenditure for large and medium industries	Outlay/expenditure for small scale industries
I	1.9	-	-
II	7.4	2.2	-
III	7.9	4.4	2.2
IV	7.5	4.5	0.57
V	11.1	7.3	0.35
VI	8.2	5.8	0.61
VII (first 3 years)	10.9	8.2	NA

Source : Compiled and computed from

i. Government of Kerala (1989), Eighth Five Year Plan - Report of the Task Force on Large and Medium Scale Industries, State Planning Board, Trivandrum.

ii. Government of Kerala (1989), Eighth Five Year Plan - Report of the Task Force on Small Scale Industries, State Planning Board, Trivandrum.

increase over the past few years, the percentage share of the state declined from 2.9 per cent in 1971-72 to 1.6 per cent in 1987-88.[4]

Similarly, the total financial assistance disbursed by the All India financial institutions such as IDBI, IFCI, ICICI, LIC and GIC to Kerala has also found to be very low. States like Maharashtra, Gujarat and Tamil Nadu received much higher quantum of financial assistance compared to Kerala which is visible from table 1.3.

Composition of labour force

Another important indicator of industrial development is the increase in the percentage of labour force depending on industries and allied sectors. Table 1.4 gives a detailed picture of the composition of workers in Kerala which shows that in 1981, 51.7 per cent of the workers depend on primary sector compared to 47 per cent in 1961. Also the percentage of workers engaged in agriculture sector increased from 38.3 per cent in 1961 to 41.3 per cent in 1981. The percentage of workers

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4. Government of Kerala (1989), Eighth Five Year Plan: Report of the Task Force on Large and Medium Scale Industries, State Planning Board, Trivandrum, p.13.

Table 1.3. Financial assistance disbursed by public sector non-banking financial institutions to selected states

(in percentages)

States	1974-75	1980-81	1985-86	1986-87
Gujarat	12.5	11.9	12.6	14.3
Maharashtra	21.4	22.2	17.1	16.6
Andhra Pradesh	3.2	5.8	8.0	7.4
Karnataka	10.1	8.9	8.7	6.1
Tamilnadu	13.2	10.7	10.0	9.1
Kerala	2.6	3.1	2.1	2.1

Source: Government of Kerala (1989), Eighth Five Year Plan - Report of the Task Force on Large and Medium Scale Industries, State Planning Board, Trivandrum.

Table 1.4. Composition of the work force in Kerala
(in percentages)

Sectors/subsectors		1961	1971	1981
i.	Cultivators	20.9	17.8	13.1
ii.	Agricultural labourers	17.4	30.7	28.2
A.	Sub Total - Agriculture Sector (i + ii)	38.3	48.5	41.3
iii.	Livestock, forestry and fisheries	8.7	7.0	9.6
iv.	Mining & Quarrying	-	0.5	0.8
B.	Sub total - Primary sector (A + iii + iv)	47.0	56.0	51.7
v.	Household industry	8.7	4.3	3.7
vi.	Manufacturing other than household	9.4	11.4	12.2
vii.	Construction	1.2	1.7	3.0
C.	Sub total - Secondary sector (v + vi + vii)	19.3	17.4	18.9
viii.	Trade and commerce	5.7	9.1	11.0
ix.	Transport, storage and communication	2.7	3.9	5.0
x.	Other sources	25.3	13.6	13.4
D.	Sub total - Tertiary sector (viii + ix + x)	33.7	26.6	29.4
Total (B + C + D)		100.0	100.0	100.0

Source: Government of Kerala (1989), Kerala Economy 1960-61 to 1987-88, Department of Economics and Statistics, Trivandrum.

engaged in the secondary sector, which includes the sub sectors, household, manufacturing and construction actually declined to 18.9 per cent in 1981 from 19.3 per cent in 1961. This clearly reveals the low rate of industrialisation in the state.

The contribution of the secondary sector to the net state domestic product is another yard stick to measure the levels of industrial development. The details of the net state domestic product is illustrated in table 1.5 which shows that the share of the secondary sector increased from 15.24 per cent in 1960-61 to 22.33 per cent in 1980-81. But the quick estimates for the year 1987-88 indicates that the share of the secondary sector has marginally declined to 21.55 per cent.

Major reasons for the low rate of industrialisation in Kerala are:

i. Non availability of deposits of industrial fuel like coal or oil or other resources.

ii. Lack of industrial skill and traditions of industrial enterprise.

iii. Acute labour troubles.

Table 1.5. Sectoral composition of net state domestic product (1970-71 series)

Items	1960-61	1970-71	1980-81	1987-88* (QE)
Net State Domestic Product (Rs crores)	432	1255	3505	7830
Sectoral contribution (in percentages)				
a) Primary	55.98	49.44	41.38	35.32
b) Secondary	15.24	16.32	22.33	21.55
c) Tertiary	28.78	34.24	36.29	43.13

*figures correspond to 1980-81 series

QE - Quick estimates

Source: Ibid.

Twenty five years ago, in his report on the Techno-Economic Survey of Kerala, Lokanathan remarked "Trade unionism, prevalent in the state, which is not always unmixed with political motives, has been responsible for retarding the progress of investment in Kerala by potential investors from outside the state"[5]. Even today, his observation holds true.

5. Sankaranarayanan, K.C. and Karunakaran, V. (1985), Op.cit. p.154.

1.4. Traditional industries in Kerala

Traditional industries in Kerala assume importance because of the large labour force employed in these industries. The major traditional industries in the state are coir, handlooms, cashew, Khadi and Village industries, handicrafts, bamboo, beedi and tiles with a total employment of about 10 lakh persons (coir 44 per cent, handloom 20 per cent, cashew 10 per cent, Khadi and Village Industries 11 per cent and others 15 per cent)[6].

There are certain characteristics common to all the traditional industries. Firstly, these industries are concentrated in certain regions of the state on account of geographical, historical and sociological factors and resource endowments. Other characteristics common to the traditional industries in the state are, low level of technology and reluctance to adopt modern techniques of production. The labour force in traditional

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6. Government of Kerala (1989), Eighth Five Year Plan - Report of the Task Force on Traditional Industries, State Planning Board, Trivandrum, p.4.

industries do not get full time employment throughout the year owing to multiplicity of reasons, the most important among them being scarcity of raw materials and slump in the market.

a) Coir industry

Among the traditional industries of the state, coir has the foremost place. The back waters of Kerala suitable for husk retting and the traditional skills of the workers have been responsible for the concentration of this industry in the state. The main centres of this industry are Chirayankeezhu, Quilon, Karunagappilly, Karthikappilly and Ambalapuzha taluks. Although, coir industry has found a place in Karnataka and Tamil Nadu, Kerala still produces 70 per cent of the coir and coir products in the country. Thirty per cent of coir and coir products manufactured in the state are exported.[7] During 1988-89 the export earnings from coir and coir products reached Rs 3332.12 lakh compared to Rs 3219.74 lakh in 1987-88.[8]

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7. Government of Kerala, (1989), Economic Review, State Planning Board, Trivandrum, p.66.

8. Ibid.

The internal market for coir and coir products is steadily increasing. The internal consumption of coir and coir products in India during 1986-87 was found 61000 tonnes.[9] Sales through the sales depots of the Coir Board increased from Rs 145 lakh in 1981-82 to Rs 250.03 lakh in 1985-86.[10] In order to expand the domestic market further, a system of rebate of 20 per cent on sale of coir and coir products for 90 days in a year was introduced from 1987 onwards.[11]

The total number of workers in coir industry in Kerala including part-time workers is estimated to be 4.30 lakh.[12] In 1988 the state government, with the assistance of the Coir Board, has issued family benefit cards to 222886 coir worker families including families of part-time coir workers.[13]

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9. Government of Kerala (1989), Eighth Five Year Plan: Report of the Task Force on Traditional Industries, Op.cit. p.12.

10. Government of Kerala (1989), Eighth Five Year Plan: Report of the Task Force on Traditional Industries, Op.cit.

11. Government of Kerala (1989), Eighth Five Year Plan: Report of the Task Force on Traditional Industries, Op.cit.

12. Government of Kerala (1989), Eighth Five Year Plan: Report of the Task Force on Traditional Industries, Op.cit.

13. Government of Kerala (1989), Economic Review, Op.cit.

The main thrust of coir development programmes in the five year plans has been the strengthening of the co-operative sector by bringing more workers into the co-operative fold and enabling them to have more days of work and better way of living. There were 828 coir co-operative societies in Kerala as on June 30, 1988. Of these, 448 societies are working, 120 newly registered societies have not started functioning, 68 are dormant and 192 are under liquidation.[14] The major constraints of this industry are:

i. Difficulties in getting the raw materials

ii. Declining foreign market for coir and coir products

iii. Reluctance to modernise the factories due to historical and sociological reasons.

b) Cashew industry

Most of the cashew processing units are confined in and around Quilon town. Cashew industry is mainly in the factory sector, but it is considered as a traditional industry because of the low level of technology involved in the processing of cashew nuts.

14. Ibid.

There were 274 cashew factories in the state at the end of 1988 employing 1.11 lakh persons, which show an increase of 10 factories and 4000 labourers over those at the end of 1987.[15] Cashew industry accounted for only 2.2 per cent of the total number of registered factories in the state, but it reached 35.9 per cent of the total number of factory workers.[16]

The industry had flourished on large imports of raw nuts from East African Countries of Mosambique, Kenya and Tanzania. Over the last decade, these countries have developed their own cashew processing units and have almost ceased to export nuts. Traditional sources of raw cashew nuts have also dried up and there arose strong competition from countries like Brazil and China for purchase of raw nuts. Hence, scarcity of raw nuts and the consequent unemployment of workers are the major problems facing the cashew industry in the state.

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15. Ibid.

16. Ibid.

c) Handloom industry

The industry is greatly concentrated in the districts of Trivandrum, Kozhikode and Cannanore providing employment to about 2 lakh persons.[17] The northern districts produce handloom fabrics to cater to the export market and the southern districts specialise in the production of finer varieties for meeting domestic demand.

Handloom weaving has been traditionally associated with particular caste and communities of Kerala for several centuries. The Pattaryas of Kottor, Erawiel in the erstwhile South Travancore and the Chalias in the other parts of the state are examples of caste guilds which grew up around the handloom industry.[18]

Production of handloom cloth in the state during 1988-89 is estimated to be 104.88 million meters, valued at Rs 69.82 crores. Fifty seven per cent of the production was contributed by the co-operative sector, while

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17. Sankaranarayanan, K.C. and Karunakaran,V. (1985), Op.cit. p.253.

18. Ibid.

the corporate sector and private sector produced three per cent and 40 per cent respectively.[19]

The number of looms in the corporate sector increased to 6984 as on 31.3.1989 from 6370 at the end of 1987-88.[20] On the other hand, the number of looms in the unorganised sector decreased by 2.7 per cent during the year 1988-89 compared to 30,130 at the end of the previous year.[21]

In recent years, the industry has been facing many difficulties such as high price of yarn, and dyes and the continuous threat from the mill sector with its superior production technology, design and marketing strategy. Though the industry could rehabilitate itself to a certain extent and improve its production and marketing services owing to the liberal assistance from the central and state governments, the problem of accumulation of unsold stocks still persists.

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19. Government of Kerala (1989), Economic Review, Op.cit.p.66.

20. Ibid.

21. Ibid.

d) Beedi industry

Beedi industry provides employment to about 3 lakh workers.[22] There is hardly any village without a beedi rolling shop. Yet it is seen unorganised to some extent in the erstwhile Malabar area of the state, where the industry is carried on a big scale employing a large number of workers and where it remains concentrated.

Co-operativisation of beedi industry is unique and the story started about 40 years back. In 1937, when the congress government came to power for the first time in the state of Madras, a noted trade union leader from Kerala, C.P.Krishnan, put forward the idea of organising beedi workers in the co-operative front. Later in 1957, the government which came to power in Kerala organised about 20 beedi employee co-operative societies. For some time, these societies worked rather satisfactorily. Today, only 3 to 4 of them continue to exist. But the Dinesh Beedi Co-operative which was started in 1969 at Cannanore has been making remarkable strides.

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22. Ibid. p. 68.

Twenty two primary beedi workers co-operative societies are functioning under the Kerala Dinesh Beedi Workers' Central Co-operative Society. The Society provided employment to 32670 workers during 1988-89 including 8168 women workers.[23] The total number of beedies manufactured by the society during the year 1988-89 was 531.06 crores, valued at Rs 27.04 crores.[24] More than 99 per cent of the raw materials consumed by the society are imported from other states, while about 87 per cent of the sales proceeds are realised from the domestic market.[25]

e) Handicrafts

The Handicrafts Development Corporation of Kerala is the primary agency for promotion and development of handicrafts industry in the state. Procurement and distribution of raw materials and marketing of finished goods are the main activities of the corporation. During 1988-89, the corporation has procured raw materials such as sandal wood, rose wood, etc. valued at Rs 4.09 lakh

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23. Ibid.

24. Ibid.

25. Ibid.

and distributed the above items worth Rs 3.28 lakh to handicrafts artisans.[26] The total sales proceeds of the corporation have increased from Rs 244.92 lakh in 1987-88 to Rs 282.21 lakh in 1988-89, registering an increase of 15 per cent over the previous years.[27] The performance in the export of handicrafts was also encouraging as the value of exports rose by 21 per cent from Rs 16.37 lakh in 1987-88 to Rs 19.83 lakh in 1988-89.[28]

f) Bamboo industry

The Kerala State Bamboo Corporation Limited is the sole agency engaged in the promotion and development of bamboo industry in the state. The procurement and distribution of bamboo reeds to traditional workers and collection and sale of mats produced by them are the main functions of the corporation. The manufacturing and marketing of resin bounded bamboo boards is another activity recently started.

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26. Ibid. p.64.

27. Ibid.

28. Ibid.

The corporation has collected and distributed 120 lakh reeds valued at Rs 137 lakh during 87-88.[29] Mats procured and sold during the year was 695 lakh sq.ft. worth Rs 161 lakh, compared to 629 lakh sq.ft. worth Rs 174 lakh during the previous year.[30] Bamboo boards manufactured was 3.29 lakh sq.ft. worth Rs 23.20 lakh and the effective sale was 2.18 lakh sq.ft. for Rs 11.76 lakh. Thus the total turnover of the corporation during 1988-89 was Rs 370 lakh registering an increase of 16 per cent over Rs 318 lakh during the previous year.[31] The corporation provides employment to 15000 weaver families, 2500 reed cutters and 1000 other workers mostly belonging to the weaker section.[32]

g) Khadi and village industries

The Kerala Khadi and Village Industries Board was constituted under the provisions of the Kerala Khadi and Village Industries Act of 1957. It is the function of the Board to organise, develop and regulate Khadi and Village Industries recognised by the Khadi and Village Industries Commission. The Board also organises

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29. Ibid.

30. Ibid.

31. Ibid.

32. Ibid.

co-operative societies for the development of Khadi and Village Industries and sanctions loans and grants and provides other assistance to the co-operative societies registered institutions and individual artisans which mainly include (i) village pottery industry (ii) fibre and screpine industry (iii) blacksmithy and carpentry (iv) village leather industry (v) non edible oil and soap industry (vi) cottage match industry (vii) cane and bamboo industry (viii) fruit processing and preservation industry and (ix) gobar gas.

During the year 1988-89, the Khadi and Village Industries Board has registered 25 co-operative societies, raising the total number of co-operatives under its control to 1997.[33] During the year the Board could provide employment to 1.79 lakh persons through its various production centres, registered institutions and co-operative societies.[34] The value of production of khadi cloth increased from Rs 246.50 lakh in 1987-88 to Rs 360.31 lakh in 1988-89. The sales value also recorded an increase of 27.5 per cent during 88-89 to

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33. Ibid. p. 65.

34. Ibid.

Rs 510.98 lakh compared to previous year's Rs 400.85 lakh. The value of production of village industries increased from Rs 46.03 crores in 1987-88 to Rs 51.66 crores in 1988-89.[35]

1.5. Tile industry

The tile industry is about a century old in Kerala. About 12,000 persons are directly employed in this industry and the indirect employment is estimated to be 3000.[36] The main centres of tile industry are, Calicut, Feroke, Trichur, Ollur, Pudukad, Chalakudy, Alwaye and Quilon together accounting for 85 per cent of the tile factories in the state.[37] The installed capacity is 100 crore tiles per annum currently producing 55 crore tile per annum valued at about Rs 60 crores. Seventy per cent of the products were sold outside the state till the middle of 1960s, main markets

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35. Ibid.

36. Government of Kerala (1989), Eighth Five Year Plan, Report of the Task Force on Traditional Industries, Op.cit. p.14.

37. Government of Kerala (1986), Economic Review, State Planning Board, Trivandrum, p.65.

being Tamil Nadu, Andhra Pradesh, Gujarat, Rajasthan, Orissa and Maharashtra.[38]

1.6. Statement of the problem

Kerala was enjoying a dominant position in tile production in the country for a century. The demand for Kerala tiles was steadily increasing till 1965 both in the local and external markets. The number of tile factories also doubled in early 1960s as natural clay, firewood and unskilled labour were easily available. But the situation changed since 1965. Development of tile factoriees in other states like Tamil Nadu, Karnataka, Andhra Pradesh and Gujarat reduced Kerala's external trade. Preference for RCC type houses crippled internal markets also. Scarcity of good clay, stiff resistance from environmentalists towards clay mining, scarcity and high price of firewood and other inputs and increase in the cost of labour adversely affected the tile industry and the majority of the factories are on the brink of sickness.

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38. Kotti Reddy, A (1987), Status of Tile Industry in Kerala, Small Industries Service Institute, Trichur, p.1.

1.7. Objective of the study

i. To study the economics of the tile industry in Kerala for the period 1978-79 to 1987-88.

ii. To examine the regional variations in the economics of the industry.

iii. To identify the major problems and constraints confronted by the tile industry in Kerala.

iv. To examine the prospects of tile industry in Kerala.

1.8. Methodology

a) Sample selection

The tile industry in Kerala is a traditional one and due to various reasons like availability of quality clay, firewood etc. it has certain regional concentration. The basic organisational structure also differs from place to place. Further, the units vary in their production capacity also. The type of control, the quality of tiles and cost of production also differ from unit to unit. Therefore, it was felt that a stratified analysis will be more appropriate based on location and size.

Classification on the basis of location

On the basis of location, the tile industry in Kerala can be classified into four regions namely Calicut region, Trichur region, Alwaye region and Quilon region.

In northern part of Kerala, the industry is concentrated in Calicut and Feroke which constitute Calicut region. Superior variety of clay is available in plenty in this area. The facility of water transpoort in this region reduces the cost of transportation of raw materials and the finished goods.

Trichur region constitutes the factories located at Trichur, Ollur, Pudukad and Chalakudy. Majority of factories located in this region are very small in size.

The factories spread around the banks of Periyar river form Alwaye region. Just like Calicut region, facility of water transport is an advantage in this region.

In southern part of Kerala, the industry is located at Quilon. Just like Trichur and Alwaye regions, factories located in Quilon region are also small in size and modernisation is yet to take place in this region.

Classification on the basis of size

The men and machinery of a factory are related to its size. The Small Industries Service Institute, Trichur classified the industry according to its size in 1981 as follows.[39]

Category A: Those units producing less than 7500 tiles per day come under this category and their share in the total factories in the state is worked out to be 76 per cent.

Category B: Units producing between 7500-20,000 tiles per day are included in this group, percentage share being 21.

Category C: Units producing more than 20,000 tiles per day come under this group (3 per cent)

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39. Small Industries Service Institute (1980), Status Report on Tile Industry in Kerala, Trichur, pp. 3.4 - 3.5

However, while selecting the sample for the purpose of this study, size wise classification is not considered due to

i. inadequate number of units under Category C

ii. Even if a strata is formed from category C or from category B, they cannot be combined with units from category A.

b) Sampling size

Of the total 324 factories in Kerala* 33 are located in Calicut region (10.18 per cent), 157 in Trichur region (48.45 per cent), 36 in Alwaye region (11.11 per cent) and 51 in Quilon region (15.74 per cent). The remaining 47 factories are spread in other areas.[40] Sample consists of 32 factories selected at random from each region, comprising of five factories from Calicut region, sixteen factories from Trichur region, five factories from Alwaye region and six

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40. Government of Kerala (1987), Economic Review, State Planning Board, Trivandrum, p.66.

*Note: Economic Review 1987 showed that there are 337 factories in the state. But field enquiry revealed that, 13 factories have stopped production due to various reasons and hence, for the purpose of this study, population is taken as 324 factories.

factories from Quilon region. Data were collected for a ten year period from 1978-79 to 1987-88 with the help of pre tested structured schedule.

In order to examine the economics of the industry, details on capital structure, inputs, output, workers emoluments etc. were required. All these concepts are developed for large manufacturing concerns and it varies even from industry to industry. For tile industry, exclusive definitions are not available and hence the definitions adopted by Annual Survey of Industries have been used for the study and hence modifications were also made wherever necessary. Collected data were analysed with the help of percentages and structural ratios.

Working definitions

a) Fixed capital

Fixed capital represents the value of fixed assets owned by the factory as on the closing day of the accounting year. Fixed assets include land, buildings and plant and machinery.

Strictly speaking, while calculating fixed capital, depreciation is also to be accounted. But all the survey units were started years and years back and hence, depreciation in the value of fixed assets is not considered.

b) Physical working capital

Physical working capital is defined to include all physical inventories owned, held or controlled by the factory as on the closing day of the accounting year such as stock of materials, stock of semi-finished goods and stock of finished goods.

c) Working capital

Working capital is the sum total of the physical working capital and the cash deposits in hand and at bank and the net balance of amounts receivable over amounts payable at the end of the accounting year.

d) Productive capital

Productive capital is the total of fixed capital and working capital as defined above.

e) Invested capital

Invested capital is the total of fixed capital and physical working capital as defined above.

f) Workers

Workers are defined to include all persons employed in the factory.

If we go for strict definition, the administrative staff is to be treated separately. But in tile industry, the number of administrative staff is only one or two in each factory and even they participate in production process occasionally. Hence workers include administrative staff also.

g) Emoluments

Emoluments are defined to include wages/salaries and also the other benefits enjoyed by the workers.

h) Inputs

Inputs comprise gross value of materials, fuels etc. consumed during the accounting year.

i) Cost of production

The total cost of production is the sum total of inputs costs, wages/salaries and other establishment costs.

j) Value of output

Value of output is defined to include the ex-factory value of products and by products manufactured during the accounting year.

k) Gross profit (output cost)

Gross profit at output cost is defined as the difference between value of output and total cost of production.

l) Value added

Value added is obtained by deducting the value of total inputs from the value of total output.

Structural changes over the reference period were discussed with the help of selected structural ratios namely, fixed capital to invested capital ratio, fixed capital to productive capital ratio, input output ratio, value added to output ratio, fixed capital to output ratio, invested capital to output ratio, value added to invested capital ratio, value added to input ratio, output input ratio, output invested capital ratio and input invested capital ratio.

In order to examine the regional variations ANOVA and Critical Difference Test were used. Capital labour relationship was examined with the help of Cobb-Douglas production function. Problems were identified from discussions with owners, managers, workers, brokers and customers.

The prospects of tile industry is related to the demand from housing sector. Hence, the population, housing demand and housing stock were projected until 2001 AD using exponential function of form $y = ab^t$. The pattern of houses in Kerala is not available from the secondary source since 1971. Hence the researcher collected the details of 600 houses built since 1975 from the offices of local bodies. This 600 houses included 200 houses from south Kerala, 200 from central Kerala and 200 from north Kerala and 200 houses represented 100 rural house and 100 urban house from each strata.

Based on these details collected, the annual requirement of roofing tiles and company produced bricks were estimated until 2001 AD under different alternatives. An attempt was also made to indicate the area where the industry can diversify.

1.9. Review of literature

The literature available on tile industry includes papers published/presented and a few reports prepared by various individuals and institutions. Below an attempt is made to review the available studies and they are placed in chronological order.

Ceramics is an old industry. Ceramic products were manufactured and used for centuries. The first knowledge about the art of ceramics is available from the Vedas itself especially Atherva Veda, Rig Veda and Yjur Veda. Of the different ceramic products, the most popular are tiles and bricks.

The work which is claimed to be the first complete work on bricks and tiles in the English language is the one entitled "A Rudimentary Treatise on the Manufacture of Bricks and Tiles" by Edward Robson (1889). In the work, he explained in detail the ancient importance of tiles and how this formed an importannt part of monuments in different parts of the world. The book also gives a detailed account of different designs existed in olden days.[41]

In India, the tile factories were first started by Basel Mission. The Basel Mission also contributed to the entire development of north Kerala. These efforts were well explained hy Hoffman in his book "The Basel Mission Industries" (1913). Basel Mission decided to start tile factories in Mangalore and northern belt of Kerala because of the favourable factors existed there like the availability of good quality clay, labour and cheap transportation facilities.[42] Further information about the origin and development of tile industry are available from the workers of Appaswamy et al.(1948),[43]

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41. Edward Robson, A (1889), "A Redimentary Treatise on the Manufacture of Bricks and Tiles", Crosshy Lockwood and Sons, London, 10th Edn. pp. 1-3.

42. Hoffman, H (1913), The Basel Mission Industries, Basel Mission Press, Mangalore, pp 15-19.

43. Appaswamy et al. (1948), Introduction to Modern Indian Sculpture, Bright and Singh Publishers, Bombay.

Bose (1948)[44] Chandler (1949)[45] Chaudhury (1949)[46], and Duby (1950).[47]

The first research work on tile industry in India came from Karat (1955). His thesis entitled "History and Development of the tile industry in Mangalore", examined the factors responsible for the concentration of tile industry in Mangalore. He was of the opinion that, the availability of good quality clay and cheap labour were the primary factors which led to the concentration of the industry in and around Mangalore. He also made a comparison between new trends in housing construction and suggested that unless the industry diversifies by 1980, the future of the industry will become very gloomy.[48]

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44. Bose H.N. (1948), Modern Pottery Manufacture, Bright & Singh Publishers, Bombay.

45. Chandler M.N. (1949), Ceramics in the Modern World, Bright & Singh Publishers, Bombay.

46. Chaudhury M.R. (1949), Indian Industries Development and Location, Wisdom Books, Delhi.

47. Duby R.N. (1950), A Treatise on Industrial Minerals in India, Bright & Singh Publishers, bombay.

48. Karat B.G.(1955), History and Development of the Tile Industry in Mangalore, Department of Economics, University of Bombay (unpublished) Quoted in: Nayak K.V. (1987), "Tile Industry Some Aspects", paper presented in the seminar on Tile Industry organised by Western India Tile Manufacturers Association at Mangalore.

In 1957, the Department of Industries, Government of Madras, evaluated the merits and defects of different building construction technologies. The survey carried out in Madras city led the team to conclude that, when compared to RCC roofing, tiled roofs are more suitable to Indian conditions.[49]

An early evaluation of the tile industry in Kerala is available from the "Report of the Minimum Wage Committee for Employment in Tile Industry" headed by V.R. Pillai (1961). The report closely examined the extent of labour absorption in the industry and also pointed out that the extent of labour absorption is coming down over the years.[50]

National Council of Applied Economic Research (1962) discussed the factors which led to the localisation of the industry in Kerala in their report "Techno Economic Survey of Kerala". The team also examined the market potential of the products. Their analysis also revealed

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49. Government of Madras (1957), Manufacture of Building Materials, Department of Industries & Commerce, Madras

50. Government of Kerala (1961), Report of the Minimum Wages Committee for Employment in Tile Industry.

that the demand for tile and other products of the industry are much influenced by the goodwill of the firm.[51]

A call for modernisation of tile industry came from Poornam (1962) in his article "Common Tile Industry in Kerala". He was of the opinion that the only remedy to uplift the fast declining industry is diversification.[52]

Bhaskaran (1963) opined that modernisation is the urgent necessity of the tile industry. He examined the pattern of declining role of tile industry in the industrial map of Kerala with the help of relevant structural ratios.[53] Menon, P.K.S. (1963) also believed that the tile industry can survive only if the industry goes for modernisation. As a first step, he suggested that, the industry can think of producing glazing tiles.[54]

Tile industry in Kerala had a glorious past. But the situation started deteriorating by mid 1960s. This aspect was considered in depth by Lokanathan (1965). He

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51. National Council of Applied Economic Research (NCAER) (1962), Techno-Economic Survey of Kerala.

52. Poornam R. (1962), "Common Tile Industry in Kerala" Kerala Productivity Journal, July-Sept.1962, pp 56-61

53. Bhaskaran, K.R. (1963), "Tile Factories in Kerala," Paper presented in the Industries Seminar held at Small Industries Service Institute, Trichur, July 1963

54. Menon, P.K.S. (1963), Ceramic Glazes, Regional Research Laboratory, Trivandrum.

was of the view that the major factors responsible for the decline were, the falling external market, high labour cost and non-availability of good quality clay.[55]

John et al. (1966) highlighted how the scientific knowledge can be used for developing tile industry. He observed that one of the drawbacks of the roofing tile industry is the absence of technological innovation.[56]

The problems of the tile industry in the country are listed in the paper prepared by the economic research wing of the Syndicate Bank (1968). The paper highlighted that the modernisation programme is delayed due to the problem of finance particularly working capital. It was suggested that, the survival of the industry is possible only if, the banks and other financial institutions come forward to liberalise the conditions.[57]

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55. Lokanathan (1965), Industrial Programmes for the Fourth Five Year Plan, National Council of Applied Economic Research.

56. John, N.C. et al.(1966), Bricks and Tile Research in Indian, Central Building Research Institute, Roorkee.

57. Syndicate Bank (1968) "The Travails of Tile Industry", Pigmy Economic Review, Vol.14, No.1, August 1968.

Another important study on tile industry in the state was made by John Thomas Chirayath (1969). This study, besides tracing the origin and growth of the industry, assembled the main statistical data relating to its structure.[58]

Earlier studies highlighted that, one of the important reasons for the concentration of the industry in Kerala was the availability of good quality clay. But Ayyappan Nair (1973) in his article on clay deposits cautioned that our clay deposits are fast declining and the adequate supply of clay will be a problem in the near future.[59]

The new trends emerging in tile industry was examined in detail by Karunakaran (1975) who suggested that the tile manufacturing process should be changed to suit the new trends in construction.[60]

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58. John Thomas Chirayath (1969), A Study on the Tile Industry in Kerala, Labour and Industrial Bureau, Trivandrum.

59. Ayyappan Nair (1973), 'Clay Reserves in Kerala', Paper presented in the Seminar on 'Tile Industry in Kerala' organised by Tile Manufacturers' Association at Trichur, May 1973.

60. Karunakaran (1975), "Emerging Trends in House Construction", Kerala Productivity Journal, July-Aug. 1975.

One of the important steps in tile manufacturing process is kiln firing. A detailed account on different types of kilns, their relative merits and demerits are available from "Developments in the technology of kilns" by Sreedharan Nair (1975).[61]

The memorandum submitted to the Minimum Wages Revision Committee for Employment in Tile Industry in 1979 gives a detailed account of the problems of the industry. The memorandum also high lighted the necessity of fixing minimum wages in tile factories.[62]

Radha (1979) discussed the economics of the tile industry in Trichur district in terms of the distribution of units, total amount of capital invested, output and demand. She also listed out the major problems of the industry, which included, non availability of good

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61. Sreedharan Nair, M.R. (1975), "Developments in the Technology of Kilns", Kerala Productivity Journal, Nov-Dec. 1975.

62. Small Industries Service Institute (1979), The Memorandum to the Minimum Wages Revision Committee for Employment in Tile Industry.

clay, high fuel cost, high labour cost, lack of demand and loss of "external" market.[63]

A comparative study on different construction methods were made by Anto (1979) with the help of social cost benefit analysis and came to the conclusion that RCC roofing is not preferable under Kerala conditions.[64]

Another major study in this area was the status report prepared by Small Industries Service Institute, Trichur in 1980. The primary objective of this study was to examine the status of tile industry in Kerala and the study team suggested the introduction of quality control, implementation of new model kilns and modernisation schemes.[65]

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63. Radha C.V. (1979), Economics of Tile Industry in Kerala with Special Reference to Trichur District, MA desertation submitted to Dr.John Mathai Centre, University of Calicut (unpublished).

64. Anto,C.C.(1979), Cost Reduction in Building Technology, MBA desertation submitted to School of Management Studies, University of Cochin (unpublished).

65. Small Industries Service Institute (1980), Op.cit.

Information on tile industry particularly in Trichur district is available from the works of Shyam Bhat (1981)[66] and Paul (1981).[67]

Aminya Rao (1981) surveyed the sufferings of tile industry workers in Gujarat and concluded that the rich class very much exploits the tile workers in Gujarat.[68]

Khosala (1983) discussed the various alternatives of building technology and claimed that even today, the rural population use tiles for roofing purposes and there is sufficient scope for this industry in rural areas. She also suggested that the problem can be solved if credit sales are introduced.[69]

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66. Shyam Bhat,K.(1981), Role of Traditional Industries, MA desertation submitted to Dr. John Mathai Centre, University of Calicut (unpublished).

67. Paul, K.A. (1981), Structure and Pattern of Industrial Development in Trichur District, MA desertation submitted to Dr. John Mathai Centre, University of Calicut (unpublished).

68. Aminya Rao (1984), "Bonded Brick-kiln Labour - In Poverty and Bondage", Economic and Political Weekly, Vol. 16, July 4, 1981, p.1137.

69. Khosala, R (1983), "The Architecture of Rural Housing - Some issues in India", Journal of Rural Development, August 1983, p.32.

Aravindakshan (1983) classified the tile industry in Kerala into 3 categories - small, medium and large and a study was made with the following important objectives.[70]

a) to ascertain the degree of modernisation required

b) to ascertain the volume of financial requirement

c) to ascertain the agencies that can act as catalysts for modernisation.

The major findings of this study were the following.

i. There is technological stagnation in the tile industry

ii. More units are becoming sick because of the high production cost.

iii. Preference towards tile roofed houses are fast declining.

iv. Intermediaries are responsible for a high selling price

v. The industry is highly labour intensive.

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70. Aravindakshan, K (1983), A study of Tile Industry in Kerala with Special Reference to Trichur District, Ph.D.desertation submitted to Department of Commerce, University of Calicut (unpublished).

In earlier days, Mangalore and Kerala had a predominant position in tile production. But, later the industry spread to other parts of the country, particularly to Morvi in Gujarat. An account about the tile industry in Morvi is available from the survey report prepared by the Government of Gujarat (1984). From a comparison of the findings with Kerala scene, it was found that the problems which are predominant in Kerala are equally relevant in Gujarat also.[71]

Balan (1986) is of the opinion that the industry stagnated because of the static nature of the industry. He also observed that, the majority of the tile units in Kerala are following traditional methods mainly due to the lack of R & D facilities.[72]

Ananthasubramanian (1986) is of the view that modernisation is delayed due to the lack of finance.

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71. Government of Gujarat (1984), Roofing Tile Industry in Morvi, Department of Industries, Gandi Nagar.

72. Balan, P.P., (1986), Modernisation of Clay Products Paper presented in the Seminar organised by State Productivity Council at Trichur in August, 1986.

Modernisation is possible only if the banks and other financial institutions come forward to finance the industry.[73] The urgent need of modernising tile industry was stressed by Thomas also (1986).[74]

The study team appointed by the Western India Tile Manufacturers Association (1986) evaluated the growth of the industry in Mangalore for the last 100 years in terms of technology, production, finance and market. The team observed that, the coming up of factories in Morvi in Gujarat poses a threat to tile factories in Mangalore and also in northern Kerala. The team also Suggested liberalised lending to tile factories.[75]

An overview on the different aspects of raw material processing based on red clays is available from "Red clay based ceramic products - An overview" by

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73. Ananthasubramanian, D. (1986), Financing for Modernisation of the Industry. Paper presented in the Seminar organised by State Productivity Council at Trichur in August, 1986.

74. Thomas, P.F. (1986), Need for Development of Technology in Tile Industry. Paper presented in the Seminar organised by State Productivity Council at Trichur in August, 1986.

75. Western India Tile Manufacturers Association (1986), Problems and Prospects of Roofing Tile Industry.

Warrier *et al.* (1987). The entire discussion is based on important parameters, such as raw material quality, processing conditions and quality of products. Some of the recent developments in the red clay product manufacture, such as, the concept of vitrified red clay tiles and firing practices were also discussed in this paper.[76]

National Productivity Council (1987) made some attempt to measure the productivity of tile industry in Kerala. The study revealed that, eventhough the industry is expanding in terms of number of units, the capital and labour productivity are declining particularly since 1975, mainly due to high labour cost and raw material cost.[77]

According to Kotti Reddy (1987) it is necessary that all the tile units in Kerala state should immediately form a single organisation to represent their problems

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76. Warrier, K.G.K. *et al.*(1987), "Red Clay Based Ceramic Products - an Overview", *Vyawasaya Keralam*, Feb.1987, pp. 9-12.

77. National Productivity Council (1987), *Productivity of Tile Industry in Kerala*.

to the government and to take necessary steps to solve marketing and technical problems collectively and in association with various research bodies and other agencies.[78]

Hajela (1988) critically examined the problems and approaches for the modernisation of clay roofing tile industry. He listed the following factors responsible for slow modernisation.[79]

i. Industry is small scale, labour-intensive and rural based

ii. Lack of R & D facilities

He also suggested the following areas where modernisation is required:

i. Standardisation of products

ii. Diversification of kiln design

iii. Introduction of semi-mechanisation at various stages of clay preparation.

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78. Kotti Reddy, A. (1987), Op.cit.

79. Hajela, R.B. (1988), Problems and Approaches for the Modernisation of Clay Roofing Tile Industry, Central Building Research Institute, Roorkee.

A detailed account on the level of modernisation required at different levels is available from the paper "Modernisation aspects of tile Industry" prepared by Balachandran (1988). The paper pointed out that the cost of production of tile has been increasing due to high cost of firewood, clay, labour and transportation. He is of the view that cost reduction is possible only if modernisation is introduced at different levels.[80]

Besides the above mentioned studies, annual reports of the tile manufacturers association, profiles prepared by different tile factories and such other materials also give insight into the various aspects of tile industry. However, barring a few, almost all the studies suffer from the following deficiencies.

1. The studies are made by individuals or associations and not by authentic sources.
2. The studies are not based on any scientific methodology.

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80. Balachandran, S. (1988), Modernisation Aspects of Tile Industry, National Productivity Council.

3. Almost all the studies suggested that, the prospects of tile industry lies in, to what extent the industry can diversify. But not a single study so far attempted to quantify the prospects or direct the area or magnitude where the industry should diversify.

The present study is an improvement over the earlier studies in the following respects.

1. This is an attempt to study the economics of tile industry in Kerala drawing samples from all the four regions namely, Calicut, Trichur, Alwaye and Quilon together accounted for 85 per cent of tile factories in the state.
2. In order to study the economics of the industry, the methodology followed by the Annual Survey of Industries was used.
3. The study also examined the intra variations (variations for the same region over the years) and inter variations (variations between regions)
4. In order to examine the prospects of tile industry, an attempt was also made to estimate the average

annual requirement of roofing tiles and burnt bricks in Kerala till 2000 AD and thus to identify the area where the industry can diversify.

1.10. Limitations of the study.

1. Tile industry is a traditional one and the factories rarely followed the practice of keeping proper records. Hence sufficient difficulty was experienced in getting required data for a ten year period.

2. In an industry like this, details of quantity of inputs used and quantity produced is important. But because of the non-availability of quantity details, the major part of the analysis was done in value terms.

3. Majority of the tile factories were started before 1947 and hence, while calculating fixed cost, depreciation is not accounted.

4. While selecting the samples, classification based on location and size are to be considered. But the samples for the present study were drawn exclusively

on the basis of location because of the inadequate number of factories in category C.

5. Standard definitions of various concepts developed for manufacturing industries are not relevant for a traditional industry like tile industry. So certain working definitions are also used for the analysis.

6. Though tile industry is also producing certain items like ceiling tiles, floor tiles, ridges and bricks, in the entire literature, the tile industry is discussed on the basis of the production of roofing tiles only. Even in studies made by Annual Survey of Industries, the industry is examined strictly on the basis of production of roofing tiles. Hence in the present study also, major thrust is placed on roofing tiles.

7. Similarly, accurate information of sales are not known. So sales analysis is not done in a detailed manner.

8. In the Sixth chapter, an attempt is made to estimate the average annual requirement of roofing tile and burnt bricks in Kerala till 2001 AD. But about this,

earlier studies were not available and also the requirement of roofing tiles and burnt bricks will vary from design to design. Hence the estimates made by the researcher cannot be considered as 'final' eventhough every effort was made to give possible accuracy by computing under different alternatives.

1.11. Scheme of the study

The present study is arranged in seven chapters.

The introductory chapter starts with a discussion on the industrial development of Kerala and a review of important traditional industries. This is followed by the statement of the problem, objectives, methodology, review of literature and limitations.

The second chapter traces the evolution of the industry and reviews the growth. After this, the manufacturing process of tiles is also described.

The economics of the tile industry in Kerala is discussed in the third chapter with reference to the capital structure, input costs, labour cost, product mix, value added and gross profit with the help of the data collected from the samples. Structural changes were examined with the help of selected structural ratios.

A regional analysis of the industry is attempted in the next chapter. Economics of four regions namely Calicut, Trichur, Alwaye and Quilon were studied separately and compared.

The third objective of the study, ie. the identification of the problems and constraints confronted by the tile industry in Kerala is covered in the fifth chapter.

The sixth chapter examines the prospects of the tile industry in Kerala. The chapter starts with a discussion on housing problem in India followed by a detailed analysis of the situation in Kerala. The annual addition to the total housing stock till 2001 AD is also estimated. Based on these estimates, the average annual requirement of roofing tiles is derived under different alternatives. This chapter also examines the scope of diversifying tile industry into the production of low cost bricks.

The conclusions emerged from the study and a few recommendations are listed in the final chapter.

CHAPTER II

TILE INDUSTRY IN KERALA - AN OVERVIEW

The modern term ceramics was derived from the Greek word "Keramikos".[1] Keramikos originally meant the horn of an animal and later began to signify burnt stuff. With the passage of time, the restricted meaning of the word ceramics got enlarged. According to Encyclopaedia Britannica "all production of which the final result is baked clay in different grades of hardness and purity is to be considered as ceramics".[2] At present, even this definition has become inadequate since the newer ceramic items either do not include clay or are produced without heat processing. A general classification of the different ceramic products are given in table 2.1. According to this classification, all articles made chiefly from clay, used in building construction and other civil engineering works are included in the classification of structural clay products.

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1. Quoted in Government of Kerala (1969), A Study on the Tile Industry in Kerala, Labour and Industries Bureau Trivandrum, p.2.

2. Encyclopaedia Britannica Inc. (reprint 1973, Original appeared in 1768), Encyclopaedia Britannica, Vol.18, William Benton, USA, p.338.

Table 2.1. A general classification of the different Ceramic products

Structural clay products	Refractories	Pottery	Miscellaneous ceramics products
Building bricks of all types	Fire clay bricks	Glazed wall and earth tiles	Fuel sillica
Hollow bricks	Raw fire clay	Domestic and Sanitary earth ware	Special refractories
Terra Cotta	Sillica and Sillicons bricks and raw stone	China ware	Electrical ware
Roofing tiles and floor tiles	Magmasite bricks	Porcelain (Domestic, laboratory, Industrial)	Cements
Flower pots	Chrome bricks		Glasses
Chimney pots	Carbon bricks	Glazes and Engobes	Glazes
Glazed grain pipes	Sillicon carbide bricks & shapes		Enamels
Glazed pipes and accessories	Insulating refractories		
	Sillimanite bricks		
	Allumina bricks		
	Netorts, crucibles, ladddles etc.for metallurgical gas plant, scientific and other applications		

Source: Scarle A.B. and Grimshew,R.W. (1960), The Chemistry and Physics of Clays and other Ceramic Materials, Ernet Bonn Ltd., London, p.38.

2.1. Clay products as roofing material

According to Encyclopaedia Britannica, tile is stated as, a thin flat slab usually of burnt clay glazed or unglazed used either structurally or decoratively in building.[3] According to Encyclopaedia Americana, tiles are stone metal or composition slabs for use in covering a roof to keep out the water.[4] Tile industry embraces wide variety of terra cotta clay products such as roofing tiles, flooring and ceiling tiles, ridges, hollow bricks and blocks, wire cut bricks and other pottery items.

2.2. Roofing tiles - World scenario

It is known that bronze roofing tiles were relatively common on the most monumental buildings of the Roman empire.[5] Due to the rarity and value of bronze, during the middle ages and the renaissance, no examples of ancient bronze roof tiles are now known. All of the classic forms of clay tiles continued in use in various

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3. Ibid. Vol. 21, p.1148

4. Quoted in Kotty Reddy,A (1987), Op.cit.

5. Scarle A.B. and Grimshew, R.W. (1960), The Chemistry and Physics of Clays and other Ceramics Material, Earnest Benn Ltd., London, p.67.

parts of the world during the medieval period; but their supremacy as a roofing material gradually yielded to lead and zinc for churchs, public buildings, palaces and stone and thatch for the smaller private houses.[6] Clay roofing tiles used at present are substantially of the same form; improvements have been only in methods of manufacture and not in design. Tiles of different designs are used in England, parts of France, Italy, Spain, Greece, Turkey and the Mediterranean. Although the principle of the roofing tile of China and Japan is the same as that in the west, there are many differences particularly in design.[7] The most important characteristic feature of the Chinese roof tile is their colour. This is produced by a shiny glaze that reveals the expected Chinese ceramic skill. The centres of tile production and the nature of tiles of each centre are presented in table 2.2.

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6. Ibid. p.73.
7. Ibid, p.78

Table 2.2. World centres of tile production

Country	Nature of tiles
Asia Minor	Persian
North Africa, Spain	Moorish; Spanish
North Haly	Faience
Netherlands	Delft
Belgium	Handmade wall tiles
Germany	Poly chrome, machine pressed floor tiles
England	Gothic models
United States	Virtified floor tiles hand made wall tiles

Source: Scarle,A.B. and Grimshew, R.W. (1960), Op.cit.

2.3. Tile industry in India

Tile manufacture was first introduced in India in 1865 at Jeppo near Mangalore by the Basel Mission, a group of Missionaries from Switzerland and the brain behind this venture was Karl George Andreas Plebst.[8]

8. Government of Kerala (1969), Op.cit. p.2

They selected Mangalore because of the easy availability of suitable clay in that area. The missionaries introduced pattern of tiles which were so far being manufactured in France and Germany. Therefore this pattern of tiles were known as Mangalore pattern tiles wherever they produced in India. The Mission tiles soon acquired popularity since they satisfied a much felt need. Though the Mission started its second factory only after a lapse of eight years, the first factory was expanded and modernised very much during this period to cope up with the ever growing demand. The then government encouraged the mission, by giving free supplies of firewood and giving directions to the Public Works Department to use Mission tiles for all government buildings. The six tile factories set up by the Mission were located at Mangalore, Jeppo (1865), Calicut (1873), Kundroli (1882), Malpe (1956), Codacal (1894) and Feroke (1905).[9] Of these, Calicut, Codacal and Feroke are located in the present Kerala state and the remaining in the Karnataka state.

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9. Ibid. p.8.

Till the year 1960, tile industry was concentrated in a few areas like Mangalore in Karnataka state and Feroke, Alwaye, Trichur and Quilon in Kerala state. The demand for tiles grew fast from all parts of the country and about 70 per cent of the products manufactured by these units were marketed outside Karnataka and Kerala states.[10] Gradually tile units came to be established in other parts also, the main centres being Morvi (Gujarat), Godavari, Samalkot, Hyderabad, Jagganpet (Andhra Pradesh) and Kundapur, Mysore and Bangalore (Karnataka).[11] During a period of 120 years, the industry had its own ups and downs. During the entire period of its service, the technologies of tile production has undergone very little change and the tile's shape and specifications have never been changed. The growth performance of the industry in the country is presented in table 2.3.

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10. Ibid.p.18.

11. Small Industries Service Institute (1980), Op.cit. p.47.

Table 2.3. Growth performance of tile industry in Kerala

Particulars	1961	1971	1981
Reg. Units	266	345 (29.70)	509 (47.54)
Average number of working days	270	279 (3.33)	280 (N)
Productive Capital (lakh Rs)	352.68	859.16 (143.61)	898.30 (4.56)
Fixed capital (lakh Rs)	246.55	627.77 (154.62)	713.84 (13.71)
Working capital (lakh Rs)	106.12	231.39 (118.04)	284.43 (22.92)
Persons employed	19,976	22,470 (12.48)	23,686 (5.41)
Gros value of output (lakh Rs)	499.41	1291.20 (158.55)	2816.63 (118.14)
Gross value of input (lakh Rs)	230.45	696.20 (202.10)	966.19 (38.78)
Value added (lakh Rs)	268.96	595 (121.22)	1850.44 (210.99)

N - Negligible

Figures in brackets show growth rate over the previous year.

Source: Compiled from Annual Survey of Industries Census Sector, Industrial Statistics, Central Statistical Organisation.

2.4. Tile industry in Kerala - Origin and growth

The first tile factory was established at Calicut in 1873.[12] A review of the growth of tile industry in Kerala would suggest three distinct stages in its development. The establishment of the pioneer factories in Kozhikode and Quilon districts towards the end of the 19th century constituted the first stage. The products of these factories were of high quality. The spread of tile factories especially in the Trichur area may be considered as the second stage. These factories were generally small in size. Their working was almost on a cottage industry basis employing only hand presses and small pug mills often run by bullocks. These factories did not possess much of the tile making machinery and hence their products were definitely inferior to the older factories at Feroke and Quilon. The third stage in the development of the industry was the spread of quality consciousness among the smaller manufacturers and the introduction of machinery by them. This was partly due to the development of the local engineering

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12. Government of Kerala (1969), Op.cit.

industry which was able to fabricate the entire range of machinery required for a tile factory. As a result, most of the medium and small factories in the state could install the essential machinery and enhance the quality of their products to an appreciable extent.

Present status of tile industry in Kerala

The growth of the tile industry since the formation of Kerala state is presented in table 2.4. The number of factories rose from 154 in 1960 to 337 in 1985. However the pattern of growth was rather uneven as shown by the quinquennial growth rates. The quinquennial growth rate between 1960 and 1965 was as high as 48.7 per cent. The following five year period (1965-70) has marked a growth rate of only 0.87 per cent and that was the lowest ever marked. Again during 1970-75, there was an increase in the growth rate (23.38 per cent) and in the following two quinquennia, the growth rates were rather constant (8.42 per cent and 9.06 per cent respe- ctively). It was also observed that in the last decade

Table 2.4. Growth performance of tile industry in Kerala

Particulars	1960	1965	1970	1975	1980	1985
Units	154	229 (48.7)	231 (0.87)	285 (23.38)	309 (8.42)	337 (9.06)
Employment (workers)	13323	10287 (-22.79)	12460 (21.12)	11287 (-9.41)	11686 (3.53)	12174 (4.17)
Productive capital (Rs in lakh)	154.62	216.75 (40.18)	201.50 (-7.04)	342.54 (70.00)	898.30 (162.25)	989.20 (10.11)
Value of output (Rs in lakh)	270	299.06 (10.76)	306.73 (2.56)	749.16 (144.26)	1806.63 (141.15)	1959.65 (8.46)
Value of input (Rs in lakh)	134.69	144.81 (0.06)	142.51 (-1.58)	325.19 (128.10)	866.19 (166.36)	950.55 (8.58)
Value added (Rs in lakh)	135.31	154.25 (13.93)	164.22 (6.46)	423.97 (158.17)	940.44 (121.82)	1019.10 (8.36)

Note: Figures in brackets show quinquennial growth rate.

Source: Compiled frcm (a) Govt. of Kerala, Economic Review, State Planning Board, Trivandrum.

(b) Govt. of Kerala, Statistics for Planning, Directorate of Economics and Statistics, Trivandrum.

(1975-85) the growth rate in the number of factories was rather slow compared to the growth rate prior to the last decade.

It has also been noticed that over the years, there was a decline in employment in tile industry. This trend was remarkable during the period 1960-75 (-15.25 per cent). The conspicious point was that, when the number of factories has increased notably between 1960-75, the generation of employment was rather negative during the same period. Also in the last decade, the growth rate in employment was less than proportionate to the growth rate in the number of factories.

Productive capital has shown a negative growth rate during the period 1965-70 (-7.04 per cent) while in other periods it marked a positive growth rate and it was as high as 162.25 per cent during 1975-80. In the case of output and value added between 1965 and 1970, the growth rates were the lowest (2.56 per cent and 6.46 per cent respectively).

The share of tile industry in terms of gross output and value added may be taken as an indicator of the industry's relative importance in the state of Kerala. Table 2.5 shows the percentage share of tile industry in the value of industrial output in Kerala from 1962 to 1980. Though in absolute terms the industry has recorded some signs of progress, in relative terms it has declined in terms of gross output and value added. For instance, in the year 1962 the tile industry had a share of 3.27 per cent in the industrial output and 6.95 per cent in the value added. In 1980, these shares declined to 1.11 per cent and 2.79 per cent respectively.

Technical indicators

One of the measures to study the technical efficiency is to examine the input output relationships. A low input output ratio indicates high turn over of each unit of input and hence a rise in input output ratio normally shows a rise in the cost of inputs while we measure the inputs in value terms. The ratios computed for different years between 1960 and 1985 show that the

Table 2.5. Percentage share of tile industry in the value of industrial output of Kerala

(Rs in lakh)

	Particulars	1962	1965	1970	1975	1980	1985
Tile Industry	Gross output (a)	294.96	299.06	306.73	749.16	1806.63	1959.65
	Value added (b)	167.64	154.25	164.22	423.97	940.44	1019.10
All Industries	Gross output (c)	9015.21	13230.26	27662.55	66752.81	161060.97	NA
	Value added (d)	2413.27	3474.64	6065.37	13701.80	33734.69	NA
Percentage share	a as % to c	3.27	2.26	1.11	1.12	1.11	
	b as % to d	6.95	4.44	2.71	3.09	2.79	

Source: Compiled from Government of Kerala, Economic Review, State Planning Board, Trivandrum.

ratio almost remained constant except in 1985 (see table 2.6). Other important indicators are value added input ratio and value added output ratio. These ratios explain the contribution of the industry in terms of input and output. High ratios indicate high contribution from the industry. It was observed that the relative contribution was maximum in 1975 both in terms of input and output. Since tile industry is a labour intensive industry, input per worker, output per worker and value added per worker may also reveal certain interesting facts. The input per worker, output per worker and value added per worker which stood respectively at Rs 1000, Rs 2000 and Rs 1000 in 1960 rose to Rs 8000, Rs 16,000 and Rs 8000 respectively in 1985. Very interestingly, the growth took place in input per worker, output per worker and value added per worker stood exactly at 700 per cent in all the three cases. The input requirement per unit rose from Rs 88,000 in 1960 to Rs 2,79,000 in 1985. On the other hand, output per unit increased from Rs 1,75,000 in 1960 to Rs 5,81,000 in 1985 recording 232 per cent increase over the period. Value added rose to Rs 3,02,000 in 1985 from Rs 88,000 in 1960. In short,

Table 2.6. Selected technical indicators of the tile industry in Kerala for the period 1960-85.

Year	Input output ratio	Ouput input ratio	Value added output ratio	Value added input ratio	Input per unit (Rs lakh)	Output per unit (Rs lakh)	Value added per unit (Rs lakh)	Input per worker (Rs lakh)	Output per worker (Rs lakh)	Value added per worker (Rs lakh)
1960	0.49	2.00	0.50	1.00	0.88	1.75	0.88	0.01	0.02	0.01
1965	0.48	2.06	0.52	1.07	0.63	1.30	0.67	0.01	0.03	0.01
1970	0.46	2.15	0.54	1.15	0.62	1.33	0.71	0.01	0.02	0.01
1975	0.43	2.30	0.57	1.30	1.14	2.62	1.48	0.02	0.07	0.04
1980	0.48	2.08	0.52	1.09	2.80	5.85	3.04	0.07	0.15	0.08
1985	0.47	2.08	0.52	1.08	2.79	5.81	3.02	0.08	0.16	0.08

Source: Computed from table 2.4.

growth has taken place in absolute terms in important variables but the real situation will be clear only if we consider the magnitude of price rise during the period.

Spatial distribution

The industry is concentrated in few districts namely Trichur, Calicut and Quilon. In 1965, 78.2 per cent of the units were concentrated in these three districts. In 1985, the share of these three districts had declined only to 70.90 per cent. The share of Trichur district alone was 52.40 per cent in 1965 and 46.60 per cent in 1985.(See table 2.7). The major factors responsible for this phenomenon were the easy availability of good quality clay and the works of the missionaries particularly Basel Mission.

Nature of cost

A close examination of table 2.8 shows that over the 10 year period from 1965-75, the rise in the price of inputs was tremendous. During this period, the cost of all the items more than doubled. Of the different

Table 2.7. Districtwise distribution of tile factories in Kerala for the period 1965-85.

Districts	1965	% to total	1975	% to total	1985	% to total
Trivandrum	1	0.4	1	0.4	2	0.6
Quilon	33	14.4	45	15.8	49	14.5
Alleppey	3	1.3	3	1.1	7	2.1
Kottayam	5	2.2	14	4.9	19	5.6
Ernakulam	16	6.9	30	10.5	36	10.7
Trichur	120	52.4	134	47.0	157	46.6
Palghat	14	6.2	12	4.2	14	4.2
Calicut	26	11.4	34	11.9	33	9.8
Cannanore	11	4.8	9	3.2	10	2.9
Malappuram*	-	-	3	1.1	8	2.4
Pathanamthitta*	-	-	-	-	2	0.5
Total	229	100	285	100	337	100

* These districts came into existence only since 1965 and 1975 respectively.

Source: Government of Kerala, Economic Review, State Planning Board, Trivandrum.

Table 2.8. Input cost, labour cost and selling price of tiles during 1955-86

(in Rs)

Year	Firewood/ tonne	Clay c.yd.	Oil/Gln. (5 lit)	Transport cost/ 1000 tiles	Women's wage/ head/day	Men's wage/ head/day	Skilled/ day	Selling price/ 1000 tiles
1955	28	3.0	1.4	7.8	0.80	1.34	2.8	70.00
1960	35 (25.0)	5.0 (66.6)	3.0 (113.2)	7.5 (-3.8)	1.20 (50.0)	1.64 (22.38)	3.0 (7.1)	115.00 (64.3)
1965	43 (22.8)	5.75 (15.0)	7.5 (150.0)	9.0 (20.0)	2.68 (123.0)	2.93 (78.60)	4.5 (50.0)	120.0 (4.3)
1970	55 (27.9)	6.0 (4.3)	14.0 (86.6)	15.0 (66.6)	3.84 (43.0)	4.09 (39.6)	5.0 (11.1)	145.0 (17.2)
1975	130 (136.4)	20.0 (233.3)	50.0 (257.0)	25.0 (66.6)	7.0 (82.3)	7.0 (95.6)	15.0 (200.0)	300.0 (113.8)
1980	230 (76.9)	30.0 (50.0)	55.0 (10.0)	35.0 (40.0)	8.89 (27.0)	8.89 (27.0)	17.5 (16.6)	375.0 (20.0)
1985	450 (95.6)	60.0 (100)	86.0 (56.4)	52.0 (48.5)	NA	NA	NA	NA

Figures in brackets show percentage change over previous period.

Source: Compiled from the various reports of the Central Kerala Tile Manufacturers Association.

items the maximum increased occurred in the price of oil closely followed by clay and fire wood. Almost the same trend continued in the next decade also. Selling price of tiles also increased sharply over the period. Selling price which was Rs 145/1000 tiles in 1970 became Rs 300/1000 tiles in 1975 recording an increase of 113.8 per cent.

Features of the industry

1. The industry is labour intensive and the workers are mostly unskilled.
2. Tile factories in Kerala still use firewood as major fuel whereas rice husk is used in Andhra Pradesh and coal in Gujarat and Maharashtra.
3. There is no uniformity or standard in the quality of tiles produced.
4. The present products of the industry are not suitable to the modern type constructions.
5. At present only 20 to 25 per cent of production is sold in other states whereas 70 per cent of the production were sold outside the state in 1960s.

6. The industry is not very remunerative because we follow a century old production process.

7. The future of the industry depends on how best and how fast the industry can be modernised and diversified.

2.5. Process of manufacture

Tile factories are generally located in areas where suitable types of clay and also firewood are easily availablle. Clay is the most important raw material required for the manufacture of tiles. Clays differ very much in their chemical composition and physical properties. Below an attempt is made to describe clays in general and the manufacturing process of tiles.

Different types of clays

The term clay is known as "ARGIL" in latin and is applied to those fine grained earthy materials whose most prominent properties are - plastic when wet, capable of retaining shape when dried and formation of hard rock like mass without losing the original contour when fired at red heat.[13] Daniel Rhodes has defined clay as an "earthy material substance composed largely of an hydrous silicate of aluminia which becomes plastic when wet and hard and rock like when fired.[14] The different geological conditions produce clays of various chemical compositions and physical properties. These clays differ from strata to strata and locality to locality in quality. The general classification of clays include china clay, ball clay, fire clay, refractory clay and building bricks clay.

China clay

In India, England and Japan white plastic clays are called China clay whereas in America and China it is termed as kaolin.[15] It is a white powdery mineral with specific gravity 2.6 and fusion point 1785°C.[16] It is distinguished from other clays primarily by its whiteness, softness, ease of dispersion in water and

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13. Bose, H.N. (1948), Op.cit. p.19.

14. Daniel Rhodes (1969),"Clays and Glazes for Potters" Indian Ceramics, January, p.11.

15. William Lee, P.(1961), Ceramics, Reinhold Publishing Corporation, New York, p.5.

16. Ibid.

other liquids and freedom from impurities. China clay is used in industries like ceramics, paper, rubber, plastics, paint, insecticides, fertilisers, textiles, pharmaceuticals and in many other industries.

Ball clay

The term ball clay is usually applied to plastic, sedimentary clays which burn to a good white colour. This clay is not found at its place of origin, but transported to the place of sedimentry by the natural agencies such as water, wind, cyclone etc. The characteristics which make first quality ball clays of special value to the ceramic industry are their exceptional whiteness when fired and high plasticity and strength. Some ball clays form the main part of the pottery bodies for table ware, fancy goods, white wall tiles and electrical equipments.

Fire clay

Fire clay may be described as an earthy plastic, detrital material in which the percentage of iron oxide, lime, magnesia and alkalies are sufficiently low to enable the material to withstand a temperature of atleast 1500°C and preferably over 1600°C.[17] They are of variable compositions and be roughly divided into three types[18] (i) Flint clays which usually occur as rock like masses (ii) plastic clays which can be broken down by water in a mouldable plastic mass (iii) shales which are generally found in close association with coal seams and grey or black in colour.

Building brick and tile clays

The physical properties of these clays are usually of more importance than their chemical composition. The most essential physical characteristics are that, the clay shall be sufficiently plastic to enable it to be easily mouldeed into the required shape that it shall retain its shape in both wet and dry states, and that it shall be capable of being sufficiently vitrified at 950°C/1100°C to form hard bricks without excessive shrinking or deformation.[19]

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17. Rao, V.(1966), Clays and Their Uses, Small Industries Service Institute, Trichur, p.2.

18. Ibid.

19. Ibid.

A judicial combination of lean and plastic clays, which will burn red, is usually employed for tile manufacturing. If the clay is too plastic the drying of tiles will not be even, and will shrink, warp and crack during drying and burning. On the other hand, mining too much of lean clay will make the tiles more porous and poor in strength and ring. The chemical composition of a typical tile clay is given in table 2.9.

Table 2.9. Chemical composition of typical tile clay

(in percentages)

Silica	59.23
Alumina	18.92
Iron oxide	5.61
Lime	1.39
Magnesia	1.03
Potash	1.61
Soda	0.92
Losson Ignition	11.29

Source: Rao (1966), Clays and Their Uses 'Small Industries Service Institute, Trichur.

Tile clays are invariably found in paddy fields and on the banks of lakes, canals and rivers. Generally surface deposits are found suitable. But some times, clay is quarried from moderate depth. It is obtained by digging with spade or pick-axe. For large scale operation excavators are also used.

Manufacturing process of tiles

The manufacturing process of tiles includes the preparation and processing of clay, pressing clay slabs into tiles and finally kiln firing. The essential plant and machinery for running a tile factory are (i) pan mill (ii) pug mill (iii) tile press (iv) kilns. There are considerable variations in the efficiency of each of these items depending on the degree of sophistication.

a) Weathering

Weathering is an essential process in the preparation of tile clays. The object of weathering is to open up the pores of the clay and to separate the particles so that it may absorb water more readily in the subsequent processes. This is effected by the exposure of clay in the lose form to the action of natural agencies like wind, sun, rain, frost etc. This disintegration of clay resulting from weathering makes the clay more homogeneous. Apart from this, exposure to atmospheric influences results in the oxidisation of certain impurities. Weathering improves the plasticity of the clay due to the decomposition of the organic compouunds present. However excessive weathering is considered undesirable since it will wash away clay particles and will leave behind a non-plastic residue. A period of one year is considered sufficient for weathering tile clays.

b) <u>Souring</u>

After proper weathering, the clay is removed from the clay yard to the souring pits. While storing clay in the souring pits, care is taken to see that each type of clay is formed into a separate layer one above the other. After one layer of particular clay is laid, water is sprayed and mixed well according to its particular requirements. A heap of clay is thus formed one above the other and is allowed to sour for 15 days. Generally there will be 3 or 4 such pits in a factory, each pit capable of holding clays for the working of the factory for about a week. The clay mix for the day's requirements is obtained by digging out the clay vertically from the souring pits. A certain portion of sand is also mixed with the clay if found necessary to get the required consistency. Some companies have no souring pits for maturing of clay. In such factories clay is fed to the pan mills directly from the yard. Head load workers are generally employed for the handling of clays in most of the small factories while in large factories this operation is done through conveyers.

It is necessary to grind and mix the clay properly before it is sent to the pug mill for extrusion into blocks of clay. For this purpose, a pan mill is generally used. By the prolonged rubbing and grinding operations in a pug mill, the clay mix is converted into a more homogenous clay mass. For the plastic mixing and grinding of clay, water is added in required quantities.

Mixing and grinding

By employing a box feeder it is possible to mix and grind the clay properly. The box feeder is provided with two shafts each of which has a number of blades fixed to it. The blades provided on the shafts effect shaving, cutting and mixing of the clay from the souring pits fed into the mixer.

Pug mill

The pug mill can be considered as the most important among the several mechanical units employed in a tile factory. This is so, because, the consistency to which clay is ground in the pug mill determines to a large extent the quality of the finished products. It is the pug mill which extrudes clay in the form of blocks sliced into slabs of the required size for pressing them into tiles. On the top of the pug mill a crusher is provided with two pairs of different rollers. These rollers are arranged in such a way that, the clay which is ground and squeezed out of the first pair with 3 mm gap falls in the middle of the second pair of differential rollers of 1 mm gap, from the second set of rollers the clay falls into the pug mill. Here the clay is again cut, kneaded properly mixed and finally extruded in the form of blocks into slabs. Wires are set at the mouth of the pug mill which automatically cut these blocks into slabs of required length. A certain amount of oil is smeared on the blocks to take off the stickness of the clay and give it smootheness. Some factories have a cutting device installed at the mouth of the pug mill which gives blocks of the required length and results in the economy of much labour and clay.

The blocks extruded from the pug mill will contain excess moisture. Hence the blocks are kept for a day or two for curing. It is only after that the blocks are split and pressed into tiles. The outer surface of the blocks are to be kept damp and for this purpose, water is sprayed on the blocks occasionally. A de-airing pug mill is used to eliminate air pockets and prepare compact and homogeneous clay blocks. Slabs obtained from such blocks can be directly pressed into tiles. The process of de-airing helps to reduce warping and cracking.

Some factories resort to double pugging in the case of soft clays and heavy breakages. But the improved results consequent on double pugging do not generally justify the additional expenditure involved.

Pressing of tiles

The pressing of slabs into tiles is perhaps the most important operation performed in a tile factory. Factories which do not employ de-airing pug mills store the extruded blocks over night so as to remove excess moisture present in the blocks. The slabs are then individually polished either by hand beating or by allowing the slabs pass through a polishing machine. The slabs are beaten into shape by smoothening with oil. Generally oil used for this purpose is a mixture of crude oil and other inferior types of oil or wastes.

Two types of presses are generally employed for pressing tiles. The first type of press is the hand operated screw press where the pressing is done manually. The other type is the power driven revolver press. Apart from these two types, some factories have crank presses where the pressing is done by electric power. The power-driven revolving presses have a higher daily output. Since the pressing in a revolving press is done by electric power the work is less strennous than in a hand press. But feeding the revolving press is an operation which has to be done very carefully and requires such skill on the part of the operator. The green tiles coming out of the press have to be properly trimmed. Trimming the edges of the green tiles is to be done with utmost care and is considered to be a highly skilled operation.

Drying tiles

The green tiles obtained from the press section have to be properly dried before they are sent for kiln firing. The process of drying has to be slow and gradual in order to prevent wraping and cracking. The green tiles are received in pellets from the presses and after trimming are carried to wooden racks for drying. For effecting proper drying different methods are employed. In most of the factories green tiles get dried gradually with the help of the atmospheric heat. Since the process of drying is very slow, all available pellets and rack space will be consequently held up. The pellets and racks cannot be put into use again unless one set of tiles is dried and removed from the racks. The problem is aggravated very much in the monsoon months when the drying process takes longer time. The production capacity of a tile factory is directly related to the number of pellets and rack space. In order to obviate the necessity for keeping large number of pellets, some factories resort to sun drying after a preliminary dehydration on the racks. Most of the medium and large tile factories make use of the kiln heat by providing wooden racks on the upper floor of the kiln as well as around the kiln. The green tiles placed on the racks provided in this manner become dry quickly due to the kiln heat that is being radiated. The nearness to the kiln in this case is an added advantage since the dried tiles have eventually to be placed in the kiln for firing. But the space that can be profitably utilised in this manner in a factory are naturally limited.

Some modern factories employ mechanical driers where heat is generated and controlled by steam in order to dry green tiles. By employing mechanical driers it is possible to ensure a speedy and continuous supply of tiles throughout the year. But it is a fact that the investment required for installing mechanical driers is beyond the reach of most of the small factories. It is also noticed that attempts to accelerate drying by artificial means generally lead to higher percentage of breakages and more wraping since the heat circulated on the tiles may not be uniform on all portions. The smaller factories employ manual labour for carrying the green tiles and conveying them on to the racks. But in the case of larger factories belt conveyers are used for this purpose and also to carry back the dried tiles from the racks to the kiln. This effects greater economy in the labour employed and goes to improve the general efficiency of the factory.

Kiln firing

After drying, the next process is kiln firing. By this process the tiles are baked adequately and each of them attains sufficient hardness and strength. Since tiles are produced in large quantities, the kilns also should be necesarily big with several chambers for the economic working of the factory. The tiles are removed from the pellets and arranged in sets inside the kiln chambers for firing. Much experience on the part of the workers is necessary for the proper setting and drawing of tiles in the kilns. Similarly the firing of the kiln and the regulation of heat also require such experience and knowledge on the part of the workers. The temperature to which tiles are generally fixed is 800°C to 900°C.[20] A highly experienced kiln worker can judge the required temperature by simply watching the colour of the flame inside the chamber. The tiles are adequately baked by firing for 16 to 24 hours.

Kiln and different types of kilns

A ceramic kiln is an enclosed chamber where ceramic wares are fired. It consists of a chamber to hold the ceramic products, fire boxes to burn fuel, flues to carry the burnt gases and chimmoney to discharge waste gases and to create drafts.[21] The efficiency of the kiln is usually defined as the ratio of the heat required

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20. Nayak, K.V. (1988), Tile Industry - some Aspects, Seminar on Modernisation of Tile Industry, Mangalore, p.1.

21. Ambigapathy, M.(1988), Roofing Tile Kilns - Design and Efficiency, Seminar on Modernisation of Tile Industry, Mangalore, p.1.

to bring up the ware to its maximum temperature divided by the amount of heat supplied by the fuel.[22] The low efficiency in the tile kilns are due to the following factors.[23]

i. Heat loss by radiation, conduction and through flue gases
ii. Improper control of air to meet the combustion requirements
iii. Improper adoption of the firing schedule
iv. Improper optimum setting density of the goods
v. Improper control over the firing such as, methods of feeding the fuel and temperature and draught control
vi. Improper use of insulation and attention to structural features.

In advanced countries, considerable improvements have taken place in the technology of kiln firing thereby effecting economies. In Kerala, three types of kilns are generally found in the tile factories - Intermittant,

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22. Ibid, p.3.
23. Ibid.

Continuous and Semi-continuous.[24] There is considerable variation in the matter of fuel consumption among the different types of kilns. Since the consumption of fire-wood is an important factor in reckoning the cost of production it is highly essential that the most economic types of kiln are installed in the tile factories.

Intermittant kiln (Down-drought kiln)

The most common type of kiln found in the tile factories is the down-drought country kiln In this type firing cannot be done continuously. When one set of chambers is fired others will be free and tiles can be loaded or unloaded. Also the fuel gas cannot be diverted from one chamber to another. Therefore considerable heat is wasted. Since the cooling of tiles and unloading take a lot of time, this involves considerable waiting. Besides, in this type of kilns fire has to be started in each set of chambers separately and this is done from the sides of kiln. Eventhough very common, the down-drought kilns are very uneconomic because of the higher firewood consumption.

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24. Nayak, K.V. (1988), Op.cit.p.9.

Continuous kilns

Continuous kilns are called Hoftman kilns which are the modern type of kilns used by the tile factories. This effects greater economy in firewood consumption and therefore is a big improvement on the down-drought kilns. The biggest advantage of this type of kiln is that the fire once started need not be put out and the fuel can be regulated and directed from one chamber to the other. In this type of kiln, firing, loading and unloading of tiles can be done in different chambers simultaneously. No heat is lost in the process since the fuel can be directed to the appropriate chamber. Unlike the down-drought kiln, fire wood is fed into the continuous kiln from the top. A saving of about 25 to 50 per cent of firewood is effected by employing this type of kiln.[25] Continuous kilns, though the initial cost of construction is higher, are used for large quantity of production with better thermal efficiency to minimise the cost of production.

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25. Ibid, p.10.

Semi-continuous kilns

Semi-continuous kilns are of latest introduction particularly in roofing tile industry due to their advantage over intermittent kiln and continuous kiln for medium range of production. In the case of semi-continuous kiln, as in the case of continuous kiln, firing can be done on a continuous basis by directing the flues from one chamber to the other. The feeding of firewood is from the sides as in the case of a down-drought kiln. The semi-continuous kiln effects economy in the matter of firewood consumption when compared to the down-drought kiln. Since the capital cost for installing a semi-continuous kiln is lower than that of a continuous kiln, this type is ideally suited for the medium-sized tile factories.

A comparative picture of the intermittent kiln, continuous kiln and semi continuous kiln in terms of fuel consumption efficiency and capacity is given in table 2.10.

Table 2.10. Comparative picture of various kilns

Particulars	Intermittent	Continuous	Semi-continuous
Fuel consumption			
i. fire wood	0.8-1.0 MT/ 1000 tiles	0.4-0.5 MT/ 1000 tiles	0.5-0.7 MT/ 1000 tiles
ii. Coal	0.4-0.5 MT/ 1000 tiles	0.2-0.25 MT/ 1000 tiles	0.3-0.35 MT/ 1000 tiles
Kiln efficiency	15-20%	30-40 %	20-30%
Capacity	6000-20,000/ chamber	3000-15,000/ chamber	3000-5000/ chamber

MT - Metric tonnes

Source: Ambigapathy, M.(1988), Roofing Tile Kilns - Design and Efficiency, Seminar on Modernisation of Tile Industry, Mangalore.

Kiln fuels

Fuels used in ceramic firings are classified as solid, liquid, gaseous and electric energy.[26] Solid fuels like wood, agricultural waste and coal are mostly used in India for firing tiles. It is recommended to

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26. Ambigapathy, M. (1983), *Op.cit*.p.7.

use agricultural waste such as saw dust, paddy husk, coffee husk etc. to get higher calorific values.[27] The appropriate calorific value of some fuels are as follows:[28]

	Calorific value/lb
i. Bituminuous coal	9000 - 10,500
ii. Wood (dry)	4500 - 6,000
iii. Lignite	7000 - 9,000

Sorting of tiles

After the tiles are fired to the required temperature to bake them adequately, firing is stopped and the tiles are allowed to cool. They are afterwards unloaded from the kiln chambers. The tiles are then sorted into different quality grades. A metallic rod is usually used by sorters for testing the ring of each tile. The first quality tile has got a ringing sound as well as good shape and colour. The tiles are sorted into different grades taking into consideration their metallic sound,

27. Ibid.

28. Ibid.

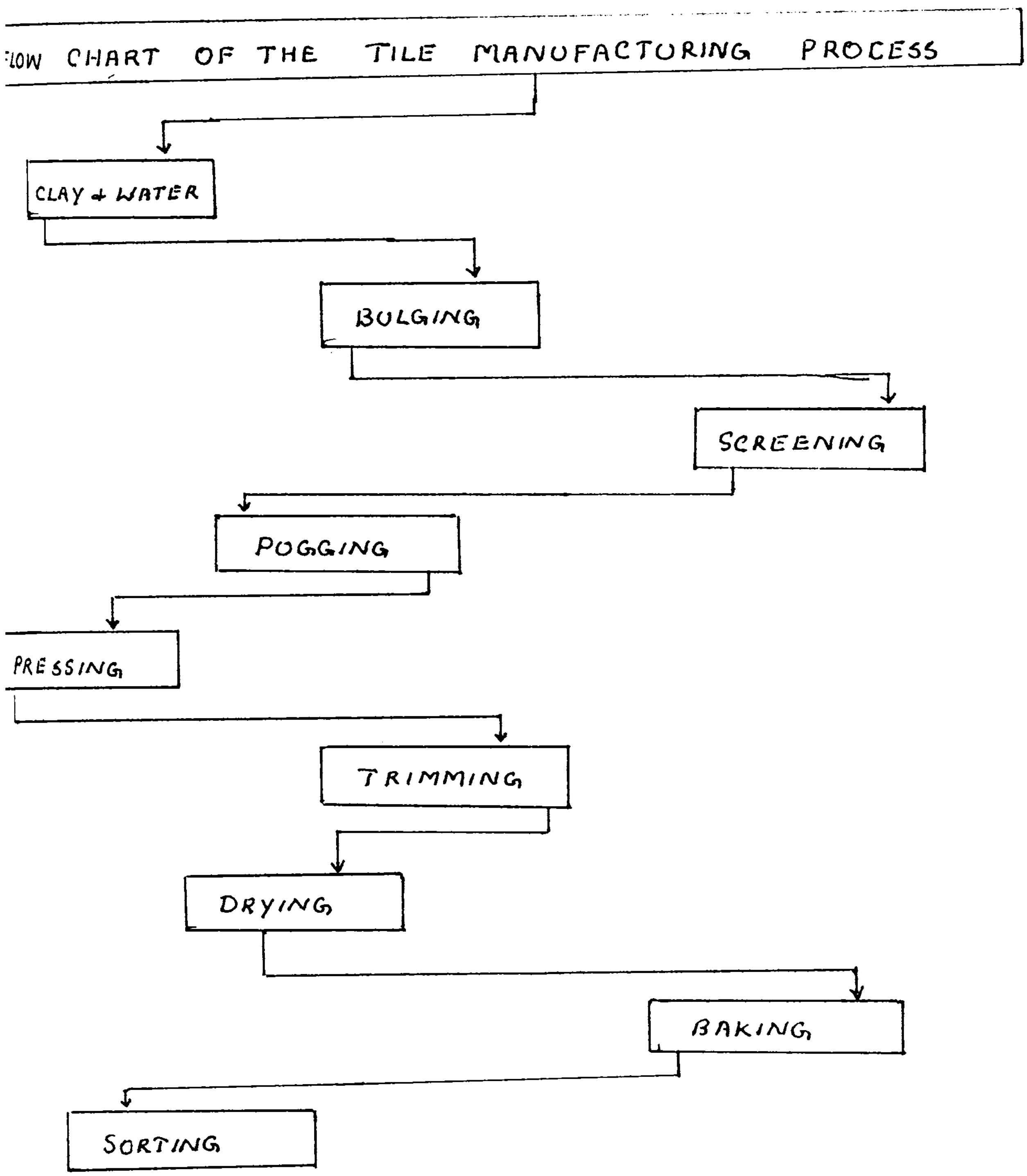
colour, nature of cracks, etc. [29] Usually tiles are graded into 5 or 6 classes.[30] The proportion of first quality tiles differs from factory to factory. The nature of the clay used, the sophistication of the machinery employed, the type of kiln and the general efficiency of production all have a bearing on the quality of tiles produced.

The graded tiles are removed to the stock yard and stacked separately. They are then transported to different destinations by trucks, bullock carts, railway wagons etc.

29. Labour and Industrial Bureau (1969), Op.cit.p.17

30. Ibid.

FIG 2·1


FLOW CHART OF THE TILE MANUFACTURING PROCESS
CLAY + WATER
BULGING
SCREENING
POGGING
PRESSING
TRIMMING
DRYING
BAKING
SORTING

CHAPTER III

ECONOMICS OF TILE INDUSTRY IN KERALA

In spite of the preeminent position of the tile industry in Kerala compared to the rest of the country, it is at present facing a serious crisis due to a number of problems. In order to tackle these problems effectively, a knowledge of its present structure is indispensable. Hence an attempt is made in this chapter to study the economics of the industry based on a stratified sample of factories which are spread over four regions, namely Calicut, Trichur, Alwaye and Quilon. The economics is examined in terms of indicators like capital employed, employment, input, output, value added etc. during the decade 1978-79 to 1987-88.

3.1. Location of the factories

The important factors which influence the location of the factories are (a) cheap labour (b) availability of raw materials (c) proximity of markets (d) facilities for the despatch of finished goods.[1] Besides these, historical factors also play an important role. In the

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1. Hoffmann, W.G.(1958), <u>The Growth of Industrial Economics</u>, Oxford, p.12.

case of tile industry, historical factors mainly include the works of Basel Mission in Malabar area.

An analysis of the location of the selected factories revealed that 69 per cent of the tile factories have a rural location. This rural bias may be due to the abundance of clay and firewood in such areas. The availability of cheap labour in rural areas may also be exerting some influence. However, in Calicut region majority of the factories are located in urban or even semi urban areas with more employment.

3.2. Year of establishment

More than 80 per cent of the selected factories were set up before independence ie. prior to 1947.

3.3. Ownership pattern

Of the total 32 factories selected, 30 are partnership firms (93.75 per cent) and two concerns are public limited companies. There are no individual proprietorship concerns and this is due to the high order of investment and other facilities necessary for setting up tile factories.

3.4. Capital structure

Capital structure covers fixed capital (FC), physical working capital (PWC), working capital (WC), invested capital (IC) and productive capital (PC).

Table 3.1 gives the structural composition of the fixed capital for the period 1978-79 to 1987-88. The components of the fixed capital include land, buildings and plant and machinery. The fixed capital came to Rs 52.45 lakh in 1978-79. Of this, 23.81 per cent was constituted by land, and the other two items, buildings and plant and machinery constituted 26.75 per cent and 49.43 per cent respectively. It was also found that the share of land has declined slightly, which indicates that sufficient procurement of land has not taken place over the reference period. Similarly, significant changes have not taken place in the share of buildings and plant and machinery over the years. By the end of the year 1987-88, fixed capital rose to Rs 84.58 lakh recording 61.26 per cent increase over the reference period. These changes over a few years period cannot be

Table 3.1. Composition of fixed capital of the sample units during the period 1978-79 to 1987-88

(Rs lakh)

Year	Land	Buildings	Plant & machinery	Total
(1)	(2)	(3)	(4)	(5)
1978-79	12.49 (23.81)	14.03 (26.75)	25.93 (49.43)	52.45 (100)
1979-80	12.58 (23.47)	14.59 (27.22)	26.43 (49.31)	54.60 (100)
1980-81	13.04 (22.49)	16.12 (27.82)	28.82 (49.71)	57.98 (100)
1981-82	13.63 (21.83)	17.49 (28.02)	31.31 (50.15)	62.43 (100)
1982-83	15.33 (18.34)	27.73 (33.18)	40.52 (48.48)	83.58 (100)
1983-84	17.17 (17.58)	34.42 (35.24)	46.07 (47.17)	97.66 (100)
1984-85	17.48 (18.48)	32.57 (34.43)	44.55 (47.09)	94.60 (100)
1985-86	16.65 (18.71)	29.69 (33.37)	42.64 (47.92)	88.98 (100)
1986-87	16.95 (19.48)	29.59 (34.00)	40.49 (46.52)	87.03 (100)
1987-88	16.61 (19.64)	27.99 (33.09)	39.98 (47.27)	84.58 (100)
Percentage change over the period	32.99	99.50	54.18	61.26

Note: Figures in brackets give percentage to total.

considered significant and hence we may believe that the factories in general, once they are established, do not incur much expenditure for any of the fixed capital items.

Table 3.2 gives the details of physical working capital and working capital. Physical working capital composes of material stock, stock of semi-finished goods and stock of finished goods. Working capital includes, physical working capital plus cash and net balance of the amount receivable and amount payable. The stock of materials was Rs 19.05 lakh in 1978-79, which rose to Rs 68.41 lakh in 1987-88 registering an increase of 259.11 per cent. Percentage increase in the stock of semi-finished goods and finished goods came to 197.08 per cent and 237.67 per cent respectively. From this, it is evident that the factories showed an increasing tendency to store materials, mainly clay and firewood. Clay, the most important raw material of the industry, requires weathering for a minimum period of one year and hence has to be stocked in adequate quantities even anticipating future rise in the quantum of production.

Table 3.2. Composition of physical working capital (PWC) and working capital (WC) of the sample units during the period 1978-79 to 1987-88.

(Rs lakh)

Year	Materials	Semi finished	Finished	Total PWC (2)+(3)+(4)	Cash	(R-P)*	W.C. (5)+(6)+(7)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
78-79	19.05 (39.60)	10.29 (21.39)	18.77 (39.01)	48.11 (100)	5.69	-8.17	45.63
79-80	25.01 (38.01)	12.98 (19.73)	27.80 (42.25)	69.79 (100)	14.31	-2.40	81.70
80-81	22.23 (41.20)	9.92 (18.39)	21.80 (40.41)	53.95 (100)	9.20	-4.21	58.94
81-82	29.42 (34.27)	13.14 (15.31)	43.28 (50.42)	85.84 (100)	9.49	4.57	99.90
82-83	34.89 (43.75)	11.18 (14.02)	33.67 (42.22)	79.74 (100)	13.03	2.49	95.26
83-84	31.58 (30.78)	16.39 (15.98)	54.62 (53.24)	102.59 (100)	8.99	23.64	135.22
84-85	36.36 (28.94)	17.49 (13.92)	71.81 (57.14)	125.66 (100)	11.05	3.83	140.54
85-86	46.00 (38.74)	17.05 (14.36)	55.70 (46.91)	118.75 (100)	14.19	-13.46	119.48
86-87	56.65 (36.37)	26.21 (16.83)	72.88 (46.80)	155.74 (100)	34.42	-33.49	156.67
87-88	68.41 (42.13)	30.57 (18.83)	63.38 (39.03)	162.36 (100)	30.06	-53.74	138.68
Percentage change over the period	259.11	197.08	237.67	237.47			203.92

* (R-P) - Receipts - payments
Figures in brackets give percentage composition of physical working capital

Similarly, large quantities of firewood have to be stocked; otherwise, the shortage of firewood would become a serious bottleneck in production.

Analysis of the composition of working capital revealed that the factories raised enough working capital by loan and advances for meeting the day-to-day expenditure. The cash component recorded a spectacular increase in 1979-80 and 1986-87 compared to the remaining years in the reference period.

Another important component is invested capital and its growth over the reference period is illustrated in table 3.3 which also includes the details of the productive capital. The sum total of the fixed capital and the physical working capital gives invested capital. The productive capital consists of the total of fixed capital and working capital. The invested capital which was only Rs 100.56 lakh in 1978-79 rose to Rs 246.94 lakh in 1987-88 marking an increase of 145.56 per cent. Of this, major share came from physical working capital during the entire period and this is due to the tremendous increase in the stock of materials, semi-finished goods and finished goods compared to low fixed capital.

Table 3.3. Details of productive capital (PC) and Invested capital (IC) of the sample units during the period 1978-79 to 1987-88.

(Rs lakh)

Year	FC	PWC	WC	PC (2)+(4)	IC (2)+(3)
(1)	(2)	(3)	(4)	(5)	(6)
78-79	52.45	48.11	45.63	98.08	100.56
79-80	53.60	69.76	81.70	135.30	123.39
80-81	57.98	53.95	58.94	116.92	111.93
81-82	62.43	85.84	99.90	162.33	148.27
82-83	83.58	79.74	95.26	178.84	163.32
83-84	97.66	102.59	135.22	232.88	200.25
84-85	94.60	125.66	140.54	235.14	220.26
85-86	88.98	118.75	119.48	208.46	207.73
86-87	87.03	155.74	156.67	243.70	242.77
87-88	84.58	162.36	138.68	223.26	246.94

The productive capital employed by the industry has progressively increased over the reference period. In 1978-79 the productive capital amounted to Rs 98.08 lakh, the share of the fixed capial being 43.47 per cent and that of the working capital 46.53 per cent. Over the years, the share of the working capital increased and it reached 64.29 per cent in 1986-87 and 62.12 per cent in 1987-88. These facts further establish the declining role of fixed capital in the capital structure of tile factories.

Average capital requirements are also computed (see table 3.8, co. 9-11). The productive capital per factory at the close of the year 1978-79 was found to be Rs 3.07 lakh, composed of Rs 1.64 lakh as fixed capital and Rs 1.43 lakh as working capital. By the end of the year 1987-88, the productive capital per factory rose to Rs 6.98 lakh, composed of Rs 2.64 lakh as fixed capital and Rs 4.34 lakh as working capital. In percentage terms, over the reference period, the fixed capital per factory increased only by 60.98 per cent while the working capital per factory increased by 203.49 per cent. As mentioned earlier, working capital recorded substantial increase because of stock piling in the form of materials. Similarly invested capital per factory increased from Rs 3.14 lakh in 1978-79 to Rs 7.72 lakh in 1987-88 recording 145.85 per cent increase.

From the above discussion, it may be seen that, in the capital structure, the share of the fixed capital is relatively low and this tendency may be probably due to the fact that the year of establishment of most of the factories covered by the survey was prior to 1950.

3.5. Employment and emoluments

The number of persons employed in the sample units during 1978-79 was 2980, which decreased to 2779 in 1987-88, making only 6.7 per cent decrease over the reference period. Maximum number of workers are employed in 1984-85 (3055). The per unit employment was 93 in 1978-79 and 87 in 1987-88. This marginal decline cannot be interpreted as labour displacement. This fluctuation was the outcome of the variations in demand and supply conditions faced by the industry. During the year 1978-79, a sum of Rs 67.25 lakh was paid as wages. By the end of 1987-88 this came to Rs 177.75 lakh (see table 3.8, col. 15). The workers also enjoyed other benefits like bonus, E.S.I. etc.

3.6. Inputs

The major inputs of the tile industry are clay, firewood, electricity, oil and others. Others include sawdust, sand, basket etc. The details of the inputs consumed are presented in table 3.4. Inputs purchased is distinguished from inputs consumed by making stock adjustment; defined as

Inputs consumed = Opening stock of inputs + purchase of inputs during the current year - closing stock of inputs.

Table 3.4. Composition of inputs consumed by the sample units during the period 1978-79 to 1987-88

(Rs lakh)

Year	Clay	Firewood	Oil	Electricity	Others	Total inputs purchased	Stock adjust-ment factor	Inputs consumed (7+8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
78-79	25.82 (28.64)	51.96 (57.64)	4.73 (5.25)	6.18 (6.86)	1.45 (1.61)	90.14 (100)	3.04	93.18
79-80	34.05 (28.60)	69.53 (58.41)	5.44 (4.60)	8.08 (6.79)	1.94 (1.63)	119.04 (100)	-5.96	113.08
80-81	38.39 (27.83)	82.22 (59.60)	6.25 (4.53)	9.20 (6.67)	1.90 (1.38)	137.96 (100)	2.78	140.74
81-82	38.13 (25.15)	95.26 (62.83)	7.28 (4.80)	8.41 (5.55)	2.54 (1.66)	151.62 (100)	-7.19	144.43
82-83	39.16 (26.16)	92.86 (62.04)	6.56 (4.38)	8.37 (5.60)	2.72 (1.82)	149.67 (100)	-5.47	144.20
83-84	46.16 (25.47)	112.96 (62.33)	8.90 (4.91)	9.95 (5.49)	3.27 (1.80)	181.24 (100)	3.31	184.55
84-85	70.09 (30.46)	133.64 (58.68)	10.88 (4.73)	12.01 (5.22)	3.48 (1.51)	230.10 (100)	-4.78	225.32
85-86	80.22 (31.64)	144.32 (56.92)	12.18 (4.80)	13.10 (5.17)	3.75 (1.48)	253.57 (100)	-9.64	243.93
86-87	87.52 (31.31)	160.20 (57.31)	11.85 (4.24)	15.12 (5.41)	4.83 (1.73)	279.52 (100)	-10.65	268.87
87-88	89.56 (29.89)	176.58 (58.93)	13.22 (4.41)	14.93 (4.98)	5.37 (1.79)	299.66 (100)	-11.76	287.90

Figures in brackets give percentage to total inputs purchased.

a) Clay

About 25-30 per cent of the total value of the materials consumed is accounted for by common clay, the most important raw material for the manufacture of bricks and tiles. The sample units altogether purchased clay worth Rs 25.82 lakh in 1978-79 which increased to Rs 89.56 lakh in 1987-88. The per unit purchase of clay in 1978-79 was worth Rs 80,687 which rose to Rs 2,79,875 in 1987-88. This increase may be the result of two factors, namely the rise in the price of clay or due to increased use of clay. Since the quantity wise data are not available, this cannot be precisely examined.

b) Firewood

Another important input of the tile industry is firewood. Nearly 60 per cent of the input cost is constituted by the cost of firewood. One of the important reasons for this high level of cost is the relative scarcity of firewood. The sample units purchased firewood worth Rs 51.96 lakh in 1978-79, which gradually increased to Rs 176.58 lakh in 1987-88 (239.83

per cent increase). The per unit purchase of firewood came to Rs 1.62 lakh in 1978-79, which increased to 5.52 lakh in 1987-88.

c) Electricity and oil

The value of oil purchased per unit came to the tune of Rs 0.147 lakh in 1978-79, which rose to Rs 0.413 lakh in 1987-88 (180.95 per cent increase). On the other hand, the per unit purchase of electricity came to Rs 0.193 lakh in 1978-79 and it has increased by 141.45 per cent by the end of 1987-88 (0.466 lakh). Both the electricity and the oil together constituted approximately 10 per cent to 12 per cent of the total inputs purchased. The other inputs such as sand, sawdust etc. accounted about two per cent of the total inputs purchased.

The above discussion shows that nearly 85 per cent of the total inputs purchased is composed of clay and firewood. Hence cost control can be achieved only if we arrest the rise in the price or scarcity in supplying these two factors, which are rather difficult. Hence it is high time to go for alternative forms of fuel and also to divert to products which require lesser quantity of clay.

3.7 Cost of production

The cost of production is the sum total of the input cost, wages and salaries and other establishment costs (see table 3.5). The cost of production amounted to 182.19 lakh in 1978-79 which consisted of inputs worth Rs 93.18 lakh (51.14 per cent). Wages and salaries amounted to Rs 67.25 lakh (36.91 per cent) and other establishment costs to the tune of Rs 21.76 lakh (11.94 per cent). During the year 1987-88, the total cost came to Rs 516.27 lakh consisting of inputs worth Rs 287.90 lakh (55.77 per cent), wages and salaries worth Rs 177.75 lakh (34.43 per cent) and other establishment costs to the tune of Rs 50.62 lakh (9.80 per cent). Over the reference period cost of production increased by 183.37 per cent. These figures reveal that the rise in wages was not acute in tile industry compared to the rise in the cost of other inputs, particularly clay and firewood.

Table 3.5. Cost of production of the sample units during the period 1978-79 to 1987-88

(Rs lakh)

Year	Inputs	Wages & salaries	Other establishment costs	Total cost (2)+(3)+(4)
(1)	(2)	(3)	(4)	(5)
1978-79	93.18 (51.14)	67.25 (36.91)	21.76 (11.94)	182.19 (100)
1979-80	113.08 (52.19)	80.94 (37.36)	22.62 (10.44)	216.66 (100)
1980-81	140.74 (53.59)	94.17 (35.86)	27.71 (10.55)	262.62 (100)
1981-82	144.43 (55.98)	87.13 (33.77)	26.45 (10.25)	258.01 (100)
1982-83	144.20 (51.86)	102.11 (36.73)	31.72 (11.41)	278.03 (100)
1983-84	184.55 (51.14)	136.47 (37.82)	39.82 (11.04)	360.84 (100)
1984-85	225.32 (53.52)	153.36 (36.43)	42.33 (10.05)	421.01 (100)
1985-86	243.93 (55.11)	156.13 (35.28)	42.54 (9.61)	442.60 (100)
1986-87	268.87 (55.16)	172.57 (35.40)	46.02 (9.44)	487.46 (100)
1987-88	287.90 (55.77)	177.75 (34.43)	50.62 (9.80)	516.27 (100)

Figures in brackets give share of different components to total cost.

3.8. Products

The important products of the industry are roofing tiles, ridges and bricks. Besides these, some of the factories manufacture a number of miscellaneous items like ceiling and flooring tiles, hourdis, water goglats, filters, flower pots and drainage pipes. Table 3.6 presents the composition of the products produced by the sample units during the period 1978-79 to 1987-88. The table reveals that the value of production has increased from Rs 336.94 lakh in 1978-79 to Rs 595.62 lakh in 1987-88. Among the products, roofing tiles had the preeminent position whose share had gone up from 74.97 per cent in 1978-79 to 81.55 per cent in 1987-88 in value terms. It may be interesting to note that even to day the product mix is in favour of roofing tiles when the demand for roofing tiles are stagnant if not fast declining. Among the other products the major share went to ridges. The per unit output was Rs 10.53 lakh in 1978-79 which rose to Rs 18.61 lakh in 1987-88 the percentage growth being 76.73. On the other hand, the cost of production increased by 183.37 per cent over the same period. Hence, the rise in the price of inputs and wages were

Table 3.6. Composition of products produced by sample units during the period 1978-79 to 1987-88

(Rs lakh)

Year (1)	Roofing tiles (2)	Flooring tiles (3)	Brick (4)	Ridges (5)	Ceiling tiles (6)	Hourdis (7)	Others (8)	Total production (9)	Stock adjustment factor (10)	Total output (11)
78-79	255.62 (74.97)	11.32 (3.32)	20.69 (6.07)	49.79 (14.62)	-	2.60 (0.87)	0.94 (0.30)	340.96 (100)	-4.02	336.94
79-80	266.52 (78.63)	16.37 (4.83)	20.32 (5.99)	31.62 (9.33)	-	2.80 (0.80)	1.31 (0.42)	338.94 (100)	9.03	347.97
80-81	282.15 (76.45)	13.55 (3.67)	28.91 (7.83)	40.01 (10.84)	0.04 (0.01)	2.60 (0.70)	1.80 (0.50)	369.06 (100)	-6.00	353.06
81-82	234.06 (72.06)	25.15 (7.75)	21.17 (6.52)	40.29 (12.41)	0.30 (0.05)	3.29 (1.01)	0.52 (0.20)	324.72 (100)	21.48	346.20
82-83	300.64 (77.49)	18.09 (4.66)	18.41 (4.75)	45.66 (11.77)	-	4.11 (1.06)	1.07 (0.27)	387.98 (100)	-9.61	378.37
83-84	309.41 (76.96)	16.53 (4.11)	19.26 (4.79)	47.22 (11.74)	0.40 (0.10)	5.13 (1.28)	4.10 (1.02)	402.05 (100)	20.95	423.00
84-85	401.67 (79.86)	19.06 (3.79)	28.43 (5.65)	47.40 (9.42)	-	5.44 (1.08)	0.97 (0.20)	502.97 (100)	17.19	520.16
85-86	467.08 (80.77)	21.07 (3.64)	31.35 (5.42)	51.25 (8.86)	-	2.59 (0.20)	4.91 (0.80)	578.25 (100)	-16.11	562.14
86-87	423.00 (80.06)	24.31 (4.60)	29.28 (5.54)	42.51 (8.05)	0.39 (0.09)	6.33 (1.19)	2.53 (0.47)	528.35 (100)	17.18	545.53
87-88	493.49 (81.55)	25.50 (4.21)	29.00 (4.79)	45.53 (7.52)	0.89 (0.20)	8.62 (1.42)	1.20 (0.30)	605.12 (100)	-9.50	595.62

Figures in brackets give percentage to total production

more than double of the rise in the value of output. This clearly indicates the declining productivity and ultimately the profitability of the sample units. The extent of declining profitability is further illustrated in table 3.7.

3.9. Gross profit (output cost)

The prosperity of the industry depends on the margin of profit earned. The sample units together earned profit worth Rs 154.75 lakh in 1978-79 which works out to Rs 4.84 lakh per unit. The extent of profit earned has continuously declined during the study period. In spite of year to year fluctuations, the per unit profit in 1987-88 was only Rs 2.47 lakh marking a decline of 48.97 per cent. From the pattern of profits over the years, it is also revealed that the tile factories in the state are influenced by periodic fluctuations and these fluctuations occur due to,

a) fluctuations in sales
b) fluctuations in input cost, and
c) fluctuations in selling price.

Table 3.7. Gross profit (output cost) and value added of sample units during the period 1978-79 to 1987-88.

(Rs lakh)

Year	Input	Output	Total cost	Gross profit (output cost) (3)-(4)	Value added (3)-(2)
(1)	(2)	(3)	(4)	(5)	(6)
1978-79	93.18	336.94	182.19	154.75	243.76
1979-80	113.08	347.97	216.66	131.31	234.89
1980-81	140.74	363.06	262.62	100.44	222.32
1981-82	144.43	346.20	258.01	88.19	201.77
1982-83	144.20	378.37	278.03	100.34	234.17
1983-84	184.55	423.00	360.84	62.16	238.45
1984-85	225.32	520.16	421.01	99.15	294.84
1985-86	243.93	562.14	442.60	119.54	318.21
1986-87	268.87	545.53	487.46	58.07	276.66
1987-88	287.90	595.62	516.27	79.35	307.72

3.10 Value added

Value added (VA) by manufacturer is a measure of the relative importance of the industrial sector in the State's/National economy. It is also a measure of the relative importance of a particular unit within the industrial sector itself.

Value added is defined as the difference between the value of output and input. In otherwords, value added is the sum total of factor income such as wages, interest, rent and profit. Tile industry is a highly labour-intensive industry and hence relative size of value added will be more. In the year 1978-79, value added by the sample units amounted to Rs 243.76 lakh which came to Rs 7.62 lakh per unit of which the contribution of wages and salaries amounted to 27.59 per cent (see table 3.8). The fluctuations in value added may be due to the variation in employing workers, depending on the nature of work in the factories depending on time and season. During 1983-84, the share of wages and salaries to value added came to 57.23 per cent, compared to 43.60 per cent in the previous year

Table 3.8. Selected aggregates of the sample units for the period 1978-79 to 1987-88

(Rs lakh)

Year	FC	IC	PC	Input	Output	VA	Workers	Selected aggregates per unit						
								FC	IC	PC	Input	Output	VA	Workers
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
78-79	52.45	100.56	98.08	93.18	336.94	243.76	2980	1.64	3.14	3.07	2.91	10.53	7.62	93
79-80	53.60	123.39	135.30	113.08	347.97	234.89	2972	1.68	3.86	4.23	3.53	10.87	7.34	93
80-81	57.98	111.93	116.92	140.74	363.06	222.32	3019	1.81	3.50	3.65	4.40	11.35	6.95	94
81-82	62.43	148.27	162.33	144.43	346.20	201.77	2712	1.95	4.63	5.07	4.50	10.82	6.31	85
82-83	83.58	163.32	178.84	144.20	378.37	234.17	2901	2.61	5.10	5.59	4.51	11.82	7.32	9[illegible]
83-84	97.66	200.25	232.88	184.55	423.00	238.45	2877	3.05	6.23	7.28	5.77	13.22	7.45	9[illegible]
84-85	94.60	220.26	235.14	225.32	520.16	294.84	3055	2.96	6.88	7.35	7.04	16.25	9.21	96
85-86	88.98	207.73	208.46	243.93	562.14	318.21	3035	2.78	6.49	6.51	7.62	17.57	9.94	95
86-87	87.03	242.77	243.70	268.87	545.53	276.66	2793	2.72	7.59	7.62	8.40	17.04	8.65	87
87-88	84.58	246.94	223.26	287.90	595.62	307.72	2779	2.64	7.72	6.98	8.99	18.61	9.62	8[illegible]

and 52.01 per cent in the succeeding year and this was the result of paying arrears to the workers as part of the recommendations of the Minimum Wages Committee (1981 revision).

3.11. Structural ratios

Structural ratios can be put to considerable use for fixation of targets and for making comparisons. But it has to be stated that the available data on comparative coefficients of this nature are only fragmentary. The precision of ratios are beset with numerous difficulties such as dearth of reliable statistical data and quantity wise details. Hence the margin of error in the ratios calculated will be consequently high.

However, in this section an attempt is made to compute the important structural ratios of the tile industry for the entire reference period and to examine whether any major shift has taken place over the years. The ratios employed for the analysis are: (see table 3.9)

Table 3.9. Important structural ratios of the sample units during the period 1978-79 to 1987-88

Year	Fixed capital to invested capital	FC to productive capital	Input output ratio	VA output ratio	FC to output	IC to output	VA to IC	Output per worker	Input per worker	VA per worker	VA to input	Output input	Output IC	Input IC
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
78-79	0.52	0.53	0.28	0.72	0.16	0.30	2.43	0.113	0.031	0.082	2.62	3.62	3.35	0.93
79-80	0.44	0.40	0.33	0.67	0.16	0.36	1.90	0.117	0.038	0.079	2.08	3.08	2.82	0.91
80-81	0.52	0.50	0.39	0.61	0.16	0.31	1.99	0.120	0.047	0.074	1.58	2.58	1.99	1.26
81-82	0.42	0.39	0.42	0.58	0.18	0.43	1.36	0.128	0.053	0.074	1.40	2.40	2.34	0.97
82-83	0.51	0.47	0.39	0.61	0.22	0.43	1.44	0.130	0.049	0.081	1.62	2.62	2.32	0.88
83-84	0.49	0.42	0.44	0.56	0.23	0.47	1.19	0.147	0.064	0.083	1.29	2.29	2.12	0.93
84-85	0.43	0.40	0.43	0.57	0.18	0.42	1.34	0.170	0.074	0.097	1.31	2.31	2.36	1.02
85-86	0.43	0.43	0.43	0.57	0.16	0.37	1.53	0.185	0.080	0.105	1.30	2.31	2.71	1.17
86-87	0.36	0.36	0.49	0.51	0.16	0.45	1.14	0.195	0.096	0.099	1.03	2.03	2.25	1.10
87-88	0.34	0.38	0.48	0.52	0.14	0.42	1.25	0.214	0.104	0.111	1.07	2.07	2.41	1.16

a) Fixed Capital Invested Capital ratio

b) Fixed Capital Productive Capital ratio

c) Fixed capital Output ratio

d) Invested Capital Output ratio

e) Input Output ratio

f) Input Invested Capital ratio

g) Output Input ratio

h) Output Invested Capital ratio

i) Value added Output ratio

j) Value added Input ratio

k) Value added Invested Capital ratio

In the initial year, the fixed capital invested capital ratio stood at 0.52 and the fixed capital productive capital ratio at 0.53. The relatively low ratio reflects the high labour intensity of the industry and these ratios have gradually declined with slight variations, which further strengthens the view. The low capital intensity is further illustrated by the behaviour of fixed capital output ratio also. Invested capital output ratio showed an increasing tendency due to a rise in invested capital which is the result of a rise in the stock of materials, semi-finished goods and finished goods. The input output relations are also very important in production economics. A low input output ratio indicates high turnover for each unit of input used and hence a rise in input output ratio normally shows a rise in the cost of inputs if inputs are measured in value terms. The ratios computed for different years clearly revealed the fact that the cost of inputs had shown a continuous increase. The input output ratio was 0.28 during 1978-79 and it rose to 0.48 in 1987-88, output input ratio being 3.62 and 2.07 respectively. This rise in input output ratio may be due to a rise in the cost of inputs or due to the problem of stock piling. Inputs are related to invested capital also. This ratio varied between 0.93 in 1978-79 and 1.16 in 1987-88.

Another important variable is value added which is related to output, input and invested capital. Value added input ratio and value added output ratio explain the contribution of the industry in terms of inputs and output and there is proportional relationship between ratio and the contribution. Value added input ratio stood at 2.62 in 1978-79 and gradually declined and reached 1.07 in 1987-88, which probably shows low input use efficiency. Similarly value added invested capital ratio also declined over the years. These trends further strengthen the view that the relative role of the tile industry is declining.

Input per worker, output per worker and value added per worker for the entire reference period are also computed. The input per worker increased from Rs 0.113 lakh in 1978-79 to Rs 0.214 lakh in 1987-88. Correspondingly output per worker rose from Rs 0.031 lakh in 1978-79 to Rs 0.104 lakh in 1987-88 and value added per worker from Rs 0.082 lakh in 1978-79 to Rs 0.111 lakh in 1987-88. These trends have taken place due to the rise in the price of inputs, price of output and rise in wages, which are only a part of the economic changes that have taken place in the country over the years.

3.12. Capacity utilisation

One of the important problems of the tile industry in recent years is the low capacity utilisation mainly due to inadequate demand. In the early 1980s the capacity utilisation was to the tune of 65 per cent[2] which has declined to the level of 40 per cent in 1988. The high cost of inputs, particularly clay and firewood also contributed to low capacity utilisation.

3.13. Economics of producing 1000 roofing tiles

In the previous part, we discussed the economics of tile industry in Kerala based on the data collected from sample units. However this analysis gives only an aggregate picture. Hence, in this section an attempt is made to work out the cost of producing 1000 roofing tiles and its sales proceeds. The economics of roofing tiles is only examined because of the following reasons:

i. Of the total products produced by tile factories, 75-80 per cent is contributed by roofing tiles. Hence the economics of roofing tiles by and large shows the economics of the entire industry.

ii. Input requirements of producing other products are not known specifically.

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2. Ananthasubramaniam D. (1986), "Problems Facing the Tile Industry", Seminar on Productivity in Tile Industry, Trichur, August, p.2.

Based on the present technology, the following are the input requirements for producing 1000 tiles.[3]

a) Labour

In order to produce 1000 roofing tiles, the services of 10 workers and a supervisor are required.

b) Material cost

Clay requirement is worked out to be 100 cu.ft. per 1000 tiles.

Oil requirement is 5 litres per 1000 tiles.

c) Fuel

1000 tiles require 700 kg firewood.

The average prices of inputs for the period 1978-79 to 1987-88 were estimated on the basis of data provided by the sample units and are presented in table 3.10. A close observation of table 3.10 shows that the price of inputs gradually increased over the 10 year period. The

3. Small Industries Service Institute (1980), Op.cit. pp. 9.1 - 9.4.

Table 3.10. The average input price, wage rate and selling price of the sample units during the period 1978-79 to 1987-88

Particulars	1978-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	Average Annual growth rate*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Wage rate (average) (Rs)	9.30 (-)	10.10 (8.60)	10.10 -	12.10 (19.80)	14.70 (21.48)	16.30 (10.88)	21.00 (28.83)	24.10 (14.76)	26.20 (8.71)	28.80 (9.92)	11.97
Clay (100 cu.ft) (Rs)	20 (-)	22 (10)	28 (27.27)	35 (25)	45 (28.57)	45 (-)	120 (166)	125 (4.12)	125 -	138 (10.40)	21.31
Oil/lit (Rs)	1.00 (-)	1.25 (25)	1.50 (20)	2.00 (33.33)	2.00 (-)	2.50 (25)	3.00 (20)	3.50 (16.67)	4.00 (14.28)	4.50 (12.50)	16.23
Firewood (per MT) (Rs)	168 (-)	170 (1.19)	190 (11.76)	210 (10.52)	230 (9.52)	230 (-)	300 (30.43)	355 (18.33)	360 (1.41)	400 (11.11)	9.06
Selling price/ 1000 roofing tiles	400 (-)	680 (70)	700 (2.94)	800 (14.28)	825 (3.13)	900 (9.09)	1000 (11.11)	1200 (16.66)	1050 (-12.5)	1100 (4.77)	10.65

Figures in brackets give percentage change over the previous year

* Average Annual percent of change $Pn = Po\ (1+r)^n$

Po = initial year value
Pn = End year value
r = relative change per year expressed as decimal
n = number of years

Hence, the average annual growth rate = Anti log $\frac{(\log Pn - \log Po)}{n} - 1 \times 100$

See Frederick E Croxton and Dudley, J. Cowden (1979), Applied General Statistics, 3rd Edn. Prentice Hall of India, New Delhi, p.181.

price of clay had suddenly increased from Rs 45/cu.ft. in 1983-84 to Rs 120/cu.ft. in 1984-85. This was a random variation since further increase in the price of clay is seemed to be steady. During the same period, the price of firewood also recorded maximum increase (30.43 per cent). The selling price of 1000 tiles also increased from Rs 400 in 1978-79 to Rs 680 in 1979-80 and further declined by 12.5 per cent in 1986-87 compared to 1985-86.

Based on the above mentioned specifications and input prices, the cost of producing 1000 tiles was estimated. While calculating labour cost, 30-50 per cent of the wages and salaries was also added as a provision for other benefits.[4] However the actual may be slightly less, but exact estimation is difficult because of the casual nature of employment in the industry. Similarly power requirement cannot be precisly estimated and hence a lumpsum provision was made. The cost of production of

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4. Ibid, p.52.

1000 tiles and also sales proceeds and gross profit for the reference period (1978-79 to 1987-88) is given in table 3.11.

A close examination of table 3.11 shows that the gross profit steadily increased from Rs 112 in 1978-79 and reached the maximum in 1981-82 and almost the same pattern continued but in 1986-87 and 1987-88 again it declined and reached Rs 140 in 1987-88. This shows the uneven behaviour of the industry which is already established in the previous discussion. Over the period 1978-79 to 1987-88 the cost of producing 1000 roofing tiles recorded 233.3 per cent increase while selling price increased only by 175 per cent. Average annual growth rate in cost of production is worked out to be 12.79 per cent, while average annual growth rate for selling price is only 10.64 per cent which shows the declining net returns from the industry. The trends in material cost, fuel cost, labour cost, total cost, selling price and gross profit may be seen from Fig.3.1. Further analysis shows that (see table 3.12) the share of labour cost varied between 44-50 per cent over the

Table 3.11. Cost of production, sales proceeds and gross profit per 1000 roofing tiles (averages)

(Figures in rupees)
(Actuals are adjusted to nearest rupee)

Particulars	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	Average annual growth rate
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
A. Direct labour cost											
i. 10 workers and a supervisor	102.00	111.00	111.00	133.00	162.00	179.00	231.00	265.00	288.00	317.00	
ii. Provision for other benefits	@ 30% 31.00	@ 30% 33.00	@ 30% 33.00	@ 33% 44.00	@ 35% 56.00	@ 35% 63.00	@ 40% 92.00	@ 45% 119.00	@ 50% 144.00	@ 50% 158.00	
	133.00	144.00	144.00	177.00	218.00	242.00	323.00	384.00	432.00	475.00	13.58
B. Material cost											
i. Clay @ 100 cu.f/ 1000 tiles	20.00	22.00	28.00	35.00	45.00	45.00	120.00	125.00	125.00	138.00	
ii. Oil 5 lt/1000 tiles	5.00	6.00	8.00	10.00	10.00	13.00	15.00	18.00	20.00	23.00	
	25.00	28.00	36.00	45.00	55.00	58.00	135.00	143.00	145.00	161.00	20.47

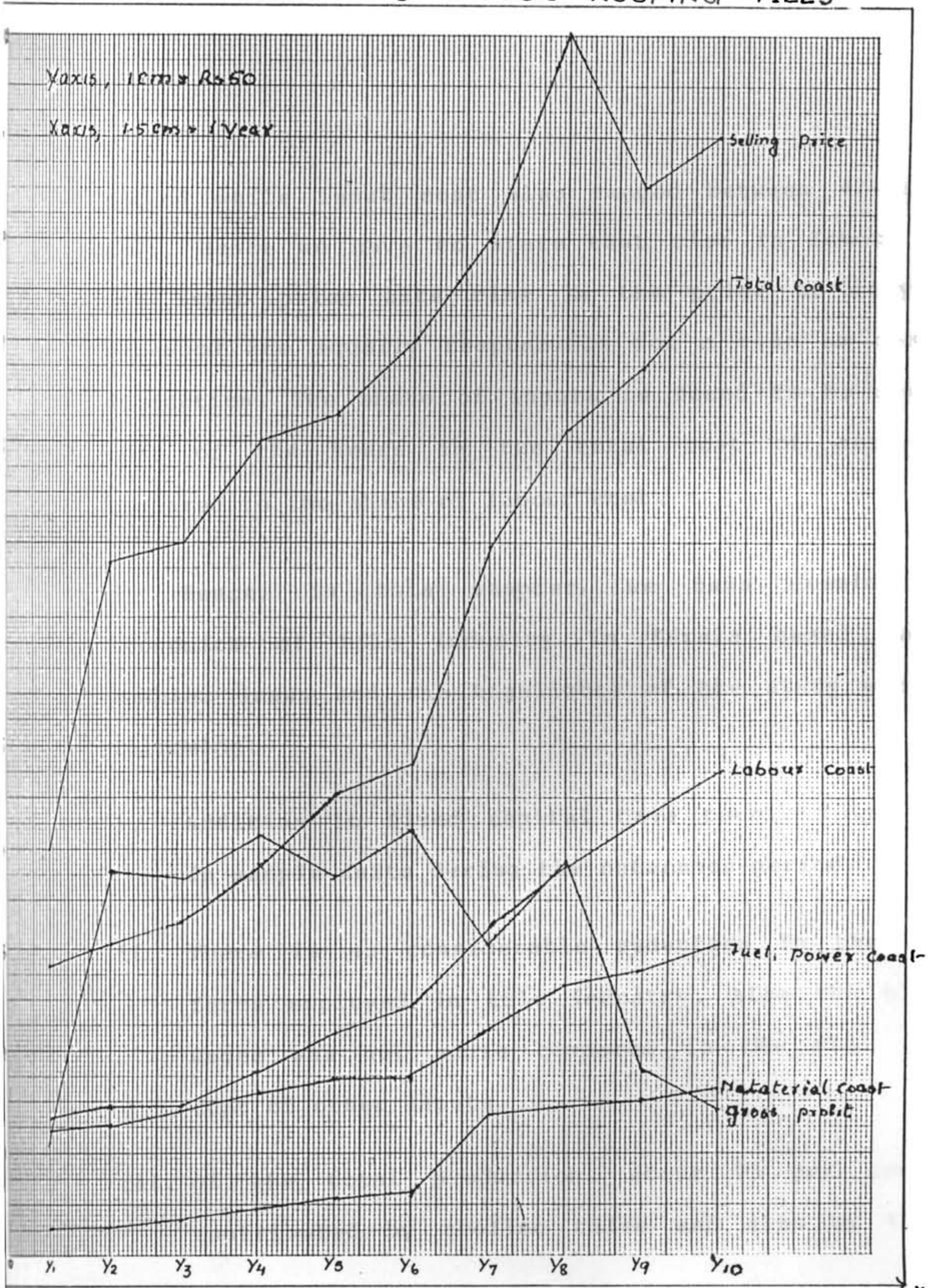
Contd........

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
C. Fuel and Power											
i. @ 700 kg for 1000 tiles	118.00	119.00	133.00	147.00	161.00	161.00	210.00	249.00	252.00	280.00	
ii. Electricity (lumpsum amount)	6.00	7.00	8.00	9.00	10.00	11.00	13.00	20.00	25.00	25.00	
	124.00	126.00	141.00	156.00	171.00	172.00	223.00	269.00	277.00	305.00	9.42
D. Other costs (approximately 20% of (A+B+C)	6.00	6.00	6.00	8.00	9.00	9.00	14.00	16.00	17.00	19.00	12.22
E. Total cost (A+B+C+D)	288.00	304.00	327.00	386.00	453.00	481.00	695.00	812.00	871.00	960.00	12.79
F. Selling price/1000 tiles	400.00	680.00	700.00	800.00	825.00	900.00	1000.00	1200.00	1050.00	1100.00	10.65
G. Gross profit on 1000 tiles (F-E)	112.00	376.00	373.00	414.00	372.00	419.00	305.00	388.00	179.00	140.00	2.26

Table 3.12. Percentage distribution of total cost of producing 1000 roofing tiles

Particulars (1)	78-79 (2)	79-80 (3)	80-81 (4)	81-82 (5)	82-83 (6)	83-84 (7)	84-85 (8)	85-86 (9)	86-87 (10)	87-88 (11)
A. Labour cost	46.18	47.36	44.04	45.85	48.12	50.31	46.47	47.29	49.60	49.48
B. Material cost	8.69	9.21	11.00	11.65	12.14	12.05	19.42	17.61	16.65	16.77
C. Fuel and power	43.05	41.45	43.12	40.41	37.74	35.73	32.08	33.79	31.80	31.77
Input cost (B+C)	51.74	50.66	54.12	52.06	49.91	47.78	51.50	51.40	48.45	50.54
D. Others	2.10	1.97	1.83	2.07	1.99	1.87	2.01	1.97	1.95	1.98
Total cost	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

FIG: 3.1 ECONOMICS OF 1000 ROOFING TILES



Y_1 = 78-79 ; . . . . . . Y_{10} = 87-88 period while input cost also ranged between 47-51 per cent. Hence we have to state that rise in labour cost and input price like rise in the price of clay and firewood are equally responsible for a rise in cost of production. The share of inputs is found to be more in most of the years in the total cost of production compared to the share of labour cost.

Hence, in this chapter, we have examined the economics of tile industry in Kerala based on the samples drawn and the highlights of the study were the following.

i. Addition to fixed capital have rarely taken place in sample units during the reference period.

ii. There is no considerable reduction in the labour force employed in tile industry. Also the hike in wages was not acute compared to the rise in the cost of other inputs.

iii. Of the total production, about 75 per cent was contributed by roofing tiles and also by the end of the reference period the share of roofing tiles even went upto 81 per cent.

iv. Cyclical variations are observed in the behaviour of the industry.

v. Capacity utilisation drastically came down basically due to inadequate demand.

vi. Cost of producing 1000 roofing tiles increased by 12.79 per cent per annum while selling price of 1000 tiles recorded only 10.65 per cent growth per annum.

CHAPTER IV

ECONOMICS OF TILE INDUSTRY - A REGIONAL ANALYSIS

As the tile industry has certain extent of concentration in four regions, namely, Calicut, Trichur, Alwaye and Quilon, the pooled analysis of the sample is likely to conceal some of the interesting regional pecularities/features of the economics of the industry. Therefore an attempt is made in this chapter to study the behaviour of the variables in these four regions. The sample consists of 32 factories which include five factories from Calicut region, sixteen factories from Trichur region, five factories from Alwaye region and six factories from Quilon region.

4.1. Capital structure

The composition of fixed capital of the regions Calicut, Trichur, Alwaye and Quilon for the period 1978-79 to 1987-88 are given in tables 4.1 - 4.4 respectively. In Calicut region fixed capital per unit stood at Rs 3.00 lakh in 1978-79 composed of 20.92 per cent land, 29.00 per cent buildings and 50.13 per cent plant and machinery which increased to Rs 7.38 lakh by the

Table 4.1. Composition of fixed capital of the sample units in Calicut region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	Land	Buildings	Plant and machinery	Fixed capital	FC per unit
(1)	(2)	(3)	(4)	(5)	(6)
78-79	3.14 (20.92)	4.35 (28.98)	7.52 (50.01)	15.01 (100)	3.00
79-80	3.23 (22.43)	4.60 (31.94)	6.57 (45.63)	14.40 (100)	2.88
80-81	3.57 (21.45)	4.57 (27.57)	8.34 (50.98)	16.36 (100)	3.27
81-82	3.82 (19.64)	5.93 (30.49)	9.70 (49.87)	19.45 (100)	3.89
82-83	5.49 (14.42)	15.67 (41.15)	16.92 (44.43)	38.08 (100)	7.62
83-84	7.62 (14.88)	21.24 (41.49)	22.34 (43.63)	51.20 (100)	10.24
84-85	7.52 (15.57)	19.37 (40.10)	21.41 (44.33)	48.30 (100)	9.66
85-86	6.68 (15.66)	17.30 (40.56)	18.67 (43.78)	42.65 (100)	8.53
86-87	7.83 (19.24)	15.83 (38.90)	17.03 (41.86)	40.69 (100)	8.14
87-88	7.48 (20.27)	14.90 (40.38)	14.52 (39.35)	36.90 (100)	7.38

Note: Figures in brackets give percentage to total

Table 4.2. Composition of fixed capital of the sample units in Trichur region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	Land	Buildings	Plant and machinery	Fixed capital	FC per unit
(1)	(2)	(3)	(4)	(5)	(6)
78-79	3.63 (16.50)	6.57 (29.58)	11.87 (53.93)	22.01 (100)	1.38
79-80	3.63 (16.02)	6.84 (30.19)	12.19 (53.80)	22.66 (100	1.42
80-81	3.81 (16.23)	6.99 (29.78)	12.68 (54.00)	23.48 (100)	1.47
81-82	3.87 (15.19)	7.83 (30.73)	13.78 (54.08)	25.48 (100)	1.59
82-83	3.87 (14.16)	8.50 (31.10)	14.96 (54.74)	27.33 (100)	1.71
83-84	3.58 (12.72)	8.95 (31.81)	15.61 (55.47)	28.14 (100)	1.76
84-85	3.99 (13.19)	10.11 (33.41)	16.16 (53.40)	30.26 (100)	1.89
85-86	4.00 (13.05)	9.40 (30.86)	17.20 (56.10)	30.66 (100)	1.92
86-87	3.99 (12.54)	10.27 (32.29)	17.55 (55.17)	31.81 (100)	1.99
87-88	4.00 (12.52)	9.67 (30.28)	18.27 (57.20)	31.94 (100)	1.99

Note: Figures in brackets give percentage to total

Table 4.3. Composition of fixed capital of the sample units in Alwaye region during the period 1978-79 - 1987-88

(Rs lakh)

Year	Land	Buildings	Plant and machinery	Fixed capital	FC per Unit
(1)	(2)	(3)	(4)	(5)	(6)
78-79	2.41 (33.47)	1.25 (17.36)	3.54 (49.17)	7.20 (100)	1.44
79-80	2.41 (30.62)	1.35 (17.15)	4.11 (52.22)	7.87 (100)	1.57
80-81	2.41 (28.39)	2.03 (23.91)	4.05 (47.70)	8.49 (100)	1.69
81-82	2.50 (29.10)	1.71 (19.91)	4.38 (50.98)	8.59 (100)	1.72
82-83	2.50 (26.15)	1.68 (17.57)	5.38 (56.28)	9.56 (100)	1.91
83-84	2.50 (16.58)	2.32 (15.38)	5.13 (43.02)	9.95 (100)	1.99
84-85	2.50 (29.94)	1.60 (19.16)	4.25 (50.90)	8.35 (100)	1.67
85-86	2.50 (31.49)	1.45 (18.26)	3.99 (50.25)	7.94 (100)	1.59
86-87	2.08 (28.69)	1.77 (24.41)	3.40 (46.89)	7.25 (100)	1.45
87-88	2.08 (25.97)	1.85 (23.09)	4.08 (50.94)	8.01 (100)	1.60

Note: Figures in brackets give percentage to total

Table 4.4. Composition of fixed capital of the sample units in Quilon region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	Land	Buildings	Plant and machinery	Fixed capital	FC per unit
(1)	(2)	(3)	(4)	(5)	(6)
78-79	3.31 (40.22)	1.92 (23.33)	3.00 (36.45)	8.23 (100)	1.37
79-80	3.31 (38.18)	1.80 (20.76)	3.56 (41.06)	8.67 (100)	1.45
80-81	3.31 (34.30)	2.59 (26.84)	3.75 (38.86)	9.65 (100)	1.61
81-82	3.44 (38.61)	2.02 (22.67)	3.45 (38.72)	8.91 (100)	1.49
82-83	3.47 (40.30)	1.88 (21.84)	3.26 (37.86)	8.61 (100)	1.44
83-84	3.47 (41.46)	1.91 (22.82)	2.99 (35.72)	8.37 (100)	1.40
84-85	3.47 (45.12)	1.49 (19.38)	2.73 (35.50)	7.69 (100)	1.28
85-86	3.47 (44.89)	1.48 (19.15)	2.78 (35.96)	7.73 (100)	1.29
86-87	3.05 (41.90)	1.72 (23.63)	2.51 (34.48)	7.28 (100)	1.21
87-88	3.05 (39.46)	1.57 (20.31)	3.11 (40.23)	7.73 (100)	1.29

Note: Figures in brackets give percentage to total

end of 1987-88 recording an increase of 146 per cent. Of this, land constituted 20.27 per cent, buildings 40.38 per cent and plant and machinery 39.35 per cent. Hence it is revealed that no addition to land has taken place in Calicut region. In 1982-83 new machinery was installed as part of modernisation attempt made by some companies in that region. On the other hand, in Trichur region fixed capital per unit came to Rs 1.38 lakh in 1978-79, which rose only to Rs 1.99 lakh by the end of the reference period (45.20 per cent increase). Land, buildings, plant and machinery respectively constituted 16.44 per cent, 29.76 per cent and 53.75 per cent in 1978-79 and 12.56 per cent, 30.37 per cent and 57.38 per cent in 1987-88. Hence we may believe that no significant addition to investment has taken place in Trichur region.

In Alwaye region the fixed capital came to Rs 7.20 lakh in 1978-79, average fixed capital being Rs 1.44 lakh. By the end of the reference period it remained only at Rs 8.01 lakh, average fixed capital being Rs 1.60 lakh. As in the case of Trichur region, no substantial change has taken place in the composition of fixed capital over the reference period. Quilon region accounted Rs 1.37 lakh in 1978-79 by way of fixed capital per unit which stood at Rs 1.29 lakh in 1987-88. Component wise, land constituted 40.26 per cent, buildings 23.36 per cent and plant and machinery 36.49 per cent in 1978-79, which came to 39.40 per cent, 20.28 per cent and 40.18 per cent respectively in 1987-88. When compared to the other three regions, the share of land is found to be more in Quilon region, and there is also an onward tendency to acquire more land.

Tables 4.5 - 4.8 give the composition of physical working capital (PWC) and working capital (WC) for the regions Calicut, Trichur, Alwaye and Quilon respectively. The average physical working capital stood at Rs 2.95 lakh in 1978-79 in Calicut region, while it came to Rs 1.29 lakh in Trichur region, 1.12 lakh in Alwaye region and Rs 1.22 lakh in Quilon region. Of this, material stock constituted 42.92 per cent in Calicut region, 40.10 per cent in Trichur region, 34.46 per cent in Alwaye region and 35.31 per cent in Quilon region. The percentage contribution of semi-finished goods came to 20.00 per cent, 21.26 per cent, 18.92 per cent and 26.69 per cent respectively. Similarly, stock

Table 4.5. Composition of physical working capital and working capital of the sample units in Calicut Region during the period 1978-79 - 1987-88

(Rs in lakh)

Year (1)	Materials (2)	Semi finished (3)	Finished (4)	Total PWC (2)+(3)+(4) (5)	Cash (6)	(R-P) (7)	W.C. (5)+(6)+(7) (8)	P.W.C. per unit (9)	W.C. per unit (10)
78-79	6.33 (42.97)	2.95 (20.03)	5.45 (36.99)	14.73 (100)	3.79	9.70	8.82	2.95	1.76
79-80	9.84 (52.70)	3.50 (18.75)	5.33 (28.55)	18.67 (100)	11.36	-7.73	22.30	3.73	0.75
80-81	5.01 (31.33)	2.80 (17.51)	8.18 (51.16)	15.99 (100)	2.56	-13.92	4.63	3.20	0.93
81-82	10.83 (31.54)	6.31 (18.38)	17.20 (50.09)	34.34 (100)	3.05	-9.36	28.03	6.87	5.61
82-83	14.93 (68.83)	2.74 (12.63)	4.02 (18.53)	21.69 (100)	6.93	-2.79	25.83	4.34	5.17
83-84	10.54 (30.97)	8.70 (25.57)	14.79 (43.46)	34.03 (100)	4.16	17.22	55.41	6.81	11.08
84-85	11.29 (43.27)	8.24 (31.58)	6.56 (25.14)	26.09 (100)	6.70	-1.00	31.79	5.22	6.36
85-86	22.66 (55.90)	7.45 (18.38)	10.43 (25.73)	40.54 (100)	7.71	-21.43	25.82	8.11	5.16
86-87	27.56 (60.85)	7.95 (17.55)	9.78 (21.59)	45.29 (100)	19.21	-25.99	38.51	9.06	7.70
87-88	32.51 (70.37)	7.04 (15.24)	6.65 (14.39)	46.20 (100)	14.19	-27.84	32.55	9.24	6.51

Figures in brackets give percentage composition of PWC

Table 4.6. Composition of physical working capital and working capital of the sample units in Trichur Region during the period 1978-79 - 1987-88

(Rs lakh)

Year	Materials	Semi finished	Finished	Total PWC	Cash	(R-P)	W.C.	PWC per unit	WC per unit
				(2)+(3)+(4)			(5)+(6)+(7)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
78-79	8.29 (40.07)	4.39 (21.22)	8.01 (38.71)	20.69 (100)	1.04	2.03	23.76	1.29	1.49
79-80	8.99 (43.16)	4.04 (19.40)	7.80 (37.45)	20.83 (100)	1.05	5.13	27.01	1.30	1.69
80-81	10.57 (45.62)	4.09 (17.65)	8.57 (36.73)	23.17 (100)	1.10	9.48	33.75	1.45	2.11
81-82	12.03 (46.14)	3.99 (15.30)	10.05 (38.56)	26.07 (100)	1.11	6.73	33.91	1.63	2.12
82-83	11.81 (42.28)	4.46 (15.97)	11.66 (41.75)	27.93 (100)	1.30	5.28	34.51	1.75	2.16
83-84	11.17 (38.33)	4.19 (14.38)	13.78 (47.29)	29.14 (100)	1.37	11.55	42.06	1.82	2.63
84-85	12.83 (30.84)	4.56 (10.96)	24.21 (58.20)	41.60 (100)	2.21	10.66	54.47	2.60	3.40
85-86	13.47 (36.15)	3.92 (10.52)	19.87 (53.33)	37.26 (100)	1.53	8.57	47.36	2.33	2.96
86-87	12.80 (28.02)	9.89 (21.66)	22.99 (50.33)	45.68 (100)	3.35	2.04	51.07	2.86	3.19
87-88	14.15 (27.32)	10.65 (20.56)	26.99 (52.11)	51.79 (100)	1.67	-0.73	52.73	3.24	3.30

Figures in brackets give percentage composition of PWC

Table 4.7. Composition of physical working capital and working capital of the sample units in Alwaye Region during the period 1978-79 - 1987-88

(Rs lakh)

Year (1)	Materials (2)	Semi finished (3)	Finished (4)	Total PWC (2)+(3)+(4) (5)	Cash (6)	(R-P) (7)	W.C. (5)+(6)+(7) (8)	PWC per unit (9)	WC per unit (10)
78-79	1.93 (34.46)	1.06 (18.92)	2.61 (46.61)	5.60 (100)	0.40	-0.24	5.76	1.12	1.15
79-80	2.83 (23.86)	1.49 (12.56)	7.54 (63.58)	11.86 (100)	0.35	-1.69	10.52	2.37	2.10
80-81	2.94 (39.78)	1.59 (21.52)	2.86 (38.70)	7.39 (100)	0.43	0.13	7.95	1.48	1.59
81-82	2.27 (19.03)	1.44 (12.07)	8.22 (68.90)	11.93 (100)	0.25	2.10	14.28	2.39	2.86
82-83	3.14 (21.84)	1.74 (12.10)	9.50 (55.05)	14.38 (100)	0.28	0.36	15.02	2.88	3.00
83-84	3.83 (19.38)	1.52 (7.69)	14.41 (72.93)	19.76 (100)	2.81	-1.72	20.85	3.95	4.17
84-85	4.49 (12.98)	2.33 (6.74)	27.76 (80.28)	34.58 (100)	0.75	-3.34	31.99	6.92	6.40
85-86	4.14 (20.73)	2.32 (11.62)	13.51 (67.65)	19.97 (100)	0.91	1.30	22.18	3.99	4.44
86-87	7.10 (21.09)	4.04 (12.00)	22.52 (66.91)	33.66 (100)	1.64	-3.73	31.57	6.73	6.31
87-88	10.17 (46.75)	5.30 (17.04)	15.64 (50.27)	31.11 (100)	2.09	-8.94	24.26	6.22	4.85

Figures in brackets give percentage composition of PWC

Table 4.8. Composition of physical working capital and working capital of the sample units in Quilon Region during the period 1978-79 - 1987-88

(Rs in lakh)

Year (1)	Materials (2)	Semi finished (3)	Finished (4)	Total PWC (2)+(3)+(4) (5)	Cash (6)	(R-P) (7)	W.C. (5)+(6)+(7) (8)	PWC per unit (9)	WC per unit (10)
78-79	2.50 (35.26)	1.89 (26.66)	2.70 (38.08)	7.09 (100)	0.46	-0.26	7.29	1.18	1.22
79-80	3.35 (23.22)	3.95 (27.37)	7.13 (49.41)	14.43 (100)	1.55	1.89	17.87	2.41	2.98
80-81	3.71 (50.14)	1.44 (19.46)	2.25 (30.41)	7.40 (100)	5.11	0.10	12.61	1.23	2.10
81-82	4.29 (31.78)	1.40 (10.37)	7.81 (57.35)	13.53 (100)	5.08	5.10	23.68	2.26	3.95
82-83	5.01 (31.83)	2.24 (14.23)	8.49 (53.94)	15.74 (100)	4.52	-0.36	19.90	2.62	3.32
83-84	6.04 (30.72)	1.98 (10.07)	4.64 (59.21)	19.66 (100)	0.65	-3.41	16.90	3.28	2.82
84-85	7.75 (33.13)	2.36 (10.09)	13.28 (56.78)	23.39 (100)	1.39	-2.49	22.29	3.90	3.72
85-86	5.73 (27.31)	3.36 (16.01)	11.89 (56.67)	20.98 (100)	4.04	-1.90	23.12	3.50	3.85
86-87	9.19 (29.54)	4.33 (13.92)	17.59 (56.54)	31.11 (100)	10.22	-5.81	35.52	5.19	5.92
87-88	11.58 (34.82)	7.58 (22.79)	14.10 (42.39)	33.26 (100)	12.11	-16.23	29.14	5.54	4.86

Figures in brackets give percentage composition of PWC

of finished goods came to 36.95 per cent, 38.81 per cent, 46.61 per ent and 38.14 per cent. By the end of 1987-88, average physical working capital rose to Rs 9.24 lakh in Calicut region, Rs 3.24 lakh in Trichur region, Rs 6.22 lakh in Alwaye region and Rs 5.54 lakh in Quilon region. A detailed examination of the percentage changes in the composition of physical working capital over the reference period for the four regions revealed that the stock of materials accumulated very much in Calicut region (70.37 per cent).

In 1987-88 the share of the stock of the finished goods came to 14.39 per cent in Calicut region, 52.06 per cent in Trichur region, 50.28 per cent in Alwaye region and 42.42 per cent in Quilon region. Hence, the accumulation of stock of finished goods is not a severe problem in Calicut region when compared to other three regions. One of the reasons for this phenomenon is the goodwill of the firms in this region. Accumulated stock of finished goods is severe in Trichur and Alwaye regions and this may be due to the low quality as well as too many firms in the region.

In Calicut region, average working capital stood at Rs 1.76 lakh in 1978-79 and it rose to Rs 6.57 lakh in 1987-88. The net difference between receivables and payables remained negative except for the year 1983-84, which indicates the extend of financial commitments. In Trichur region average working capital increased from Rs 1.49 lakh in 1978-79 to Rs 3.30 lakh in 1987-88. For the same period, in Alwaye region it rose from Rs 1.15 lakh to Rs 4.85 lakh. Quilon region accounted Rs 1.22 lakh in 1978-79 and Rs 4.86 lakh in 1987-88.

The other two important constituents of capital structure are invested capital and productive capital. The details of invested capital and productive capital for the four regions, namely Calicut, Trichur, Alwaye and Quilon are presented in tables 4.9 - 4.12 respectively. Over the reference period invested capital increased by 179 per cent, 96.09 per cent, 205 per cent and 167 per cent respectively in the four regions. The respective percentages for the productive capital came to 191.44, 84.99, 148.99 and 137.56. A high growth in both the productive and the invested capital in Calicut

Table 4.9. Details of Productive Capital and Invested Capital of the sample units in Calicut region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	FC	PWC	WC	PC (2)+(4)	IC (2)+(3)	PC per unit	IC per unit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
78-79	15.01	14.73	8.82	23.83	29.74	4.77	5.95
79-80	14.40	18.67	22.30	36.70	33.07	7.34	6.61
80-81	16.36	15.99	4.63	20.99	32.35	4.19	6.47
81-82	19.45	34.34	28.03	47.48	53.79	9.50	10.76
82-83	38.08	21.69	25.83	63.91	59.77	12.78	11.95
83-84	51.20	34.03	55.41	106.61	85.23	21.32	17.05
84-85	48.30	26.09	31.79	80.09	74.39	16.02	14.88
85-86	42.65	40.54	26.82	69.47	83.19	13.89	16.64
86-87	40.69	45.29	38.51	79.20	85.98	15.84	17.19
87-88	36.90	46.20	32.55	69.45	83.10	13.89	16.62

Table 4.10. Details of Productive Capital and Invested Capital of the sample units in Trichur region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	FC	PWC	WC	PC (2)+(4)	IC (2)+(3)	PC per unit	IC per unit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
78-79	22.01	20.69	23.76	45.77	42.70	2.86	2.67
79-80	22.66	20.83	27.01	49.67	43.49	3.10	2.72
80-81	23.48	23.17	33.75	57.23	46.65	3.58	2.92
81-82	25.48	26.07	33.91	59.39	57.55	3.71	3.59
82-83	27.33	27.93	34.51	61.84	55.26	3.87	3.45
83-84	28.14	29.14	42.06	70.20	57.28	4.39	3.58
84-85	30.26	41.60	54.47	84.73	71.86	5.29	4.49
85-86	30.66	37.26	47.36	78.02	67.92	4.88	4.25
86-87	31.81	45.68	51.07	82.88	77.49	5.18	4.84
87-88	31.94	51.79	52.73	84.67	83.73	5.29	5.23

Table 4.11. Details of Productive Capital and Invested Capital of the sample units in Alwaye region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	FC	PWC	WC	PC (2)+(4)	IC (2)+(3)	PC per unit	IC per unit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
78-79	7.20	5.60	5.76	12.96	12.80	2.59	2.56
79-80	7.87	11.86	10.52	18.39	19.73	3.68	3.95
80-81	8.49	7.39	7.95	16.44	15.88	3.29	3.18
81-82	8.59	11.93	14.28	22.87	20.52	4.57	4.10
82-83	9.56	14.38	15.02	24.58	23.94	4.92	4.79
83-84	9.95	19.76	20.85	30.80	29.71	6.16	5.94
84-85	8.35	34.58	31.99	40.34	42.93	8.07	8.59
85-86	7.94	19.97	22.18	30.12	27.91	6.02	5.58
86-87	7.25	33.66	31.57	38.82	40.91	7.76	8.18
87-88	8.01	31.11	24.26	32.27	39.12	6.45	7.82

Table 4.12. Details of Productive Capital and Invested Capital of the sample units in Quilon region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	FC	PWC	WC	PC (2)+(4)	IC (2)+(3)	PC per unit	IC per unit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
78-79	8.23	7.09	7.29	15.52	15.32	2.59	2.55
79-80	8.67	14.43	17.87	26.54	23.10	4.42	3.85
80-81	9.65	7.40	12.61	22.26	17.05	3.71	2.84
81-82	8.91	13.50	23.68	32.59	22.41	5.43	3.74
82-83	8.61	15.74	19.90	28.51	24.35	4.75	4.06
83-84	8.37	19.66	16.90	25.27	28.03	4.21	4.67
84-85	7.69	23.39	22.29	29.98	31.08	4.99	5.18
85-86	7.73	20.98	23.12	30.85	28.71	5.14	4.79
86-87	7.28	31.11	35.52	42.80	38.39	7.13	6.39
87-88	7.73	33.26	29.14	36.87	40.99	6.15	6.83

region is due to the increased stock of materials and in Alwaye region it is due to the heavy stock of the finished goods. Average productive capital came to Rs 4.77 lakh, Rs 2.86 lakh, Rs 2.59 lakh and Rs 2.59 lakh respectively in Calicut, Trichur, Alwaye and Quilon regions in 1978-79, which rose to Rs 13.89 lakh, Rs 5.29 lakh, Rs 6.45 lakh and Rs 6.15 lakh in 1987-88. Similarly, average invested capital was Rs 5.95 lakh in Calicut region, Rs 2.67 lakh in Trichur region, Rs 2.56 lakh in Alwaye region and Rs 2.55 lakh in Quilon region which reached Rs 16.62 lakh, Rs 5.23 lakh, Rs 7.82 lakh and Rs 6.83 lakh respectively by the end of 1987-88.

4.2. Employment and emoluments

In this section, an attempt is made to examine the extent of labour absorption in tile industry in the different regions (see tables 4.17 - 4.20, col.3 and 4.29 - 4.32 col.8). In Calicut region, the number of workers employed per factory was 179 in 1978-79 and 178 in 1987-88. It shows that no change has taken place in employment in Calicut region. But the average number of workers per unit was much lower in Trichur which declined from 77 in 1978-79 to 63 in 1987-88. This decline does not reflect labour displacement, because fluctuations in employment may be caused due to the cyclical nature which is unique to this industry. The average number of workers varied between 82-86 in Alwaye region and 73-75 in Quilon region over the reference period. From the above discussion, the following findings are emerged.

i. No labour displacement has taken place between 1978-79 and 1987-88 in any of the regions.

ii. Labour is becoming more costly in Alwaye region (average annual growth rate of wages and salaries was found to be maximum in Alwaye during the reference period 13.93). This is mainly due to the various employment opportunities available in other industries located in Alwaye belt.

4.3. Inputs

The regional variations in the intake of inputs like clay, firewood, electricity and oil were examined and presented in tables 4.13 - 4.16. Of the total inputs

Table 4.13. Composition of inputs consumed by the sample units in Calicut region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	Clay	Fire-wood	Oil	Electri-city	Others	Total in-puts pur-chased	Stock ad-justment factor	Inputs consu-med	Inputs con-sumed per unit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
78-79	9.60 (33.05)	15.39 (52.98)	1.61 (5.54)	2.09 (7.19)	0.36 (7.23)	29.05 (100)	4.97	34.02	6.80
79-80	12.13 (29.15)	24.00 (57.68)	2.06 (4.95)	2.95 (7.09)	0.47 (1.13)	41.61 (100)	3.51	38.10	7.62
80-81	12.18 (26.34)	27.61 (59.70)	2.16 (4.67)	3.60 (7.78)	0.43 (1.51)	45.98 (100)	4.83	50.81	10.16
81-82	13.09 (29.36)	25.73 (57.72)	2.16 (4.85)	3.15 (7.07)	0.45 (1.00)	44.58 (100)	-5.28	38.76	7.75
82-83	11.51 (31.89)	19.30 (53.48)	1.56 (4.32)	3.33 (9.23)	0.39 (1.08)	36.09 (100)	-4.10	31.99	6.39
83-84	17.86 (30.32)	33.21 (56.38)	2.68 (4.55)	4.48 (7.61)	0.67 (1.14)	58.90 (100)	4.39	63.29	12.66
84-85	25.97 (34.06)	41.57 (54.33)	3.07 (4.03)	4.96 (6.51)	0.67 (0.87)	76.24 (100)	-0.75	75.49	15.09
85-86	25.95 (31.99)	45.41 (55.99)	3.19 (3.93)	5.87 (7.24)	0.69 (0.85)	81.11 (100)	-11.37	69.74	13.95
86-87	28.11 (33.62)	44.31 (52.99)	2.69 (3.22)	7.18 (8.59)	1.33 (1.58)	83.62 (100)	-4.90	78.72	15.74
87-88	30.59 (33.86)	48.80 (54.02)	3.05 (3.38)	6.62 (7.33)	1.27 (1.41)	90.33 (100)	4.95	85.38	17.08

Figures in brackets give percentage to total inputs purchased.

Table 4.14. Composition of inputs consumed by the sample units in Trichur region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	Clay	Fire-wood	Oil	Electri-city	Others	Total in-puts pur-chased	Stock ad-justment factor	Inputs consu-med	Inputs con-sumed per unit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
78-79	8.94 (26.38)	20.56 (60.67)	1.97 (5.81)	1.75 (5.16)	0.67 (1.98)	33.89 (100)	0.99	34.88	2.18
79-80	12.11 (27.06)	27.24 (60.86)	2.16 (4.83)	2.36 (5.28)	0.89 (1.97)	44.76 (100)	-0.76	44.06	2.75
80-81	16.18 (28.16)	35.11 (61.10)	2.59 (4.51)	2.65 (4.61)	0.93 (1.62)	57.46 (100)	-1.58	55.88	3.49
81-82	15.22 (25.22)	38.09 (63.11)	3.15 (5.22)	2.66 (4.41)	1.24 (2.05)	60.36 (100)	-1.46	58.90	3.68
82-83	18.38 (26.96)	42.82 (62.81)	3.22 (4.72)	2.46 (3.61)	1.29 (1.89)	68.17 (100)	0.22	68.39	4.27
83-84	16.98 (25.64)	41.07 (62.02)	3.76 (5.68)	3.11 (4.70)	1.30 (1.96)	66.22 (100)	0.64	66.86	4.18
84-85	22.90 (29.90)	44.55 (58.14)	4.27 (5.57)	3.66 (4.78)	1.25 (1.63)	76.63 (100)	-1.66	74.97	4.67
85-86	25.63 (29.25)	51.23 (58.48)	5.56 (6.35)	3.70 (4.22)	1.48 (1.69)	87.60 (100)	-0.64	86.96	5.44
86-87	28.16 (28.60)	58.86 (59.78)	5.49 (5.58)	4.39 (4.46)	1.56 (1.58)	98.46 (100)	0.67	99.13	6.19
87-88	31.75 (28.28)	68.52 (61.03)	6.39 (5.69)	3.72 (3.31)	1.90 (1.69)	112.28 (100)	-1.35	110.93	6.93

Figures in brackets give percentage to total inputs purchased

Table 4.15. Composition of inputs consumed by the sample units in Alwaye region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	Clay	Fire-wood	Oil	Electri-city	Others	Total inputs purchased	Stock adjustment factor	Inputs consumed	Inputs consumed per unit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
78-79	4.61 (27.34)	9.84 (58.36)	0.73 (4.33)	1.36 (8.07)	0.32 (1.90)	16.86 (100)	0.64	17.50	3.50
79-80	5.67 (28.96)	11.18 (57.10)	0.78 (3.98)	1.56 (7.97)	0.39 (1.99)	19.58 (100)	-0.90	18.68	3.74
80-81	6.32 (28.43)	12.87 (57.89)	0.98 (4.41)	1.66 (7.47)	0.40 (1.80)	22.23 (100)	-0.11	22.12	4.42
81-82	5.58 (21.56)	17.21 (66.52)	1.13 (4.37)	1.39 (5.37)	0.56 (2.16)	25.87 (100)	0.67	26.54	5.31
82-83	5.03 (21.57)	15.47 (66.34)	0.88 (3.77)	1.40 (6.00)	0.54 (2.32)	23.32 (100)	-0.87	22.45	4.49
83-84	6.09 (20.74)	19.89 (67.72)	1.38 (4.70)	1.34 (4.56)	0.67 (2.28)	29.37 (100)	-0.69	28.68	5.74
84-85	11.87 (27.31)	26.97 (62.07)	1.91 (4.39)	1.88 (4.32)	0.82 (1.89)	43.45 (100)	-0.66	42.79	8.56
85-86	16.86 (33.61)	28.68 (57.18)	1.88 (3.75)	1.95 (3.89)	0.79 (1.57)	50.16 (100)	0.35	50.51	10.10
86-87	17.59 (32.48)	31.57 (58.29)	1.97 (3.64)	2.29 (4.23)	0.74 (1.37)	54.16 (100)	-2.96	51.20	10.24
87-88	15.03 (29.33)	30.64 (59.79)	2.10 (4.09)	2.60 (5.07)	0.88 (1.72)	51.25 (100)	-3.07	48.18	9.64

Figures in brackets give percentage to total inputs purchased

Table 4.16. Composition of inputs consumed by the sample units in Quilon region during the period 1978-79 - 1987-88

(Rs lakh)

Year	Clay	Fire-wood	Oil	Electri-city	Others	Total in-puts pur-chased	Stock ad-justment factor	Inputs consu-med	Inputs con-sumed per unit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
78-79	2.67 (25.82)	6.17 (59.67)	0.42 (4.06)	0.98 (9.48)	0.10 (0.97)	10.34 (100)	0.69	11.03	1.84
79-80	4.14 (31.63)	7.11 (54.32)	0.44 (3.36)	1.21 (9.24)	0.19 (1.45)	13.09 (100)	-0.85	12.24	2.04
80-81	3.71 (30.19)	6.63 (53.95)	0.52 (4.23)	1.29 (10.50)	0.14 (1.14)	12.29 (100)	-0.36	11.93	1.99
81-82	4.24 (20.37)	14.23 (68.38)	0.84 (4.04)	1.21 (5.81)	0.29 (1.34)	20.81 (100)	-0.58	20.23	3.37
82-83	4.24 (19.19)	15.27 (69.12)	0.90 (4.07)	1.18 (5.34)	0.50 (2.26)	22.09 (100)	-0.72	21.37	3.56
83-84	5.23 (19.55)	18.79 (70.24)	1.08 (4.04)	1.02 (3.81)	0.63 (2.36)	26.75 (100)	-1.03	25.72	4.29
84-85	9.35 (27.38)	20.55 (60.83)	1.63 (4.83)	1.51 (4.47)	0.74 (2.19)	33.78 (100)	-1.71	32.07	5.35
85-86	11.78 (33.95)	19.00 (54.76)	1.55 (4.47)	1.58 (4.55)	0.79 (2.28)	34.70 (100)	2.02	36.72	6.12
86-87	13.66 (31.56)	25.46 (58.83)	1.70 (3.93)	1.26 (2.91)	1.20 (2.77)	43.28 (100)	-3.46	39.82	6.64
87-88	13.19 (26.62)	28.62 (62.49)	1.68 (3.69)	1.99 (4.35)	1.32 (2.88)	45.80 (100)	-3.00	42.80	7.13

Figures in brackets give percentage to total inputs purchased.

purchased, in Calicut Region 33.05 per cent was constituted by clay, 52.98 per cent by firewood, 5.54 per cent by electricity and 7.19 per cent by oil in 1978-79. After stock adjustment, total inputs consumed amounted to Rs 34.02 lakh in 1978-79, which rose to 85.38 lakh in 1987-88, recording an increase of 210.95 per cent. The percentage composition almost remained constant throughout. The average consumption of inputs came to Rs 6.80 lakh in 1978-79 and Rs 17.08 lakh in 1987-88. In Trichur region, of the total inputs purchased 25.22 - 29.25 per cent is constituted by clay, 58.14 - 63.11 per cent by firewood, 4.51 - 6.35 per cent by oil and 3.31 - 5.28 per cent by electricity. Sample units together consumed inputs worth Rs 34.88 lakh in 1978-79, per unit consumption of inputs being Rs 2.18 lakh. This was increased by 218.03 per cent (Rs 110.93 lakh) by the end of 1987-88, per unit consumption of inputs being Rs 6.93 lakh. Sample units in Alwaye altogether consumed inputs worth Rs 17.50 lakh, which became Rs 48.18 lakh by the end of the reference period. Average consumption came to Rs 3.50 lakh in 1978-79 and it rose to Rs 9.64 lakh in 1987-88, percentage increase being 175.43. The percentage contribution of clay in total inputs purchased varied between 20.74 - 33.61 per cent, firewood 57.10 - 67.72 per cent, oil 3.75 - 4.07 per cent and electricity 3.89 - 8.07 per cent. In Quilon region total inputs purchased amounted to Rs 10.34 lakh in 1978-79 constituted by 25.22 per cent of clay, 59.57 per cent of firewood, 4.06 per cent of oil and 9.48 per cent of electricity. This composition stood at 26.62 per cent, 62.49 per cent, 3.69 per cent and 4.35 per cent respectively in 1987-88. Per unit consumption was Rs 1.84 lakh in 1978-79 and it became Rs 7.13 lakh in 1987-88 marking a percentage increase of 287.50 per cent. An enquiry into the composition of inputs in four regions revealed the following pattern.

i. Of the total input cost, clay constituted about 30 per cent in all the regions.

ii. Firewood is found to be cheap in Calicut region.

4.4. Cost of production

The total cost of production per unit came to Rs 12.32 lakh in Calicut region, Rs 4.04 lakh in Trichur region, Rs 6.47 lakh in Alwaye region and Rs 4.65 lakh in Quilon region (Tables 4.17 - 4.20). By the end of the reference period, it increased respectively to Rs 27.87 lakh, Rs 10.98 lakh, Rs 20.54 lakh and Rs 16.31 lakh, percentage increase being 126.22, 171.08, 220.87 and 250.75. The emerging trends are:

i. rise in input cost is maximum in Quilon region and minimum in Calicut region.

ii. labour cost is maximum in Alwaye region and minimum in Calicut region.

Hence among the four regions, Calicut region is capable of producing tiles at low cost and this is due to the easy availability of firewood which was already established in the earlier section and also may be due to the economies of scale enjoyed by the factories in the region because of their size economy.

Table 4.17. Cost of production of the sample units in Calicut region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	Input	Wages & salaries	Other esta-blishment costs	Total cost (2)+(3)+(4)	Total cost per unit
(1)	(2)	(3)	(4)	(5)	(6)
78-79	34.02 (55.21)	20.58 (33.37)	7.02 (11.39)	61.62 (100)	12.32
79-80	38.10 (52.89)	27.22 (37.78)	6.71 (9.31)	72.03 (100)	14.41
80-81	50.81 (54.88)	32.05 (34.62)	9.72 (10.50)	92.58 (100)	18.52
81-82	38.76 (54.89)	24.04 (34.05)	7.81 (11.06)	70.61 (100)	14.12
82-83	31.99 (46.23)	28.99 (41.89)	8.22 (11.89)	69.20 (100)	13.84
83-84	63.29 (54.98)	39.93 (34.69)	11.89 (10.33)	115.11 (100)	23.02
84-85	75.49 (56.52)	44.49 (33.31)	13.58 (10.17)	133.56 (100)	26.71
85-86	69.74 (57.83)	36.78 (30.50)	14.07 (11.67)	120.59 (100)	24.12
86-87	78.72 (61.10)	37.86 (29.39)	12.25 (9.51)	128.83 (100)	25.77
87-88	85.38 (61.27)	38.48 (27.61)	15.50 (11.12)	139.36 (100)	27.87

Figures in brackets give percentage share of each compound to total cost.

Table 4.18. Cost of production of the sample units in Trichur region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	Input	Wages & salaries	Other establishment costs	Total cost (2)+(3)+(4)	Total cost per unit
(1)	(2)	(3)	(4)	(5)	(6)
78-79	34.88 (54.02)	22.45 (34.77)	7.24 (11.21)	64.57 (100)	4.04
79-80	44.06 (55.92)	26.41 (33.52)	8.32 (10.56)	78.79 (100)	4.92
80-81	55.88 (58.28)	31.04 (32.07)	8.97 (9.35)	95.89 (100)	5.99
81-82	58.90 (57.82)	33.97 (33.35)	8.99 (8.83)	101.86 (100)	6.37
82-83	68.39 (59.42)	37.08 (32.22)	9.63 (8.37)	115.10 (100)	7.19
83-84	66.86 (57.51)	39.68 (34.13)	9.72 (8.36)	116.26 (100)	7.27
84-85	74.97 (60.79)	40.35 (32.72)	8.00 (6.49)	123.32 (100)	7.71
85-86	86.96 (62.20)	44.71 (31.98)	8.13 (5.82)	139.80 (100)	8.74
86-87	99.13 (61.03)	53.37 (32.86)	9.92 (6.12)	162.42 (100)	10.15
87-88	110.93 (63.12)	55.88 (31.80)	8.94 (5.09)	175.75 (100)	10.98

Figures in brackets give percentage share of each component to total cost.

Table 4.19. Cost of production of the sample units in Alwaye region during the period 1978-79 - 1987-88

(Rs lakh)

Year	Input	Wages & salaries	Other establishment costs	Total cost (2)+(3)+(4)	Total cost per unit
(1)	(2)	(3)	(4)	(5)	(6)
78-79	17.50 (54.10)	11.62 (35.92)	3.23 (9.98)	32.35 (100)	6.47
79-80	18.68 (52.66)	13.15 (37.07)	3.64 (10.26)	35.47 (100)	7.09
80-81	22.12 (49.45)	18.40 (41.13)	4.21 (8.42)	44.73 (100)	8.95
81-82	26.54 (61.25)	12.89 (29.75)	3.90 (9.00)	43.33 (100)	8.67
82-83	22.45 (48.18)	19.17 (41.14)	4.97 (10.67)	46.59 (100)	9.32
83-84	28.68 (40.82)	31.93 (45.45)	9.64 (13.72)	70.25 (100)	14.05
84-85	42.79 (48.12)	37.91 (42.63)	8.23 (9.25)	88.93 (100)	17.79
85-86	50.51 (53.77)	36.32 (38.67)	7.10 (7.55)	93.93 (100)	18.79
86-87	51.20 (49.33)	42.83 (41.27)	9.76 (9.40)	103.79 (100)	20.76
87-88	48.18 (46.92)	45.09 (43.91)	9.42 (9.17)	102.69 (100)	20.54

Figures in brackets give percentage share of each component to total cost.

Table 4.20. Cost of production of the sample units in Quilon region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	Input	Wages & salaries	Other establishment costs	Total cost (2)+(3)+(4)	Total cost per unit
(1)	(2)	(3)	(4)	(5)	(6)
78-79	11.03 (39.53)	12.60 (45.16)	4.27 (15.30)	27.90 (100)	4.65
79-80	12.24 (40.30)	14.16 (46.62)	3.97 (13.07)	30.37 (100)	5.06
80-81	11.93 (40.55)	12.68 (43.10)	4.81 (16.35)	29.42 (100)	4.90
81-82	20.23 (47.92)	16.23 (38.45)	5.75 (13.62)	42.21 (100)	7.04
82-83	21.37 (45.33)	16.87 (35.79)	8.90 (18.88)	47.14 (100)	7.86
83-84	25.72 (43.43)	24.93 (42.10)	8.57 (14.47)	59.22 (100)	9.87
84-85	32.07 (42.64)	30.61 (40.70)	12.52 (16.65)	75.20 (100)	12.53
85-86	36.72 (42.56)	36.32 (42.10)	13.24 (15.35)	86.28 (100)	14.38
86-87	39.82 (43.09)	38.51 (41.66)	14.09 (15.25)	92.42 (100)	15.40
87-88	42.80 (43.74)	38.30 (39.13)	16.76 (17.13)	97.86 (100)	16.31

Figures in brackets give percentage share of each component to total cost.

4.5. Products

Tables 4.21 - 4.24 give a detailed picture of output composition in regions Calicut, Trichur, Alwaye and Quilon respectively. In Calicut region, of the total output produced in 1978-79, roofing tiles came to 82.73 per cent, ridges 9.42 per cent, floor tiles 4.48 per cent, bricks 1.42 per cent, hourdis 1.10 per cent and others 0.85 per cent. From table 4.21 it is clear that the share of each item remained almost the same over the decade, but for slight fall in the share of roofing tiles and slight increase in the share of ridges. In 1987-88, the share of roofing tiles came to 78.61 per cent and ridges 12.08 per cent. The value of output recorded 90.47 per cent increase over the period.

In Trichur region also the product mix was more or less the same. The share of roofing tiles came to 69.23 per cent, ridges 17.84 per cent and bricks 8.11 per cent in 1978-79 which stood respectively at 80.46 per cent, 7.33 per cent and 6.11 per cent in 1987-88. The value of output recorded 46.49 per cent increase over the decade. The situation is not much different

Table 4.21. Composition of the products produced by the sample units in Calicut region during the period 1978-79 - 1987-88

(Rs lakh)

Year	Roof tiles	Floor tiles	Brick	Ridges	Ceiling tiles	Hourdis	Others	Total production	Stock adjustment factor	Total output	Output per unit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
78-79	91.50 (82.73)	4.95 (4.48)	1.57 (1.42)	10.42 (9.42)	-	1.22 (1.10)	0.94 (0.85)	110.60 (100)	-0.87	109.73	21.95
79-80	91.65 (80.81)	5.85 (5.16)	1.15 (1.01)	12.07 (10.64)	-	1.40 (1.23)	1.30 (1.15)	113.42 (100)	-0.12	113.30	22.66
80-81	101.25 (77.46)	6.33 (4.84)	8.50 (6.50)	11.66 (8.93)	0.04 (0.03)	1.15 (0.88)	1.79 (1.36)	130.72 (100)	2.85	133.57	26.71
81-82	82.57 (77.31)	7.89 (7.39)	0.73 (0.69)	13.34 (12.50)	0.10 (0.08)	1.64 (1.54)	0.57 (0.49)	106.72 (100)	9.02	115.74	23.15
82-83	94.56 (77.22)	9.37 (7.65)	1.16 (0.91)	13.95 (11.39)	-	2.34 (1.91)	1.07 (0.89)	122.45 (100)	-13.18	109.27	21.85
83-84	103.72 (74.46)	6.94 (4.98)	2.46 (1.77)	18.88 (13.55)	-	3.21 (2.30)	4.09 (2.94)	139.30 (100)	10.77	150.70	30.14
84-85	146.32 (79.99)	10.64 (5.82)	3.34 (1.83)	18.19 (9.94)	-	3.46 (1.89)	0.97 (0.53)	182.92 (100)	-8.23	174.69	34.94
85-86	157.30 (80.75)	10.84 (5.56)	0.94 (0.47)	20.39 (10.47)	-	0.45 (0.24)	4.89 (2.51)	194.81 (100)	3.87	198.68	39.74
86-87	133.50 (76.53)	10.53 (6.04)	1.55 (0.89)	22.21 (12.73)	-	4.14 (2.37)	2.52 (1.44)	174.45 (100)	-0.65	173.80	34.76
87-88	165.60 (78.61)	10.36 (4.92)	1.89 (0.85)	25.44 (12.08)	-	6.19 (2.94)	1.19 (0.60)	210.67	-3.13	207.54	41.51

Figures in brackets give percentage to total production

Table 4.22. Composition of the products produced by the sample units in Trichur region during the period 1978-79 - 1987-88

(Rs lakh)

Year	Roof tiles	Floor tiles	Brick	Ridges	Ceiling tiles	Hourdis	Others	Total production	Stock adjustment factor	Total output	Output per unit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
78-79	91.57 (69.23)	4.99 (3.77)	10.73 (8.11)	23.60 (17.84)	-	1.38 (1.04)	-	132.27 (100)	-0.12	132.15	8.26
79-80	100.83 (75.13)	6.19 (4.61)	10.82 (8.06)	14.96 (11.15)	-	1.40 (1.04)	-	134.20 (100)	-0.21	133.99	8.37
80-81	99.55 (73.69)	5.21 (3.86)	10.93 (8.09)	17.94 (13.28)	-	1.45 (1.07)	-	135.02 (100)	0.71	135.79	8.49
81-82	94.88 (71.56)	6.18 (4.67)	11.26 (8.49)	18.42 (13.89)	0.20 (0.15)	1.65 (1.24)	-	132.59 (100)	1.54	134.13	8.38
82-83	111.54 (76.44)	6.82 (4.67)	8.47 (5.80)	17.31 (11.86)	-	1.77 (1.21)	-	145.91 (100)	1.61	147.52	9.22
83-84	114.12 (75.98)	7.02 (4.67)	10.32 (6.87)	16.41 (10.93)	0.40 (0.27)	1.92 (1.28)	-	150.19 (100)	2.12	152.31	9.52
84-85	131.80 (78.07)	6.83 (4.05)	12.32 (7.29)	15.90 (9.42)	-	1.98 (1.17)	-	168.83 (100)	10.43	179.26	11.20
85-86	152.91 (79.99)	7.78 (4.07)	12.99 (6.80)	15.32 (8.02)	-	2.14 (1.12)	-	191.14 (100)	4.34	186.80	11.68
86-87	144.08 (79.86)	7.49 (4.15)	12.47 (6.91)	13.80 (7.65)	0.39 (0.22)	2.19 (1.21)	-	180.42 (100)	3.12	183.54	11.47
87-88	152.57 (80.46)	8.25 (4.36)	11.59 (6.11)	13.89 (7.33)	0.89 (0.46)	2.43 (1.23)	-	189.62 (100)	4.00	193.62	12.10

Figures in brackets give percentage to total production

Table 4.23. Composition of the products produced by the sample units in Alwaye region during the period 1978-79 - 1987-88

(Rs lakh)

Year (1)	Roof tiles (2)	Floor tiles (3)	Brick (4)	Ridges (5)	Ceiling tiles (6)	Hourdis (7)	Others (8)	Total production (9)	Stock adjustment factor (10)	Total output (11)	Output per unit (12)
78-79	44.29 (75.06)	0.45 (0.76)	5.04 (8.54)	9.23 (15.64)	-	-	-	59.01 (100)	-1.73	57.28	11.46
79-80	43.78 (81.42)	1.80 (3.35)	4.69 (8.72)	3.50 (6.51)	-	-	-	53.77 (100)	4.93	58.70	11.74
80-81	50.74 (79.96)	0.63 (0.99)	5.19 (8.18)	6.90 (10.87)	-	-	-	63.46 (100)	-4.68	58.78	11.76
81-82	36.35 (65.03)	9.20 (16.46)	4.65 (8.32)	5.68 (10.16)	0.013 (0.03)	-	-	55.89 (100)	5.36	61.25	12.25
82-83	49.73 (80.18)	0.65 (1.05)	4.19 (6.76)	7.45 (12.01)	-	-	-	62.02 (100)	1.28	63.30	12.66
83-84	51.24 (83.56)	0.59 (0.96)	2.91 (4.75)	6.58 (10.73)	-	-	-	61.32 (100)	4.91	66.23	13.25
84-85	69.74 (82.23)	0.44 (0.91)	5.40 (6.40)	8.83 (10.46)	-	-	-	84.41 (100)	13.55	97.76	19.55
85-86	90.47 (82.22)	1.04 (0.80)	8.44 (7.67)	10.08 (9.16)	0.002 (0.15)	-	-	110.03 (100)	-14.25	95.78	19.16
86-87	80.23 (83.78)	3.06 (3.20)	7.72 (8.06)	4.75 (4.96)	-	-	-	95.76 (100)	9.04	104.80	20.96
87-88	97.33 (85.35)	3.89 (3.41)	7.70 (6.75)	5.11 (4.48)	-	-	-	114.03 (100)	-6.88	107.15	21.43

Figures in brackets give percentage to total production

Table 4.24. Composition of the products produced by the sample units in Quilon region during the period 1978-79 - 1987-88

(Rs lakh)

Year	Roof tiles	Floor tiles	Brick	Ridges	Ceiling	Hourdis	Others	Total production	Stock adjustment factor	Total output	Output per unit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
78-79	28.26 (72.31)	0.93 (2.38)	3.35 (8.57)	6.54 (16.74)	-	-	-	39.08 (100)	-1.33	37.75	6.24
79-80	30.26 (80.59)	2.53 (6.74)	3.66 (9.75)	1.02 (2.90)	-	-	0.0085 (0.02)	37.55 (100)	4.43	41.98	6.99
80-81	30.61 (76.90)	1.38 (3.47)	4.29 (10.78)	3.51 (8.82)	-	-	0.009 (0.03)	39.80 (100)	-4.88	34.92	5.82
81-82	20.26 (68.37)	1.88 (6.34)	4.53 (15.29)	2.95 (9.96)	-	-	0.012 (0.04)	29.63 (100)	5.56	35.19	5.87
82-83	44.81 (77.80)	1.25 (2.17)	4.59 (7.97)	6.95 (12.07)			-	57.60 (100)	0.68	58.28	9.71
83-84	40.33 (78.71)	1.98 (3.86)	3.57 (6.97)	5.35 (10.44)			0.008 (0.02)	51.24 (100)	3.15	54.39	9.07
84-85	54.14 (80.63)	1.15 (1.71)	7.37 (10.98)	4.48 (6.67)	-	-	0.0014 (0.01)	67.14 (100)	1.64	68.78	11.46
85-86	66.40 (80.71)	1.41 (1.71)	8.98 (10.92)	5.46 (6.64)	-	-	0.018 (0.02)	82.27 (100)	-1.39	80.88	13.48
86-87	65.19 (83.87)	3.23 (4.16)	7.54 (9.70)	1.75 (2.25)	-	-	0.0135 (0.02)	77.72 (100)	5.70	83.42	13.90
87-88	77.99 (86.74)	3.00 (3.34)	7.82 (8.70)	1.09 (1.21)	-	-	0.0108 (0.01)	89.91 (100)	-3.49	86.42	14.40

Figures in brackets give percentage to total production

in Alwaye and Quilon regions also. An interesting feature noticed was that in all the regions except Calicut, the share of roofing tiles increased over the years inspite of the claim, the demand for roofing tiles is declining. This shows that the increasing dependence of the industry on roofing tiles or in other words, the absence of product diversification.

4.6. Gross profit (Output cost)

A comparative picture of the profit earned expressed in terms of output cost is available from tables 4.25 - 4.28. In Calicut region, gross profit declined continuously upto 1983-84 and again started rising and the per unit profit even reached Rs 13.64 lakh in 1987-88. On the other hand gross profit steadily declined in Trichur and Alwaye regions and the rate of decline was more in Alwaye region (average annual growth was found to be 15.84 per cent in Alwaye region compared to 12.42 per cent in Trichur region). The high cost of labour may be one of the reasons responsible for this phenomenon. The trends of gross profit in Quilon region shows an uneven pattern which

Table 4.25. Gross profit (output cost) and value added by the sample unit of Calicut region during the period 1978-79 - 1987-88

(Rs lakh)

Year	Input	Output	Total cost	Gross profit (output cost) (3)-(4)	Gross profit per unit	Value added (3)-(2)	Value added per unit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
78-79	34.02	109.73	61.62	48.11	9.62	75.71	15.14
79-80	38.10	113.30	72.03	41.27	8.25	75.20	15.04
80-81	50.81	133.57	92.58	40.99	8.20	82.76	16.55
81-82	38.76	115.74	70.61	45.13	9.03	76.98	15.40
82-83	31.99	109.27	69.20	40.07	8.01	77.28	15.46
83-84	63.29	150.70	115.11	35.59	7.12	87.41	17.48
84-85	75.49	174.69	133.56	41.13	8.23	99.20	19.84
85-86	69.74	198.68	120.59	78.09	15.62	128.94	25.79
86-87	78.72	173.80	128.83	50.11	10.02	95.08	19.02
87-88	85.38	207.54	139.36	68.18	13.64	122.16	24.43

Table 4.26. Gross profit (output cost) and value added by the sample unit of Trichur region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	Input	Output	Total cost	Gross profit (output cost) (3)-(4)	Gross profit per unit	Value added (3)-(2)	Value added per unit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
78-79	34.88	132.15	64.57	67.58	4.22	97.27	6.08
79-80	44.06	133.99	78.79	55.20	3.45	89.93	5.62
80-81	55.88	135.79	95.89	39.90	2.49	79.91	4.99
81-82	58.90	134.13	101.86	32.27	2.02	75.23	4.70
82-83	68.39	147.52	115.10	32.42	2.03	79.13	4.95
83-84	66.86	152.31	116.26	36.05	2.25	85.45	5.34
84-85	74.97	179.26	123.32	55.94	3.49	104.29	6.52
85-86	86.96	186.80	139.80	47.00	2.94	99.84	6.24
86-87	99.13	183.54	162.42	21.12	1.32	84.41	5.28
87-88	110.93	193.62	175.75	17.87	1.12	82.69	5.17

Table 4.27. Gross profit (output cost) and value added by the sample unit of Alwaye region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	Input	Output	Total cost	Gross profit (output cost) (3)-(4)	Gross profit per unit	Value added (3)-(2)	Value added per unit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
78-79	17.50	57.28	32.35	24.93	4.99	39.78	7.96
79-80	18.68	58.70	35.47	23.23	4.65	40.02	8.00
80-81	22.12	58.78	44.73	14.05	2.81	36.66	7.33
81-82	26.54	61.25	43.33	17.92	3.58	34.71	6.94
82-83	22.45	63.30	46.59	16.71	3.34	40.85	8.17
83-84	28.68	66.23	70.25	4.02	0.80	37.55	7.51
84-85	42.79	97.76	88.93	8.83	1.77	54.97	10.99
85-86	50.51	95.78	89.84	5.94	1.19	45.27	9.05
86-87	51.20	104.80	103.79	1.01	0.20	53.60	10.72
87-88	48.18	107.51	102.69	4.46	0.89	58.97	11.79

Table 4.28. Gross profit (output cost) and value added by the sample unit of Quilon region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	Input	Output	Total cost	Gross profit (output cost) (3)-(4)	Gross profit per unit	Value added (3)-(2)	Value added per unit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
78-79	11.03	37.45	27.90	9.55	1.59	26.42	4.40
79-80	12.24	41.98	30.37	11.61	1.94	29.74	4.96
80-81	11.93	34.92	29.42	5.50	0.92	22.99	3.83
81-82	20.23	35.19	42.21	7.02	1.17	14.96	2.49
82-83	21.37	58.28	47.14	11.14	1.86	36.91	6.15
83-84	25.72	54.39	59.22	4.83	0.81	28.67	4.78
84-85	32.07	68.78	75.20	6.42	1.07	36.71	6.12
85-86	36.72	80.88	86.28	5.40	0.90	44.16	7.36
86-87	39.82	83.42	92.42	9.00	1.50	43.60	7.27
87-88	42.80	86.42	97.86	11.44	1.91	43.62	7.27

indicates the high variability of the industry in Quilon region. An overall picture indicated that in terms of gross profit, Calicut region alone is in a better condition. The possible reasons responsible for this phenomenon are,

i. good will of the factories in that region,
ii. size economies enjoyed by the factories
iii. availability of inputs at low cost particularly firewood.

4.7. Value added

A comparative analysis of value added of different regions will help us to know the contribution of tile industry in each region. In all the regions value added recorded an uneven trend (also see tables 4.25 - 4.28). A direct relationship between profit and value added was rarely observed particularly in Alwaye and Quilon regions and this again established the fluctuating nature of this industry. Also in absolute terms value added may be going up due to the influence of price factor.

Table 4.29. Selected aggregates of the sample units in Calicut region during the period 1978-79 to 1987-88

(Rs lakh)

Year	F.C.	I.C.	P.C.	Input	Output	V.A.	Workers	Selected aggregates per unit						
								F.C.	I.C.	P.C.	Input	Output	VA	workers
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
78-79	15.01	29.74	23.83	34.02	109.73	75.71	894	3.00	5.95	4.77	6.80	21.95	15.14	179
79-80	14.40	33.07	36.70	38.10	113.30	75.20	893	2.88	6.61	7.34	7.62	22.66	15.04	179
80-81	14.36	32.35	20.99	50.81	133.57	82.76	960	2.87	6.47	4.20	10.16	26.71	16.55	192
81-82	19.45	53.79	47.48	38.76	115.74	76.98	884	3.89	10.76	9.50	7.75	23.15	15.40	177
82-83	38.08	59.77	63.91	31.99	109.27	77.28	877	7.62	11.95	12.78	6.40	21.85	15.46	175
83-84	51.20	85.23	106.61	63.29	150.70	87.44	917	10.24	17.05	21.32	12.66	30.14	17.48	183
84-85	48.30	74.39	80.09	75.49	174.69	99.20	975	9.66	14.88	16.02	15.10	34.94	19.84	195
85-86	42.65	83.19	69.47	69.74	198.68	128.94	882	8.53	16.64	13.89	13.95	39.74	25.79	176
86-87	40.69	85.98	79.20	78.72	173.80	95.08	847	8.14	17.20	15.84	15.74	34.76	19.02	169
87-88	36.90	83.10	69.45	85.38	207.54	122.16	890	7.38	16.62	13.89	17.08	41.51	24.43	178

Table 4.30 Selected aggregates of the sample units in Trichur region during the period 1978-79 to 1987-88

(Rs lakh)

Year	FC	IC	PC	Input	Output	VA	Workers	Selected aggregates per unit						
								FC	IC	PC	Input	Output	VA	Workers
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
78-79	22.01	42.70	45.77	34.88	132.15	97.27	1238	1.37	2.66	2.86	2.18	8.25	6.08	77
79-80	22.66	43.49	49.67	44.06	133.99	89.93	1216	1.42	2.72	3.10	2.75	8.37	5.62	76
80-81	23.48	46.65	57.23	55.88	135.79	79.91	1172	1.46	2.92	3.58	3.50	8.49	4.99	73
81-82	25.48	51.55	59.39	58.90	134.13	75.23	1003	1.59	3.22	3.71	3.68	8.38	4.70	63
82-83	27.33	55.26	61.84	68.39	147.52	79.13	1084	1.71	3.45	3.87	4.27	9.22	4.95	68
83-84	28.14	57.28	70.20	66.86	152.31	85.45	987	1.76	3.58	4.39	4.18	9.52	5.34	62
84-85	30.26	71.86	84.73	74.97	179.26	104.29	1110	1.89	4.49	5.30	4.69	11.20	6.52	69
85-86	30.66	67.92	78.02	86.96	186.80	99.84	1215	1.91	4.25	4.88	5.44	11.68	6.24	76
86-87	31.81	77.49	82.88	99.13	183.54	84.41	1003	1.99	4.84	5.18	6.20	11.47	5.28	63
87-88	31.94	83.73	84.67	110.93	193.62	82.69	1007	1.99	5.23	5.29	6.93	12.10	5.17	63

Table 4.31. Selected aggregates of the sample units in Alwaye region during the period 1978-79 to 1987-88

(Rs lakh)

Year	FC	IC	PC	Input	Output	VA	Workers	Selected aggregates per unit						
								FC	IC	PC	Input	Output	VA	Workers
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
78-79	7.20	12.80	12.96	17.50	57.28	39.78	412	1.44	2.56	2.59	3.50	11.46	7.96	82
79-80	7.87	19.73	18.39	18.68	58.70	40.02	420	1.57	3.95	3.68	3.74	11.74	8.00	84
80-81	8.49	15.88	16.44	22.12	58.78	36.66	464	1.70	3.18	3.29	4.42	11.76	7.33	93
81-82	8.59	20.52	22.87	26.54	61.25	34.71	407	1.72	4.10	4.57	5.31	12.25	6.94	81
82-83	9.56	23.94	24.58	22.45	63.30	40.85	510	1.91	4.79	4.92	4.49	12.66	8.17	102
83-84	9.95	29.71	30.80	28.68	66.23	37.55	487	1.99	5.94	6.16	5.74	13.25	7.51	97
84-85	8.35	42.93	40.34	42.79	97.76	54.97	486	1.67	8.59	8.07	8.56	19.55	10.99	97
85-86	7.94	27.91	30.12	50.51	95.78	45.27	443	1.59	5.58	6.02	10.10	19.16	9.05	89
86-87	7.25	40.91	38.82	57.20	104.80	53.60	458	1.45	8.18	7.76	10.24	20.96	10.72	92
87-88	8.01	39.12	32.27	48.18	107.15	58.97	432	1.60	7.82	6.45	9.64	21.43	11.79	84

Table 4.32. Selected aggregates of the sample units in Quilon region during the period 1978-79 to 1987-88

(Rs lakh)

Year	FC	IC	PC	Input	Output	VA	Workers	Selected aggregates per unit FC	IC	PC	Input	Output	VA	Workers
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
78-79	8.23	15.32	15.52	11.03	26.42	37.45	436	1.37	2.55	2.58	1.84	6.24	4.40	73
79-80	8.67	23.10	26.54	12.24	29.74	41.98	443	1.45	3.85	4.42	2.04	6.99	4.96	74
80-81	9.65	17.05	22.26	11.93	22.99	34.92	423	1.61	2.84	3.71	1.99	5.82	3.83	71
81-82	8.91	22.41	32.59	20.23	14.96	35.19	418	1.49	3.74	5.43	3.37	5.87	2.49	70
82-83	8.61	24.35	28.51	21.37	36.91	58.28	430	1.44	4.06	4.75	3.56	9.71	6.15	72
83-84	8.37	28.03	25.27	25.72	23.67	54.39	486	1.40	4.67	4.21	4.29	9.07	4.78	81
84-85	7.69	31.08	29.98	32.07	36.71	68.78	484	1.28	5.18	4.99	5.35	11.46	6.12	81
85-86	7.73	28.71	30.85	36.72	44.16	80.88	495	1.29	4.79	5.14	6.12	13.48	7.36	83
86-87	7.28	38.39	42.80	39.82	43.60	83.42	485	1.21	6.40	7.13	6.64	13.90	7.27	81
87-88	7.73	40.99	36.87	42.80	43.62	86.42	450	1.29	6.83	6.15	7.13	14.40	7.27	75

4.8. Structural ratios

This section is devoted to examine the behaviour of structural ratios in different regions for the entire reference period. The computed ratios are presented in tables 4.33 - 4.36 respectively for regions Calicut, Trichur, Alwaye and Quilon and the major inferences are:

i. The magnitude of capital consumption will be reflected in fixed capital invested capital ratio and fixed capital to productive capital ratio. A high ratio indicates the intake of more capital in the industry. These ratios were found to be high in Calicut region and this was due to some attempt for modernisation by certain companies. In Alwaye and Quilon regions the ratios continuously declined over the reference period.

ii. Invested capital to output ratio is an indicator of the extent of stock piling in the form of materials, semi finished goods and finished goods. This ratio showed an uneven behaviour in all the

Table 4.33. Important structural ratios of the sample units in Calicut region during the period 1978-79 - 1987-88

(Rs lakh)

Year	Fixed capital to invested capital	FC to productive capital	Input output ratio	VA output ratio	FC to output	IC to output	VA to IC	Output per worker	Input per worker	VA to worker	VA to input	Output input	Ouput IC	Input to IC
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
78-79	0.50	0.63	0.31	0.69	0.14	0.27	2.55	0.122	0.038	0.085	2.22	3.22	3.69	1.14
79-80	0.44	0.39	0.34	0.66	0.13	0.29	2.27	0.126	0.042	0.084	1.97	2.97	3.43	1.15
80-81	0.51	0.78	0.38	0.52	0.12	0.24	2.56	0.139	0.053	0.086	1.63	2.62	4.13	1.57
81-82	0.36	0.41	0.34	0.66	0.17	0.46	1.43	0.131	0.044	0.087	1.99	2.99	2.15	0.72
82-83	0.63	0.60	0.30	0.70	0.35	0.55	1.29	0.125	0.036	0.088	2.42	3.42	1.83	0.53
83-84	0.60	0.48	0.42	0.58	0.34	0.57	1.03	0.164	0.069	0.095	1.38	2.38	1.77	0.74
84-85	0.65	0.60	0.43	0.57	0.28	0.43	1.33	0.179	0.077	0.101	1.31	2.31	2.35	1.02
85-86	0.57	0.61	0.35	0.65	0.22	0.42	1.55	0.225	0.079	0.146	1.85	2.85	2.39	0.84
86-87	0.47	0.57	0.45	0.55	0.23	0.49	1.11	0.205	0.093	0.112	1.21	2.21	2.02	0.92
87-88	0.44	0.53	0.41	0.59	0.18	0.40	1.47	0.233	0.096	0.137	1.76	2.43	2.50	1.02

Table 4.34. Important structural ratios of the sample units in Trichur region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	Fixed capital to invested capital	FC to productive capital	Input output ratio	VA output ratio	FC to output	IC to output	VA to IC	Output per worker	Input per worker	VA per worker	VA to input	Output input	Output IC	Input IC
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
78-79	0.52	0.48	0.26	0.74	0.17	0.32	2.28	0.107	0.028	0.079	2.79	3.79	3.09	0.82
79-80	0.52	0.46	0.33	0.67	0.17	0.32	2.07	0.110	0.036	0.074	2.04	3.04	3.08	1.01
80-81	0.50	0.41	0.41	0.59	0.17	0.34	1.71	0.116	0.048	0.068	1.43	2.43	2.91	1.20
81-82	0.49	0.43	0.44	0.54	0.19	0.38	1.46	0.134	0.059	0.075	1.28	2.25	2.60	1.14
82-83	0.49	0.44	0.46	0.54	0.19	0.38	1.43	0.136	0.063	0.073	1.16	2.15	2.67	1.24
83-84	0.49	0.40	0.44	0.56	0.19	0.38	1.49	0.154	0.068	0.087	1.28	2.28	2.56	1.17
84-85	0.42	0.36	0.42	0.58	0.17	0.40	1.45	0.161	0.068	0.094	1.39	2.39	2.49	1.04
85-86	0.45	0.39	0.47	0.53	0.16	0.36	1.47	0.154	0.072	0.082	1.15	2.15	2.75	1.28
86-87	0.41	0.38	0.54	0.46	0.17	0.42	1.09	0.183	0.099	0.084	0.85	1.85	2.37	1.28
87-88	0.38	0.38	0.57	0.43	0.17	0.43	0.99	0.192	0.110	0.082	0.75	1.75	2.31	1.32

Table 4.35. Important structural ratios of the sample units in Alwaye region during the period 1978-79 - 1987-88

(Rs lakh)

Year	Fixed capital to invested capital	FC to productive capital	Input output ratio	VA output ratio	FC to output	IC to output	VA to IC	Output per worker	Input per worker	VA per worker	VA to input	Output input	Output IC	Input IC
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
78-79	0.56	0.56	0.31	0.69	0.13	0.22	3.11	0.139	0.042	0.097	2.27	3.27	4.48	1.37
79-80	0.40	0.43	0.32	0.68	0.13	0.34	2.03	0.140	0.044	0.095	2.14	3.14	2.98	0.95
80-81	0.54	0.52	0.38	0.62	0.14	0.43	2.31	0.127	0.048	0.079	1.66	2.66	3.70	1.39
81-82	0.42	0.38	0.43	0.57	0.14	0.34	1.69	0.150	0.065	0.085	1.31	2.31	2.98	1.29
82-83	0.40	0.39	0.36	0.64	0.15	0.38	1.71	0.124	0.044	0.080	1.82	2.82	2.64	0.94
83-84	0.34	0.32	0.43	0.57	0.15	0.45	1.26	0.136	0.059	0.077	1.31	2.31	2.23	0.96
84-85	0.20	0.21	0.44	0.56	0.08	0.44	1.28	0.201	0.088	0.113	1.28	2.28	2.28	0.99
85-86	0.30	0.26	0.53	0.47	0.08	0.30	1.62	0.216	0.115	0.102	0.896	1.89	3.43	1.81
86-87	0.18	0.19	0.49	0.51	0.07	0.40	1.31	0.229	0.112	0.117	1.05	2.05	2.56	1.25
87-88	0.20	0.25	0.45	0.55	0.07	0.37	1.51	0.248	0.112	0.137	1.22	2.22	2.74	1.23

Table 4.36. Important structural ratios of the sample units in Quilon region during the period 1978-79 - 1987-88.

(Rs lakh)

Year	Fixed capital to invested capital	FC to productive capital	Input output ratio	VA output ratio	FC to output	IC to output	VA to IC	Output per worker	Input per worker	VA per worker	VA to input	Output input	Output IC	Input IC
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
78-79	0.54	0.53	0.30	0.70	0.22	0.41	1.72	0.086	0.025	0.061	2.40	3.40	2.44	0.72
79-80	0.38	0.33	0.30	0.70	0.21	0.55	1.28	0.095	0.028	0.067	2.43	3.43	1.81	0.53
80-81	0.57	0.43	0.34	0.66	0.28	0.50	1.34	0.083	0.028	0.054	1.93	2.93	2.05	0.70
81-82	0.40	0.27	0.57	0.43	0.25	0.64	0.66	0.084	0.048	0.036	0.74	1.74	1.57	0.90
82-83	0.36	0.30	0.37	0.63	0.15	0.42	1.51	0.136	0.049	0.086	1.73	2.73	2.39	0.88
83-84	0.30	0.33	0.47	0.53	0.15	0.52	1.02	0.111	0.053	0.059	1.11	2.11	1.94	0.92
84-85	0.25	0.26	0.47	0.53	0.11	0.45	1.18	0.142	0.066	0.076	1.14	2.14	2.21	1.03
85-86	0.27	0.25	0.45	0.55	0.10	0.35	1.53	0.163	0.074	0.089	1.20	2.20	2.81	1.28
86-87	0.19	0.17	0.48	0.52	0.10	0.46	1.13	0.172	0.082	0.089	1.09	2.09	2.17	1.04
87-88	0.19	0.21	0.50	0.50	0.10	0.47	1.06	0.192	0.095	0.097	1.02	2.02	2.11	1.04

regions which in turn establishes the cyclical nature of the industry.

iii. Input output ratio showed a rising tendency in all the regions over the period which establishes the rise in the cost of inputs. Among the regions, the ratio was found to be low in Calicut region.

iv. The contribution of the industry is expressed in value added output ratio and a high ratio shows greater contribution. This ratio declined in all the regions compared to 1978-79 except some random rise in certain years.

v. Input per worker, output per worker and value added per worker increased over the years in value terms.

4.9. Capacity utilisation

Tile industry in Kerala is in a very critical position, owing to multiple number of factors. One among them is the low capacity utilisation. Majority of the factories presently utilise only 45-50 per cent of the installed capacity. In Calicut region, the capacity utilisation was to the extent of 85 per cent in 1978-79 which declined to 60 per cent in 1987-88. Similarly, in Trichur region, capacity utilisation steadily declined from 75 per cent in 1978-79 to 40 per cent in 1987-88. While the capacity utilisation had declined from 80 to 45 per cent during the same period in Alwaye region, it declined from 75 per cent to 50 per cent in Quilon region.

4.10. Productivity and economies of scale

The growth of output depends on the growth of inputs and on the efficiency of their allocation and use. The term productivity is broadly meant to express the input use efficiency of a production process or an activity. Productivity in its simplified form and in conventional terms is considered as a ratio of outputs to inputs responsible for the output. Different models have been developed for the measurement of productivity. One of the earlier approaches to measure productivity is production function approach. Among the family of production functions, the most popular one is Cobb Douglas function, which is conventionally expressed as,[1]

$$Q = A\,L^{\alpha}\,K^{\beta}$$

$\alpha + \beta$ gives the returns to scale

Q = Output

L = Labour

K = Capital

A = Efficiency parameter

α = Elasticity of output with respect to labour

β = Elasticity of output with respect to capital

The variable output (Q) has been defined as the money value of output. Labour (L) has been represented by the wages and salaries paid instead of man hours since data on man hours are not reliable. Similarly, invested capital has been used as the measure of capital (K) rather than fixed capital since fixed capital has only a very limited role in tile industry for the

1. Damodar Gujarathi (1975), Basic Econometrics, McGraw-Hill, New Delhi, p.107.

reasons specified in the earlier chapters. In short, the model is tried on the basis of working definitions and not on the basis of quantities of output and labour which are traditionally used in production function estimation. Hence, due to these constraints, the results presented in table 4.37 gives only a broad picture of the situation.

The elasticity of output with respect to labour and capital are given by the coefficients α and β respectively. The value of coefficient β is quite small but insignificant for all the regions except Trichur which strengthened the view that the industry is not capital intensive. A comparatively high value for β in Trichur region may be due to excess stock piling which will be reflected in invested capital. The coefficient of capital for the state based on the sample units was found to be negative but insignificant. The negative coefficient may occur due to the following reasons.[2]

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2. Lakhwinder Singh and K.C. Singhal (1986), "Economies of Scale and Technical Change", Productivity, Vol. XXVII No.1, pp 55-60.

Table 4.37. Estimates of the Cobb-Douglas production function (logarithmic regression) 1978-79 - 1987-88.

Region	A	α	β	R^2	F
Calicut	7.570	0.602 (0.350) t=(1.719)	0.217 (0.198) (1.097)	0.7136	8.722*
Trichur	13.435	0.030 (0.246) t=(0.122)	0.575 (0.298) (1.932)	0.8642	22.280**
Alwaye	14.387	0.318 (0.172) t=(1.852)	0.197 (0.224) (0.879)	0.8447	19.034**
Quilon	4.444	0.622 (0.250) t=(2.483)	0.183 (0.370) (0.495)	0.8926	29.077**
Kerala	24.862	0.744 (0.248) t=(3.000)	-0.134 (0.264) (0.506)	0.9188	39.585**

Note: *Statistically significant at 5 per cent level
**Statistically significant at 1 per cent level

i. over dose of capital use

ii. Negligible share of capital

On the other hand, the labour intensive nature of the industry is substantiated in the values of α except in Trichur and Alwaye regions. However, the value of α is much higher than β in Alwaye region. On the whole, the fit given by R^2 and F ratio are good.

The sum total of α and β explains the returns to scale. If the sum equals 1, it indicates constant returns to scale. On the other hand, if the sum is greater than 1, it indicates increasing returns to scale and if the sum is less than 1, it is an indication of diminishing returns to scale. From the analysis, it was found that the industry is in a stage of decreasing returns in all the regions. Among the regions, economies of scale was found to be high in Calicut region (0.819). This validates the earlier claim that the factories in Calicut region enjoy better economies and consequently better profit.

4.11. Intra regional and inter regional variations

From the earlier discussions, it was found that Calicut region possess certain unique features compared to other three regiions. Similarly, over the reference period, certain years showed favourable trend and certain years indicated unfavourable situation for the industry. Hence, the objective of this section is to examine whether there is significant intra regional and inter regional variations and for the purpose, ANOVA (RBD type)* and critical different test** were used. The results are presented in tables 4.38 and 4.39.

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*In order to examine the variability it is desirable to divide the experimental units into homogenous groups of units known as blocks. The treatments are randomly allocated separately to each of these blocks. This procedure gives rise to a design known as Randomised Block Design (RBD) which can be defined as an arrangement of t treatments in r blocks.

The analysis of RBD is the one similar to analysis of a two way classification. The following formulae can be employed for ANOVA

Table 4.38. ANOVA

Particulars	F Ratio	
	Block	Treatment
1. Fixed capital	1.175	27.90**
2. Material stock	3.159*	18.70**
3. Finished goods	3.292*	5.823**
4. Working capital	5.226**	9.219**
5. Productive capital	3.423**	23.508**
6. Invested capital	5.570**	46.131**
7. Clay purchased	11.706**	47.758**
8. Firewood purchased	14.980**	53.558**
9. Inputs purchased	14.270**	63.517**
10. Output produced	8.917**	117.843**
11. Value added	3.803**	119.678**
12. Workers	1.351	671.715**
13. Wages and salaries paid	10.709**	34.138**
14. Profit	0.809	49.519**

Note: Years are treated as blocks and regions are treated as treatments.

* Significant at 5 per cent level
** Significant at 1 per cent level

$$\text{Correction factor (CF)} = \frac{(G.T.)^2}{r\ t}$$

$$\text{where G.T.} = \sum_i \sum_j y_{ij}$$

$$\text{Total sum of squares} = \sum_i \sum_j y_{ij}^2 - \text{C.F.}$$

Table 4.39. Critical Difference Analysis

Particulars	Homogenous group: Blocks	Homogenous group: Treatments
1. Fixed Capital	Single group	T A Q
2. Material stock	Y8, Y9	T A Q
3. Finished goods	Y4, Y6, Y7, Y8, Y10	--
4. Working capital	Y6, Y7, Y8, Y10	T A Q
5. Productive capital	Y4,Y5,Y7,Y8,Y9,Y10	T A Q
6. Invested capital	Y6,Y7,Y8,Y10	T A Q
7. Clay purchased	Y7,Y8,Y10	T A Q
8. Firewood purchased	Y8, Y9	T A Q
9. Inputs purchased	Y7, Y8, Y9	T A Q
10. Output produced	Y7, Y8, Y9	T A Q
11. Value added	Y7, Y8, Y9	T A Q
12. Workers	Y1,Y2,Y3,Y5,Y6,Y8, Y9, Y10	--
13. Wages and salaries paid	Y6, Y7, Y8, Y9	--
14. Profit	Single group	T A Q

Note: Y1 - 1978-79, Y2 - 1979-80, ...Y10 - 1987-88
T - Trichur, A - Alwaye, Q - Quilon.

Sum of squares due to treatment $= \frac{\sum Ti^2}{r} - C.F.$

Sum of squares due to blocks (or replications)

$$= \sum_j \frac{R_j^2}{t} - C.F.$$

Sum of square due to error = total S.S. - Treatment S.S. - Block S.S.

From table 4.38, it was found that the F ratio is significant even at one per cent level for all the variables except fixed capital, workers employed and profit. This indicates that there is significant difference in the behaviour of majority of variables over the years which further strengthen the view that the behaviour of this industry is subject to cyclical fluctuations. The insignificant values of F ratio for

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y_{ij} = value of the variate for the i^{th} treatment in the j^{th} block ($i = 1,2, ...t$, $j = 1,2,...r$)

$Ti^2 = y_{ij}^2 = R_j^2$

ANOVA

Source	D.F.	S.S.	M.S.	F
Replications of blocks	$(r-1)$	$\sum R_j^2/t$ - CF	S_r^2	S_r^2/S_e^2
Treatments	$(t-1)$	$\sum_i T_i^2/r$ - C.F.	S_t^2	S_t^2/S_e^2
Error	$(r-1)(t-1)$	By subtraction	S_e^2	
Total	$rt-1$	$\sum_i \sum_j y_{ij}^2$ - C.F.		

where S_r^2, S_t^2 and S_e^2 are the mean squares for replications, treatments and error respectively.

fixed capital, workers and profit, establish the earlier claim that no considerable addition has taken place to fixed capital or workers over the reference period in any of the regions.

The above argument is further strengthened with the help of critical difference test which reveals that the entire reference period formed a homogenous group with regard to the variables fixed capital and profit. Even in the case of workers the size of homogenous group is very large, barring years 1981-82 and 1984-85.

If the calculated value of F is greater than the table value of $F\alpha$, (t-1)(r-1), (t-1), where α denotes the level of significance, the hypothesis Ho is rejected and it can be inferred that the treatment effects are significantly different from one another.

** The critical difference (CD) can be calculated as,

C.D. = SE_d x ta, error d.f.

Insignificant variations in the behaviour of fixed capital over the reference period is even reflected in the behaviour of productive capital and invested capital, where fixed capital is one of the components.

Similarly, it is worth to examine whether there are any significant variations between the regions.

The degree of freedom for t are those as for error. the treatment means are given as,

T_i/r_i (i=1, 2, ...t). These means can be compared with the help of critical difference. Any two treatment means are said to differ significantly if their difference is larger than the critical difference. The effect of the i^{th} treatment is estimated using the principle of least square and is

$$\hat{t}_i = \frac{Ti}{r} - \sum_i \sum_j \frac{y_{ij}}{rt}$$

From table 4.39, it is found that in the case of majority of the variables, Trichur, Alwaye and Quilon regions formed a homogeneous group. In other words, Calicut region was seemed to be unique in respect of almost all the variables.

For a detailed discussion on ANOVA and C.D., see

i. George W Snedecor and William G Cochran (1967), Statistical Methods, 6th Edn. Oxford & IBH, New Delhi.

ii. Fisher, R.A. (1925), Statistical Methods for Research Workers, Oliver and Boyed, Edinburgh.

iii. Damodar Gujarathi (1979), Basic Econometrics, Mc GRAW-Hill, New Delhi.

iv. Nigam A.K. and Gupta, V.K. (1979), Handbook on Analysis of Agricultural Experiments, IASRI, New Delhi.

CHAPTER V

PROBLEMS OF TILE INDUSTRY IN KERALA

Tile industry which had flourished for more than a century finds it difficult to survive today due to multiplicity of problems. With the opening of new tile factories in other states like Tamil Nadu, Karnataka, Andhra Pradesh, Gujarat, Rajasthan and Orissa our products lost many of their major markets with the result that the stock of roofing tiles in all factories have accumulated. Due to the changes in the pattern and design of houses, the demand position of the products have come down to such an extent that the tile factory owners are not able to effect sales even on credit basis. Also, majority of the tile factories are small in size with limited financial resources and hence they will not be able to withstand the stress and strain for any length of time and will be forced to discontinue and close down in the immediate future. Hence an attempt is made in this chapter to identify the problems and constraints facing the tile industry in Kerala.

5.1. Technological problems

Barring a few units, the level of technology is seen to be outdated. About 80 per cent of them continues to be family concerns and are not properly organised as industrial units. Sentiments to maintain the inherited property is the only motive force in running the units and not the entrepreneurship. The notable change that has taken place over the last 100 years is the replacemnt of screw press by revolving presses in the Trichur region. Of the sample units in Trichur region, 68.75 per cent have replaced screw press by revolving press. In Calicut region also 60 per cent have effected the replacement. Quilon region is lagging far behind in this respect as only 16.7 per cent of the sample units alone have made this replacement.

Quality control is essential to ensure the availability of quality products. The quality of products depends on the availability of good quality clay. Quality of clay can be ensured only if the proper testing is made. But the clay testing and product testing facilities are available only in a handful of units. Of the sample units, only three units in the Calicut region had the facility of clay testing.

Fuel efficiency can be achieved only if Hoff-man type kilns are used which give 28 per cent fuel efficiency compared to traditional intermittent kilns which give only 18 per cent.[1] New type of kilns are replaced in Calicut region, where 60 per cent of the sample units have Hoff-man type kilns. In Trichur area, majority of the units have started in small scale and the number of chambers of kilns were limited. But subsequently, the introduction of revolving press has necessitated increasing the capacity and a few more chambers were added. In Alwaye and Quilon regions intermittent kilns still dominate. Even where new model kilns are used, the kilns are not properly designed resulting in energy waste.

The age old technique of drying the tiles by keeping them in pallets is followed throughout the state. Drying on pallets require more time, space and

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1. Ambigapathy, M. (1988), Roofing Tile Kilns - Design and Efficiency, Op.cit. p.2.

capital investment. Of the sample units, replacement of pallets by dryers has taken place only in 40 per cent units in Calicut region, 6.25 per cent in Trichur region, 20 per cent in Alwaye region and 33.33 per cent in Quilon region.

5.2. Scarcity and increasing cost of inputs

The major inputs of the industry are clay and firewood. The scarcity of quality clay and firewood took its price to the peak in recent years.

Now a days, the collection of clay and its transporttation have become major problems. Earlier the factories were situated near the fields where large quantity of clay was available. Due to persisting consumption for years, these fields are getting exhausted. Digging to lower strata may not be feasible due to two reasons (a) The quality of clay will differ when it goes to lower strata (b) the cost of collection increases in the depths. Due to these reasons the contractors collect the clay from the far off places and supply at very high rates. The average cost of clay per cu. meter has gone up from Rs 20-25 in 1978 to Rs 120-140 in 1988 which reflects a five fold increase in its price over a 10 year period.

Clay at Calicut and Trichur regions are found to be much superior to those of Quilon region. When the clay is too plastic, they add lean clay and keep the lean clay and plastic clay in layers for some days for aging and then use for actual production. Quilon clay contains too much of organic materials and hence more percentage of yellow clay should be added during processing.

Firewood is the most commonly used fuel in the tile industry in Kerala. A major problem facing this industry currently is the rising cost of firewood and its scarcity. More than 50 per cent of the cost of production of tile is the cost of firewood in units having intermittent kilns, while this is about 25 per cent in units having Hoff-man type kilns.[2] The firewood price at present is in the range of Rs 300-350/tonne

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2. Ibid p.3.

in Calicut region, Rs 400-450/tonne in Trichur region, Rs 375-440/tonne in Alwaye region and Rs 325-400/tonne in Quilon region. The average price of firewood in Kerala as a whole was Rs 140-160/tonne in 1978 which rose to Rs 350-400/tonne in 1988, recording a decennial growth rate of 150 per cent. The major reasons responsible for scarcity and high price of firewood are,

i. the reduction in the forest area and stoppage of clear felling.

ii. the increasing demand for wood for other industries.

iii. growing demand for fuel wood in the domestic sector.

iv. rise in the cost of all other sources of fuel.

It is estimated that the average annual requirement of firewood in a factory in Kerala is 1100 tonnes at the present scale of production and hence the tile factories in Kerala altogether require 3,50,000 tonnes of firewood annually valued at Rs 14 crores. These statistics highlight the need for discovering fuel substitutes.

The other important input is lubricating oil among which kerosene is the most important one. The price of kerosene has also increased considerably over the years and the required quantity is not available. As per ISI prescriptions, 1000 tiles require 5 litres of kerosene[3] but at present the sanctioned quantity is only 1.5 litres.

5.3. Cost of labour

A sustained rise in wages is a common problem in Kerala which is equally applicable to tile industry also. The tile manufacturers in Kerala are bound to pay the wages to the workers as per "The Minimum Wages Act 1948" of the Government of India as revised from time to time. The Minimum Wages Committee were constituted in 1958, 1961, 1968, 1977 and 1989.* As per their recommendations the wage rates were revised in 1965, 1971 and 1981. It has been noted from table 5.1 that the

3. Labour and Industrial Bureau (1969), Op.cit.p.72.

* The report of the Minimum Wages Committee 1989 is in the final stage and is expected to submit in December '90

Table 5.1. Minimum wages in different states (1980)

Class	Minimum wages in			
	Tamil nadu (Rs)	Karna-taka (Rs)	Andhra-pradesh (Rs)	Kerala (Rs)
Skilled	5.25	6.50	5.00	9.84
Semi skilled	4.25	5.25	3.50	9.59
Unskilled	4.00	4.50	3.00	8.89
Difference for skilled with Kerala	4.59	3.84	4.84	
Difference for semi-skilled with Kerala	5.34	4.34	6.09	
Difference for unskilled with Kerala	4.89	4.39	5.89	

Source: Small Industries Service Institute (1980), Status Report on Tile Industry, Op.cit.

the minimum wages in Kerala was very much higher than their neighbouring states like Karnataka, Tamilnadu and Andhra Pradesh.

From table 5.1, it is found that for a factory employing 100 workers for a year consisting of 270 working days, the average difference in wages between Andhra Pradesh and Kerala works out to be Rs 1,51,380 while that between Tamilnadu and Kerala will be Rs 1,33,380 and that between Karnataka and Kerala Rs 1,08,630. In other words, assuming the same technology in all the four states, the difference in labour cost for producing 1000 tiles between Andhra Pradesh and Kerala will work out to be Rs 61.68 while that between Tamilnadu and Kerala will be Rs 54.34 and that between Karnataka and Kerala Rs 44.26.

5.4. Marketing problems

The market for tiles may be divided into three areas;

a. Export market

b. External market (Market outside Kerala state but within the country)

c. Home market (within the Kerala state).

The export of tiles from Kerala has reduced to a great extent since 1960. India, and in particular Kerala, dominated the tiles market in the world in early 20th century. Unique in their quality and design, the Mangalore and Calicut tiles got their market in Burma, Malaya, Singapore, Basra, Sumatra, Ceylon, Africa and even Australia. With the independence of India, the gradual disintegration of the colonial empire of British started and most of the colonies became independent. Soon, these independent countries started to develop their own tile factories to meet their demand, thereby reducing the Indian export. The steep downward trend in the export of tile since 1960 is illustrated in table 5.2.

From table 5.2, it is evident that, of the total production, nearly 20 per cent was exported in 1960 which came down to a very negligible share in 1985. It is significant to note that while the value of output increased by 1714.8 per cent during quarter century 1960-85, exports declined by 98.74 per cent. The major complaints of manufacturers regarding exports are:

Table 5.2. Export of tiles from Kerala (1960-1985)

(Rs lakh)

Year	value of production	Value of exports	Exports as percentage to production
1960	270	50.3	18.62
1965	380(40.74)	5.69(-88.68)	1.49
1970	576(35.78)	2.54(-55.36)	0.49
1975	1800(248.83)	1.37(-46.06)	0.08
1980	2000(11.11)	0.92(-32.85)	0.04
1985	4900(145)	0.63(-31.52)	0.01

Figures in brackets give percentage growth over the previous period.

Source: National Productivity Council (1987), Productivity of Tile Industry in Kerala, Op.cit.

1. Export is done mainly through cargo ships. Factories are not located near the water ways and hence they have to transport the tiles by road and rail to the port. This naturally imposes heavy cost due to a chain of loading and unloading operations on the manufacturers. Losses are also incurred due to the attitude of headload workers. The loading and unloading should be

done by utilising the workers of that particular area. There are instances when the goods were kept idle for weeks together due to such problems. This problem is equally relevant to external and internal trade also.

2. Each time, when the loading and unloading is done, breakage to the tune of 3-8 per cent occurs leading to additional breakage losses.

3. Heavy demurrages in ships: For example, ship may not be available at the warf when the materials arrive. Due to such problems, the manufacturers are now-a-days reluctant to accept orders.

Some customers from gulf countries and Japan are placing orders for special design tiles in recent days. But the manufacturers are reluctant to accept orders because,

a) they demand specially designed tiles which cannot be sold in local market.

b) the tiles should be packed in wooden boxes which take the packing cost to the peak.

The marketing of tiles became further complicated due to the wrangle of home market. Earlier, we send tiles to Tamilnadu, Karnataka, Andhra Pradesh, Maharashtra and Gujarat. Now we lost a considerable portion of our external market. For instance, only 20-25 per cent of the production is sold outside Kerala state today, whereas 70 per cent of the tiles were sold in sixties. The major factors contributed to this unenviable state of affairs are:

i. Higher labour cost in Kerala compared to other states.

ii. Increased transportation cost also raised the selling price, which consequently affected the external sales.

It was reported by the units covered by the survey that there has been an increase of around 75 per cent in railway freight and truck charges. For instance, the railway freight from Trichur to Poona was Rs 5.12 per quintal* in 1970 which rose to Rs 8.56 per quintal in

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* Quintal is a standard measure followed by railway authorities for charging railway wagons.

1976 and Rs 14.32 per quintal in 1985 making 67 per cent increase in both the periods. The despatch was around 2400 wagons in 1970 which declined to 1200 wagons in 1976 and 400 wagons in 1985. Each wagon had a capacity of 9000 tiles and hence the value of external sales came to Rs 32.4 lakh in 1970, Rs 27 lakh in 1976 and Rs 36.48 lakh in 1985 at Rs 150/1000 tiles in 1970, Rs 250/1000 tiles in 1976 and Rs 750/1000 tiles in 1985 assuming that the entire external trade was done through railway wagons. The rise in truck charges is also not different. At present the truck charges come to Rs 2.25 per km and a truck can carry 3000 tiles which means that on an average the transportation cost of 1000 tiles per km is worked out to be Rs 0.75 with slight variation from region to region.*

iii. The problem is further aggravated by the starting of tile factories in other states like Tamilnadu, Andhra Pradesh, Maharashtra and Gujarat, where Kerala

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* The truck charges are found to be low at the present level because,

  i. transportation is done on contract basis
  ii. in their return trip they carry vegetables, rice, wheat etc. to Kerala for which they charge.

tiles found potential market in earlier years. Due to the lower cost of labour in other states, even some manufacturers from Kerala have started factories in other states.

iv. Changes in the pattern and design of houses.

The third component of the market is the demand from within the state which also declines at a faster rate due to,

a. shifting preference for RCC and other types of houses for middle and higher income group and commercial and public buildings.

b. the annual maintenance cost of tiled houses is very high.

c. tiled houses can be cheaply constructed only if wood is available at low rate, which is a complementary good for tiled roofs. But the price of wood is exorbitantly high.

From the above discussion, it is evident that the external and internal market for roofing tiles is fast declining, which constitute 75-80 per cent of the product mix of tile factories even today. Hence it is high time to introduce product diversification.

5.5. Emergence of new technology in building construction

The type of houses and materials used is selected based on climatic conditions, strength, durability, cost and social status. Now a days there is an increased demand for RCC type houses where the contribution of the tile products is negligible or even zero. Also the substitution of clay products by synthetic items nullified the demand for clay products in building construction. Therefore, if the industry has to survive it should innovate products to suit the modern house building technology. In other words, it is high time to think of intensifying product research.

5.6. Financial problem

Tile industry can be activised by the adoption of technology which is cost effective and which can also enable the industry to diversify into areas manufacturing products which suit modern building technology. But the basic problem responsible for lack of modernisation is the non availability of adequate finance and also lack of financial support from the government, commercial banks and other financial agencies.

5.7. Lack of standardisation of tiles

There is no uniformity or standard in the quality of tiles produced. There are some units which bring out as many as seven standards which indicate poor furnace control.

5.8. Statutory regulations

A number of regulations were imposed on tile factories as a result of which quite a lot of time, money and effort has to be spent in fulfiling the obligations of various enactments. The minor minerals levy is applicable to tile factories. This is to be abolished. Similarly the existing rate of sales tax is high and the industry can be made prosperous only if the sales tax is reduced to the earlier rate of two per cent. Certain statutory regulations act as a blessing also. For instance, a factory after its commencement can enjoy tax holiday for the first five years. This concession led to the starting of scores of small factories particularly in Trichur region in recent years and consequently the installed capacity increased in a situation where only 50-60 per cent of the existing capacity is utilised.

5.9. Organisational problems

The organisational environment is an important factor for the success of any industry. In tile industry, there is no well defined structure of organisation in most of the factories. The medium size factories are mostly of partnership type and a few big units are limited companies. In majority of the factories the workers are not classified according to their skills. The manager/proprietor does most of the administrative work by himself. Contacting the suppliers of fuels, clay and other raw materials, arranging transportation, marketing, sales etc. are done by the manager/proprietor. In many cases he himself goes and supervises the production too. Though a good percentage of the proprietors are well experienced in the field, some are totally new to the field. In a set up like this, effective management is rather difficult.

Productivity in any manufacturing unit can be improved only by a combined effort of management and workers. The workers will improve the productivity if they have an efficient organisational structure and environment.

5.10. Absence of Research and Development (R&D)

Research and development is inevitable in any industry. In tile industry the need of R&D is all the more important because the involvement of educated and technically qualified people are few in the tile factories. Detailed analysis of clay and clay products can be conducted only by qualified persons. But the training and laboratory facilities are totally absent in tile producing centres such as Calicut, Trichur, Alwaye and Quilon. For instance, earlier there was a proposal to start a clay testing laboratory at Ollur near Trichur. But ultimately it was installed at Valapatnam near Cannanore (1976) where only two tile factories are located.

5.11. Common marketing agency

Another problem of the tile industry is the unhealthy competition between regions and factories within the region. This can be solved if a common marketing agency is formed.

CHAPTER VI

PROSPECTS OF TILE INDUSTRY IN KERALA

The main products of the tile industry such as roofing tiles, bricks, floor tiles, ceiling tiles etc. are used for the construction of buildings. Hence, the prospects of the industry depend on the demand for the products from the construction sector which, in turn, depends on the expected addition to the housing stock both for the residential purpose and for the non-residential purpose. Therefore, in this chapter, an attempt is made to study the share of the tile industry in the census house stock and also to project the demand for roofing tiles and bricks till 2001 AD in Kerala.

The analysis is restricted to roofing tiles and bricks alone because they together constitute more than 80 per cent of the products. Similarly, the projections are made only for the internal market (Kerala state) because the pattern of house construction varies from state to state and region to region.

6.1. Concept of census house

The term 'house' in India covers the greatest diversity of dwellings. In 1872 a house was defined as, 'any permanent structure which on land, serves or would serve for the accommodation of human beings, or of animals, or goods of any description provided always that it could not be struck and removed bodily like a tent or a mud hut'.[1] In the census of 1881, house was defined as the dwelling place of one or more families with their servants, having a separate principal entrance from the public way.[2] The same definition with slight modification continued till 1951. In 1961, 'census house was defined as a structure or part of a structure inhabited or vacant, or a dwelling, a shop, a shop cum dwelling or a place of business, workshop, school, etc. with a separate main entrance'.[3] In 1971 a census house was defined as a building or part of a building with a separate main entrance from the road or

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1. Director of Census operations, Kerala (1973). Census of India 1971, Series 9 - Kerala, Part IV, Housing Report and Tables, Trivandrum, p.8.
2. Ibid.
3. Ibid.

common courtyard or stair case etc. used or recognised as a separate unit. It may be inhabited or vacant. It may be used for residential or non-residential purpose or both.[4] The present analysis is based on the definition used in 1971 census. As seen from the definition, the 1971 census classified census houses into residential and non-residential. But much details are not available on non-residential houses. Even for residential houses, lack of data and other relevant details are a problem. This fact was highlighted by the Task Force constituted for the preparation of the Eighth Five Year Plan by the Kerala State Planning Board in the following words, "....... although we have a general idea of the housing requirements of the state as a whole, we do not have a realistic estimate of the details of housing situation in each panchayat or municipality ..... Therefore, the Task Force feels that steps should be taken for the collection of data on housing covering all panchayats and municipalities including the corporations. Reliable data on housing stock

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4. Ibid

are essential for formulating a housing policy for the state also.[5] Due to these issues, detailed analysis was limited to residential houses alone.

6.2. Importance of housing sector

The Planning Commission observed in the First Five Year Plan document as follows, "..... in fulfilling the basic needs of the population, housing ranks next only to food and clothing in importance. The development of housing, therefore, must enjoy high priority in a poor society such as ours where housing amenities are far below the minimum standards that have been internationally accepted.[6]

The contribution of housing to GDP (factor cost) increased to Rs 3562 crores in 1980-81 at current prices.

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5. Government of Kerala (1989), Eighth Five Year Plan: Report of the Task Force on Housing, State Planning Board, Trivandrum, p.15.

6. Planning Commission (1951), First Five Year Plan Document, Delhi, p.254.

The share of housing to gross capital formation at current prices was of the order of Rs 962 crores in 1970-71 and Rs 3034 crores in 1978-79. This accounted for 13.4 per cent and 12.8 per cent of GDP respectively. In 1980-81 the respective shares came over 40 per cent.[7] According to the study of "Household Income and its Disposition" (1975) made by the National Council of Applied Economic Research, housing property accounted for about 28 per cent of the total wealth of the households. The number of workers in building construction increased from 1.15 million in 1961 and this formed 64.4 per cent of the total workers in construction activities and 1.14 per cent of the total workers.[8] Realising the importance of the housing sector, the government spent a substantial amount on housing activities in different plans which is seen from table 6.1.

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7. Francis Cherunilam (1986), "This Growing Shortage of Housing", Yojana, Vol.30, No.18, Oct 1-15, 1986, pp. 15-16.

8. Ibid.

Table 6.1. Expendiure on housing construction under five year plans in India

(Rs crores)

Particulars	I FYP	II FYP	III FYP	IV FYP	V FYP	VI FYP	VII FYP
Plan expenditure on housing	48	80	110	1890	495	1302	2458
Total expenditure on public housing	250	300	425	625	796	1491	NA
Private sector expenditure	900	1000	1125	2175	3640	11500	29000

NA - Not available

Sources: 1. Planning Commission (1980), Sixth Five Year Plan Document, Delhi.

2. Planning Commission (1985), Seventh Five Year Plan Document, Delhi.

In spite of the efforts made by the government to solve the housing problem, the rate of growth of housing stock for the period 1951-81 (rural 65.56 per cent and urban 115.83) has been lagging behind the rate of growth of population (rural 74.76 per cent and urban 160.09) with the inevitable result of increasing the housing shortage (see table 6.2). Based on the details presented

Table 6.2. Population, households, housing stock and housing shortage (All India)

(in millions)

Census	Population			Households			Housing stock			Housing shortage*		
	R	U	T	R	U	T	R	U	T	R	U	T
1951	298.4	62.4	360.9	60.6	12.8	73.4	54.0	10.3	64.30	6.60	2.5	9.1
1961	360.1	79.1	439.2	68.6	14.9	83.5	65.2	14.0	72.20	3.40	0.9	4.3
1971	438.3	108.9	547.2	78.0	19.1	97.1	74.0	18.4	92.40	4.00	0.7	4.7
1981	521.5	162.3	683.8	98.4	31.2	129.6	89.4	22.23	111.63	8.97	9.0	17.97
Percentage change over the period	74.76	160.09	89.47	62.38	143.75	76.57	65.56	115.83	73.61			
Average annual growth rate	1.87	3.24	2.15	1.63	3.01	1.68	1.69	2.59	1.86			

* Housing shortage = Households - Housing stock

R - rural, U - urban, T - total.

Source: Government of Kerala (1983), Facts and Figures on Housing, State Planning Board, Trivandrum.

in table 6.2, projections were made using exponential function of form $y = ab^{t}$* and the results are presented in table 6.3.

Analysis showed that during 1991-2001 AD, the addition to residential housing stock will be 271.20 lakh, ie. on an average the annual addition will be 27.12 lakh, under the assumption that estimated addition to housing stock has taken place during 1981-91. If the entire housing shortage is to be eliminated by the end of the century, the annual additional requirement is estimated to be 48.74 lakh houses for residential purpose alone.

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* $y = ab^{t}$

Taking logarithms,

$\log y = \log a + t \log b$

Corresponding normal equations are,

$$\Sigma \log y = NA + B\Sigma X$$

$$\Sigma X \log y = \Sigma XA + \Sigma X^{2}B$$

where

$A = \log a$, $B = \log b$

See, Frederick E Croxton, Dudley,J.Cowden *et al*.(1964), *Applied General Statistics*, *Op*.*cit*. pp.256-60.

Table 6.3. Estimates of population, households, housing stock and housing shortage (All India).

(in millions)

Particulars	log a	log b	Estimates 1991	Estimates 2001 AD
POpulation				
rural	2.395	0.081	630.96	760.33
urban	1.640	0.138	213.79	293.76
Total			844.75	1054.09
Households				
rural	1.703	0.069	111.69	130.92
urban	0.946	0.127	38.11	51.05
Total			144.80	181.97
Housing stock				
rural	1.66	0.071	103.51	121.89
urban	0.913	0.112	29.72	38.46
Total			133.23	160.35
Housing shortage				
rural			8.18	9.03
urban			8.39	12.59
Total			16.57	21.62

6.3. Housing problem in Kerala

Unlike the national level, the growth rate in the housing stock has exceeded the growth rate in population in Kerala (see table 6.4) and the possible reasons for this phenomenon are the following.

i. The successful implementation of the family planning programmes. For instance, the average family size declined to 5.94 in 1981 from 8.06 in 1961.

ii. Various housing schemes introduced by the government, cooperatives and other agencies reduced the scarcity of the problem though substantial shortage continue to persist.

According to 1981 census, the housing shortage was 1.56 lakh units and estimates showed that the shortage will reach 1.88 lakh units in 1991 and 1.84 lakh units by the turn of the century.

Table 6.4. Population, households, housing stock and housing shortage (Kerala)

(in lakh)

Census	Population			Households			Housing stock			Housing shortage		
	R	U	T	R	U	T	R	U	T			
1961	143.5	25.5	169	22.23	4.33	26.66	20.96	4.12	25.08	1.27	0.21	1.48
1971	178.8	34.7	213.5	28.50	6.93	35.43	28.18	6.00	34.18	0.32	0.93	1.25
1981	206.8	47.7	254.5	33.57	9.32	42.89	32.37	8.96	41.33	1.20	0.36	1.56
Percentage change over the period	44.11	87.06	50.59	51.01	115.25	60.88	54.44	117.48	64.79			
Average Annual growth rate	1.84	3.18	2.07	2.08	3.90	2.41	2.19	3.96	2.53			

R - rural, U - urban, T - total

Source: Government of Kerala (1983), Facts and Figures on Housing Op. cit.

Table 6.5. Estimates of population, households, housing stock and housing shortage (Kerala)

(in lakh)

Particulars	log a	log b	Estimates 1991	Estimates 2001 AD
Population				
rural	2.080	0.079	248.89	298.54
urban	1.270	0.136	65.16	89.13
Total			314.05	387.67
Households				
rural	1.270	0.089	42.27	51.88
urban	0.481	0.167	14.09	20.70
Total			56.36	72.58
Housing stock				
rural	1.240	0.094	41.30	51.29
urban	0.444	0.169	13.18	19.45
Total			54.48	70.74
Housing shortage				
rural			0.97	0.59
urban			0.91	1.25
Total			1.88	1.84

6.4. Share of the tile industry in the housing sector

Of the different inputs required for constructing houses, tile industry mainly contribute tiles and burnt bricks. But the entire houses may not use the tile industry products. Roofing can be made either with grass leaves, reeds, thatch, wood, bamboo or tiles or one can go for RCC. Similarly, wall material can be grass leaves, reeds, bamboo, mud, unburnt bricks, burnt bricks or others. Hence the contribution of the tile industry can be studied only if we have the percentage distribution of houses using roofing tiles and bricks. These details available from census reports are presented in tables 6.6 and 6.7. However, analysis is restricted to roofing tiles and bricks alone due to the following reasons.

a) Roofing tiles and bricks constitute more than 80 per cent of the products produced by the tile industry.

b) Secondary data are limited to materials used for roofing, flooring and wall.

Table 6.6. Distribution of houses by roof material

(Kerala)

(in percentages)

Materials	1961 census R	U	1971 census R	U
Grass leaves, reeds, thatch, wood, bamboo	77.5	47.2	59.5	35.1
Tiles, Slate, Shingle	22.5	52.8	38.3	58.6
Corrugated iron, Zinc, or other metal sheets	N	N	0.6	0.6
Asbestos, Cement sheets	N	N	0.7	0.9
Brick and lime	N	N	N	N
Stone	N	N	N	N
RCC	N	N	0.9	4.8
Others	N	N	N	N

N - Negligible, R - rural, U - urban

Source: Director of Census Operations, Kerala (1973), *Census of India, 1971, Series 9 - Kerala, Part IV, Housing Report and Tables*, *Op. cit*.

Table 6.7. Distribution of houses by wall material (Kerala)

(in percentages)

Materials	1961 census R	1961 census U	1971 census R	1971 census U
Grass leaves, reeds, bamboo	22.8	13.6	12.8	9.9
Mud	27.8	24.9	19.3	7.1
Unburnt bricks	18.7	13.7	20.3	11.7
Burnt bricks	1.07	0.70	6.5	16.8
Wood	0.43	0.94	4.4	5.4
Metal sheets	N	N	0.1	0.1
Stone	29.2	46.06	36.0	48.4
Cement concrete	N	0.1	0.1	0.1
Others	N	N	0.5	0.5

N - Negligible R - rural, U - urban

Source: Director of Census Operations, Kerala (1973), Census of India, 1971 Series 9, Kerala, Part IV Housing Report and Tables Op.cit

Among the different kinds of roof materials, grass leaves, reeds, thatch, wood and bamboo dominated in the rural Kerala both in 1961 and 1971 census. The proportion of houses with tiled roof went up from 22.5 per cent in 1961 to 38.3 per cent in 1971 in rural areas and from 52.8 per cent to 58.6 per cent in urban areas for the same time period. The share of RCC houses came to 4.8 per cent in 1971 in urban areas but only to 0.9 per cent in rural areas. Thus by the end of 1970, 16.56 lakh houses consisting of half the number of houses had tiled roof in Kerala.

In the case of wall material, the proportion of houses with stones went up from 46.06 per cent to 48.4 per cent in rural areas between 1961 and 1971. Since 1965, the use of burnt bricks as wall material became noticeable and according to 1971 census, the share of houses used burnt bricks reached 6.5 per cent in rural areas and 16.8 per cent in urban areas. But the 1971 data do not give separate breakup for houses with wirecut bricks produced by the tile factories and country bricks produced in the unorganised sector (paddy fields) and hence it is difficult to estimate precisly the share of the tile industry in providing wall material.

6.5. Housing pattern since 1970

Considerable changes have taken place in the house building technology in Kerala since 1970. The affluent sections preferred RCC roofed houses. The middle income group and the lower income groups are shifting their preference for RCC buildings. Relative scarcity of timber and rise in its cost which is a complementary for tiled roofs also influenced the shift. Similarly, the use of burnt bricks as wall material considerably increased in recent years. Traditional floor tiles were replaced by mosaic tiles, marble and so on. However trends in recent developments in housing are not available, pending the publication of Census Report (1981) on Housing. At the same time, pattern prevailed in 1950s or 1960s cannot be used as a proxy because of the changes in technology noticed apriori. In order to bridge this gap, the details of roof material, wall material and plinth area of 600 residential houses built since 1975 were collected from the offices of local bodies (panchayats, municipalities and corporations). The 600 residential houses were selected from the entire state, 300 each from rural and urban areas. To get a cross section, the entire state was divided into three stratas, namely, Northern Kerala, Central Kerala and Southern Kerala. From each strata, details of 200 houses were collected, 100 each from rural and urban. From the analysis, the following distribution emerged.

a) Roof material

Compared to 1961 and 1971 census, there was considerable reduction in the proportion of thatched houses both in rural and urban areas (see table 6.8).

The major reason responsible for this phenomenon was the efforts of voluntary agencies and the government. Another notable feature was the increased preference for RCC roofing. The share of RCC houses increased from 0.9 per cent in 1971 to 5.7 per cent in 1989 in rural areas and from 4.8 per cent to 16.33 per cent in urban areas between the same period. The share of tile roofed houses

Table 6.8. Distribution of sample houses by roof material

(in number)

Particulars	South Kerala		North Kerala		Central Kerala		Total		Grand total
	R	U	R	U	R	U	R	U	
Grass leaves, reeds, thatch, wood, bamboo	50	23	49	31	46	20	145 (48.33)	74 (24.66)	219 (36.50)
Tiles	45	58	44	58	45	55	134 (44.67)	171 (57.00)	305 (50.85)
RCC	5	17	7	21	5	11	17 (5.70)	49 (16.33)	66 (11.00)
Others	-	2	2	4	2	-	4 (1.30)	6 (2.00)	10 (1.67)
Total	100	100	100	100	100	100	300 (100)	300 (100)	600 (100)

Figures in brackets give percentage to total

R - rural, U - urban

Source: Building records kept in the local bodies also increased from 48.45 per cent in 1971 to 50.83 per cent in 1989. Since other sources are not available, these proportions were used for further analysis.

b) Wall material

The distribution of sample houses by wall material is illustrated in table 6.9. The table shows that 18.7 per cent houses used burnt bricks as wall material in rural areas while the respective share went upto 33 per cent in urban areas. It was also observed that, the share of wirecut bricks was very low both in the rural and in the urban areas (rural and urban, 4.7 per cent each). The main reason responsible for this trend was the relatively lower price of country bricks. For instance, the average price of 1000 country bricks in 1989 was between Rs 500-600 while the price of wirecut bricks ranged between Rs 1100-1300.

The building records also provide the details of plinth area of residential houses constructed and this information is vital for estimating the quantity of roofing tiles and bricks required. Hence the details of plinth area of houses used tiles as roofing material and

Table 6.9. Distribution of sample houses by wall material

(in numbers)

Particulars	South Kerala		North Kerala		Central Kerala		Total		Grand total
	R	U	R	U	R	U	R	U	
Grass leaves reeds, thatch wood, bamboo	13	10	14	8	12	6	39 (13.00)	24 (8.00)	63 (10.50)
Burnt bricks									
a) Wirecut	1	2	1	8	12	4	14 (4.70)	14 (4.70)	28 (4.70)
b) Country	8	23	13	20	21	42	42 (14.00)	85 (28.30)	127 (21.16)
Stone	38	50	37	44	27	32	102 (34.00)	126 (42.00)	228 (38.00)
Others	40	15	35	20	28	16	103 (34.30)	51 (17.00)	154 (25.64)
Total	100	100	100	100	100	100	300 (100)	300 (100)	600 (100)

Figures in brackets give percentage to total

R - rural, U - urban

Source: Building records kept in the local bodies.

burnt bricks as wall material were also collected and are presented in table 6.10. Sixty four per cent of tile roofed houses had plinth area below 600 sq.ft. The proportion of houses with plinth area above 1500 sq.ft. used tiles for roofing was negligible and this was due to the preference for RCC houses by higher income and affluent sections. On the other hand, the preference for burnt bricks primarly came from higher income and affluent sections. For instance, seventy nine per cent of sample houses had plinth area above 900 sq.ft.

Based on the survey of 600 houses, the following conclusions were emerged regarding the pattern of houses constructed in Kerala since 1975 and they were used as criteria for estimating the prospects of tile industry in Kerala.

i. Fifty per cent of houses constructed in Kerala since 1975 used tiles as roofing material.

ii. Sixty four per cent of houses used tiles as roofing material had plinth area below 600 sq.ft.

iii. Twenty five per cent of houses constructed in Kerala since 1975 used burnt bricks as wall material.

Table 6.10. Percentage distribution of plinth area of sample houses used tiles as roofing material and burnt bricks as wall material

Plinth area	Tile as roofing material		Burnt bricks as wall material	
(sq.ft)	Percentage	cumulative percentage	Percentage	cumulative percentage
Less than 300	24	24	3	3
301-600	40	64	8	11
601-900	23	87	10	21
901-1200	8	95	34	55
1201-1500	5	100	19	74
1501-1800	N	-	17	91
1801 and above	N	-	9	100

N - Negligible

NOte: N was attributed value O for computing percentages

Source: Building records kept in the local bodies

iv. Five per cent of houses constructed in Kerala since 1975 used wire cut bricks as wall material. This constituted 18 per cent of houses constructed since 1975 used burnt bricks as wall material.

v. Seventy nine per cent of houses used burnt bricks as wall material had plinth area above 900 sq.ft.

6.6. Prospects of tile industry in Kerala with reference to roofing tiles and wire cut bricks.

Below an attempt is made to project the annual requirement of roofing tiles and bricks in Kerala until 2001 AD.

a) Roofing tiles

Roofing tiles will be demanded for,

i. constructing and maintaining residential houses

ii. constructing and maintaining non-residential houses

iii. converting thatched houses into tile roofed houses (residential and non residential)

iv. miscellaneous purposes.

The demand is projected under three alternatives; alternative A, alternative B and alternative C.

Alternative A

Alternative A is based on the following assumptions

a) Installed capacity of roofing tiles in Kerala is 100 crores and only fifty per cent of the installed capacity is utilised (see sec. 3.12)

b) Only 25 per cent of the production of roofing tiles is sold outside the Kerala state due to various marketing problems (see sec. 5.4).

c) Estimated average annual addition of residential houses in Kerala between 1991-2001 AD will be 1.626 lakh units (see table 6.5).

d) Fifty per cent of new houses (residential) use tile as roofing material (see sec. 6.5, criteria ii) ie. 81,300 new houses use tile as roofing material every year.

e) Estimated housing shortage (residential) is not eliminated (see table 6.5).

f) Percentage distribution of plinth area of sample houses used tile as roofing material continues (see table 6.10).

The requirement of roofing tiles for constructing houses was projected by adopting the following technical norms followed by the Public Works Department.[9]

i. To cover one square feet roof, the requirement is 1.45 tiles.

ii. One square feet is equivalent to 1.5 sq.ft.for roofing purpose because of the slope of the roof.

Hence in order to roof one square feet, the requirement is equivalent to 1.45 x 1.50 tiles.

Adopting this conversion factor, tiles requirement were projected using the formula

$M \times 1.45 \times 1.50 \times N$,

where,

M = Mid point of the plinth area

N = Number of houses in that category

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9. Government of Kerala (1965), PWD Manual Public Works Department, Trivandrum, p.65.

Table 6.11. Projected annual requirement of roofing tiles in Kerala for constructing houses (residential) (1991-2001 AD) (Alternative A)

Plinth area (sq.ft)	Percentage of houses	Addition	Requirement of tiles (in crores)
Less than 300	24	19512	0.63
301-600	40	32520	3.18
601-900	23	18699	3.05
901-1200	8	6504	1.48
1201-1500	5	4065	1.19
1501-1800	-	-	-
1801 and above	-	-	-
Total			9.53

Allowing 25 per cent variations for price rise, changes in the tastes and preferences etc. range of requirement is 9.53±25 per cent (7.15-11.91).

The requirement of roofing tiles for constructing houses for non-residential purpose is also to be estimated. Houses for non residential activities include[10]

10. Director of Census Operations, Kerala (1973), <u>Census of India 1971, Series 9, Kerala, Part IV, Housing Report and Tables, Op.cit</u>.

i) shops, ii) workshops, iii) Hostels, Sarais. dharma salas, tourist homes etc.,, iv) business houses and offices, v) factories, vi) restaurants, vii) educational institutions, viii) hospital and other medical institutions, ix) others but not for residential purposes.

The number of non-residential houses increased from 3.53 lakh units in 1961 to 8.42 lakh units in 1971[11] and 17.9 lakh units in 1981.[12] But as per the census definition a single building may include more than one entity with a separate census number. To quote census report (1961), "In the case of buildings having a number of flats or blocks which have separate entrances of their own and are independent of each other with a common stair case or a common courtyard leading to a main gate, such flats or blocks were considered separate census houses".[13] Hence the actual number of buildings used for non-residential purpose will be much less than

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11. Ibid.

12. Director of Census Operations, Kerala (1985), Census of India 1981, Series 9, Kerala, Economic Tables, Trivandrum, p.62.

13. Director of Census Operations, Kerala (1966), Census of India 1961, Series 9, Kerala, Part IV, Housing Report and Tables, Trivandrum, p.23.

the number stated by counting the census house units. Similarly, the plinth area of houses used for non-residential purposes cannot be precisly determined since some buildings are too big (schools, hospitals etc) and some are too small (shops etc.). Nextly, the growth of houses for non-residential purpose will be more in urban areas compared to rural areas and hence the share of tile roofed houses will be less compared to the share of tile roofed houses used for residential purpose. Because of these conceptual and technical problems, the actual requirement of roofing tiles for non-residential construction cannot be directly estimated. Hence, as a proxy, the quantity of roofing tiles required for non-residential purpose was assumed to be equivalent to the quantity of roofing tiles required for residential houses. The same methodology was adopted by Raj Mohan also[14] for estimating the quantity of roofing tiles required for constructing non-residential houses in Gujarat.

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14. Raj Mohan, M (1984), Prospects of Housing paper presented in the seminar on Housing Problems in Gujarat at Ahmedabad, 1984.

Roofing tiles are required for maintaining the housing stock (residential and non-residential) and also for converting thatched roofs into tiled roofs (residential and non-residential). The housing stock (residential) in Kerala was reported to be 53 lakh units by the end of 1988.[15] Assuming that 50 per cent are tile roofed houses (assumption d) and each house require 10 tiles annually for maintenance,[16] the tile requirement for maintaining housing stock (residential) was estimated to be 2.65 crores and equivalent quantity was allocated for maintaining housing stock (non-residential) also.

Based on the survey, 36.5 per cent of the housing stock (residential) was found to be thatched. Also if we assume that 50 per cent of the thatched houses are converted into tiles between 1991-2001 AD, annual conversion will be the tune of 96725 houses. Thatched houses are normally very small in size and therefore if

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15. Government of Kerala (1989), Eighth Five Year Plan. Report of the Task Force on Housing Op.cit.p.2.

16. Government of Kerala (1965), PWD Manual, Op.cit. p.72.

we assume an average plinth area of 300 sq.ft. per house, the annual requirement for conversion purpose will be 6.32 crore tiles and an equivalent quantity is allotted for converting thatched houses (non-residential) also. The final picture is presented in table 6.12.

Estimates show that under the stated assumptions, the annual minimum requirement of roofing tiles will be 30.58 crores and the maximum will be 50.82 crores, the average being 40.70 crores.

Alternative B

In alternative B, we assume a favourable climate for tile industry in Kerala and the model is based on the following assumptions.

a) Sixty per cent of the installed capacity is utilised.

b) Thirty per cent of the production of roofing tiles is sold outside the Kerala State.

c) Estimated average annual addition of residential houses in Kerala between 1991 - 2001 AD will be 1.626 lakh.

Table 6.12. Projected annual requirement of roofing tiles in Kerala for all purposes (1991-2001 AD) (Alternative A)

(in crores)

Purpose	Lower limit (-25 per cent)	Average	Upper limit (+25 per cent)
a) Construct residential houses	7.15	9.53	11.91
b) Construct non-residential houses	7.15	9.53	11.91
c) maintain residential housing stock	1.99	2.65	3.31
d) maintain non-residential housing stock	1.99	2.65	3.31
e) convert thatched houses (residential)	4.76	6.32	7.88
f) convert thatched houses (non residential)	4.76	6.32	7.88
g) Total	27.80	37.00	46.20
h) miscellaneous (10 per cent of (g)	2.78	3.70	4.62
Grand total	30.58	40.70	50.82

d) Sixty per cent of new houses (residential) use tile as roofing material ie. 97,560 new houses use tile as roofing material every year.

e) Estimated housing shortage (residential) is eliminated and of this 60 per cent are tile roofed.

f) Percentage distribution of plinth area of sample houses used tiles as roofing material continues.

g) Sixty per cent of the thatched housing stock is converted into tiled roofs.

Table 6.14 shows that, under the assumptions of alternative B, the average annual requirement of roofing tiles in Kerala will be 54.92 crores.

Alternative C

Pattern of houses underwent drastic changes since 1980. While, even the lower income groups preferred RCC houses, the higher income and affluent sections think of providing synthetic roofs . Hence in alternative C, an unfavourable climate is assumed for tile industry in Kerala and the analysis is framed on the following assumptions.

Table 6.13. Projected annual requirement of roofing tiles in Kerala for constructing houses (residential) (1991 - 2001 AD) (Alternative B)

Plinth area	Percentage of houses	Addition	Requirement of tiles (in crores)
Less than 300	24	23414	0.76
301-600	40	39024	3.82
601-900	23	22439	3.66
901-1200	8	7805	1.78
1201-1500	5	4878	1.43
1501-1800	-	-	-
1801 and above	-	-	-
Total			11.45

a) Only forty per cent of the installed capacity is utilised.

b) Only twenty per cent of the production of roofing tiles is sold outside the Kerala state.

c) Only 1.50 lakh residential houses are added annually in Kerala between 1991-2001 AD against the estimated requirement of 1.626 lakh.

Table 6.14. Projected annual requirement of roofing tiles in Kerala for all purposes (1991-2001 AD) (Alternative B)

(in crores)

Purpose	Lower limit (-25 per cent)	Average	Upper limit (+ 25 per cent)
a) Construct residential houses	8.59	11.45	14.31
b) Construct non-residential houses	8.59	11.45	14.31
c) maintain residential housing stock (at the rate of 20 tiles per house)	3.98	5.30	6.62
d) maintain non-residential housing stock	3.98	5.30	6.62
e) convert thatched houses (residential)	5.68	7.57	9.46
f) convert thatched houses (non residential)	5.68	7.57	9.46
g) eliminate housing shortage	0.97	1.29	1.61
h) Total	37.47	49.93	62.39
i) miscellaneous (10 per cent of h)	3.75	4.99	6.24
Grand total	41.22	54.92	68.63

d) Only forty per cent of new houses (residential) use tile as roofing material (60,000 houses per annum)

e) Percentage distribution of plinth area of sample houses used tiles as roofing material continues.

f) Forty per cent of thatched housing stock is converted into tiled roofs.

The projections presented in tables 6.15 and 6.16 revealed that under the stated assumptions, the average annual requirement of roofing tiles in Kerala will be 29.52 crores.

Thus we have examined the prospects of tile industry with respect to the production of roofing tiles under alternative assumptions and table 6.17 provides the summary of the analysis.

From table 6.17 it is clear that even under alternatives A and B, stock piling can be curtailed only if the expected sales take place in the external market which is less probable to occur. Even if all factors turn in favour of tile industry, the maximum requirement

Table 6.15. Projected annual requirement of roofing tiles in Kerala for constructing houses (residential) (1991-2001 AD) (Alternative C)

Plinth area	Percentage of houses	Addition	Requirement of tiles (in crores)
Less than 300	24	14,400	0.47
301-600	40	24,000	2.35
601-900	23	13,800	2.25
901-1200	8	4,800	1.09
1201-1500	5	3,000	0.88
1501-1800	-	-	-
1801 and above	-	-	-
Total			7.04

Table 6.16. Projected annual requirement of roofing tiles in Kerala for all purposes (1991-2001 AD) (Alternative C)

(in crores)

Purpose	Lower limit (-25 per cent)	Average	Upper limit (+25 per cent)
a) construct residential houses	5.28	7.04	8.80
b) construct non residential houses	5.28	7.04	8.80
c) maintain residential housing stock	0.99	1.33	1.66
d) maintain non residential housing stock	0.99	1.33	1.66
e) convert thatched houses (residential)	3.79	5.05	6.31
f) convert thatched houses (non residential)	3.79	5.05	6.31
g) Total	20.12	26.84	33.54
h) miscellaneous (10 per cent of g)	2.01	2.68	3.35
Grand total	22.13	29.52	36.89

Table 6.17. Average annual requirement of roofing tiles in Kerala under alternative assumptions (1991 - 2001 AD)

(in crores)

Alternative	Production	Estimated requirement in Kerala	Expected sales in the external market	Excess produ-tion
A	50	40.70	12.5	-
B	60	54.92	18.0	-
C	40	29.52	8.0	2.48

is 72.92 crores which is far away from the installed capacity. Also HUDCO has estimated that by all means the demand for Kerala tiles will not exceed 45 crores annually.[17]

Hence, the researcher is of the view that there is no more scope for the tile industry to confine to roofing tiles only. Therefore product diversification is recommended for the survival of the industry.

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17. HUDCO (1984), Future of Tile Industry in Kerala - A Report, Trivandrum, p.21.

Product diversification may take different forms. Barring roofing tiles, the next major output of the tile industry in Kerala is wirecut brick which is an important input in the construction sector. Hence below an attempt is made to project the annual requirement of burnt bricks (burnt bricks include wirecut bricks produced in the tile factories and country bricks produced in the paddy fields) in Kerala until 2001 AD.

b) Burnt bricks

Burnt bricks will be demanded for,

i. constructing residential houses

ii. constructing non-residential houses

iii. converting thatched walls into bricks walls (residential and non-residential)

iv. providing infrastructure to the houses (eg) compound walls

v. miscellaneous purposes.

The demand is projected under three alternatives; alternative D, alternative E and alternative F.

Alternative D

a) Estimated average annual addition of residential houses in Kerala between 1991-2001 AD will be 1.626 lakh units (see table 6.5).

b) Twenty five per cent of new houses (residential) use burnt bricks as wall material (see sec. 6.5, criteria iii) ie, 40650 new houses use burnt bricks as wall material every year.

c) Fifty per cent of the thatched housing stock is converted into brick walls.

d) Percentage distribution of plinth area of sample houses used burnt bricks as wall material continues (see table 6.10).

The projects were made by adopting the following technical norms followed by the Public Works Department[18].

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18. Government of Kerala (1965), PWD Manual, Op.cit.p.70

i. To cover one square feet, the requirement is 24 burnt bricks (standard size).

ii. To provide infrastructure, 25 per cent of the actual is allotted.

Adopting these norms, burnt bricks requirement were projected using the formula,

M x 24 x N

where,

M = Mid point of the plinth area

N = Number of houses in that category.

Allowing 25 per cent variations for price rise,changes in the tastes and preferences etc. range of requirement is 115.64±25 per cent (86.73 - 144.55)

Estimates show that under the stated assumptions, the annual minimum requirement will be 269.98 crores and the maximum will be 450.87 crores, the average being 359.99 crores.

Table 6.18. Projected annual requirement of burnt bricks in Kerala for constructing houses (residential) (1991-2001 AD) (Alternative D)

Plinth area (sq.ft)	Percentage of houses	Addition	Requirement of burnt bricks (in crores)
Less than 300	3	1220	0.44
301-600	8	3252	3.52
601-900	10	4065	7.32
901-1200	34	13821	34.84
1201-1500	19	7723	25.03
1501-1800	17	6910	27.37
1801 and above	9	3659	17.12
Total			115.64

Table 6.19. Projected annual requirement of burnt bricks in Kerala for all purposes (1991-2001 AD) (Alternative D)

(in crores)

Purpose	Lower limit (-25 per cent)	Average	Upper limit (+25 per cent)
a) construct residential houses	86.73	115.64	144.55
b) construct non residential houses	86.73	115.64	144.55
c) Provide infrastructure (residential, 25 per cent of (a)	21.68	28.91	36.14
d) provide infrastructure (non residential)	21.68	28.91	36.14
e) convert thatched houses (residential)	14.31	19.08	23.85
f) convert thatched houses (non residential)	14.31	19.08	23.85
g) Total	245.44	327.26	409.83
h) miscellaneous (10 per cent of (g)	24.54	32.73	40.99
Grand total	269.98	359.99	450.87

Alternative E

Earlier analysis revealed that in 1961 36.63 per cent and in 1971 42.2 per cent of houses (see table 6.7) used stone as wall material but the share declined to 38 per cent (see table 6.9) in 1989. Further, it is not rational to believe that preference for stones will continue basically due to the scarcity of getting quality stones. Hence, in alternative E, we assume that the preference will shift in favour of burnt bricks and on this basis the following assumptions are made.

a) Estimated average annual addition of residential houses in Kerala between 1991-2001 AD will be 1.626 lakh units.

b) Thirty five per cent of new houses (residential) use burnt bricks as wall material ie. 56910 new houses use burnt bricks as wall material every year.

c) Sixty per cent of the thatched housing stock is converted into brick walls.

d) Percentage distribution of plinth area of sample houses used burnt bricks as wall material continues

e) Estimate housing shortage (residential) is eliminated.

Table 6.20. Projected annual requirement of burnt bricks in Kerala for constructing houses (residential) (1991 - 2001 AD) (Alternative E)

Plinth area (sq.ft)	Percentage of houses	Addition	Requirement of burnt bricks (in crores)
Less than 300	3	1707	0.61
301-600	8	4553	4.92
601-900	10	5691	10.25
901-1200	34	19349	48.78
1201-1500	19	10813	35.04
1501-1800	17	9675	38.32
1800 and above	9	5122	23.98
Total			161.90

Table 6.21. Projected annual requirement of burnt bricks in Kerala for all purposes (1991-2001AD) (Alternative E)

(in crores)

Purpose	Lower limit (-25 per cent)	Average	Upper limit (+25 per cent)
a) construct residential houses	121.42	161.90	202.38
b) construct non residential houses	121.42	161.90	202.38
c) provide infrastructure (residential)	30.36	40.48	50.59
d) provide infrastructure (non residential)	30.36	40.48	50.59
e) convert thatched houses (residential)	21.47	28.62	35.78
f) convert thatched houses (non-residential)	21.47	28.62	35.78
g) eliminate housing shortage	13.74	18.32	22.90
h) Total	360.24	480.32	600.40
i) miscellaneous (10 per cent of h)	36.02	48.03	60.04
Grand total	396.26	528.35	660.44

Table 6.21 shows that under the assumptions, the average annual requirement of burnt bricks in Kerala will be 528.35 crores.

Alternative F

New types of wall materials are slowly entering into the market in very recent years. Hence in alternative F, an unfavourable climate is assumed even for burnt bricks in Kerala and the analysis is framed on the following assumptions.

a) Only 1.50 lakh residential houses are added annually in Kerala between 1991-2001 AD against the estimated requirement of 1.626 lakh.

b) Only fifteen per cent of new houses (residential) use burnt bricks as wall material, ie. only 22,500 new houses use burnt bricks as wall material every year.

c) Only forty per cent of the thatched housing stock is converted into brick walls.

d) Percentage distribution of plinth area of sample houses used burnt bricks as wall material continues.

Table 6.22. Projected annual requirement of burnt bricks in Kerala for constructing houses (residential) (1991 - 2001 AD) (Alternative F)

Plinth area (sq.ft.)	Percentage of houses	Addition	Requirement of burnt bricks (in crores)
Less than 300	3	675	0.24
301-600	8	1800	1.95
601-900	10	2250	4.05
901-1200	34	7650	19.29
1201-1500	19	4275	13.85
1501-1800	17	3825	15.15
1801 and above	9	2025	9.48
Total			64.01

The projections presented in tables 6.22 and 6.23 revealed that under the stated assumptions, the average annual requirement of burnt bricks in Kerala will be 209.59 crores.

Table 6.23. Projected annual requirement of burnt bricks in Kerala for all all purposes (1991-2001 AD) (Alternative F)

(in crores)

Purpose	Lower limit (-25 per cent)	Average	Upper limit (+25 per cent)
a) construct residential houses	48.00	64.01	80.00
b) construct non residential houses	48.00	64.01	80.00
c) provide infrastructure (residential)	12.00	16.00	20.00
d) provide infrastructure (non residential)	12.00	16.00	20.00
e) convert thatch houses (residential)	11.44	15.26	19.08
f) convert thatch houses (non residential)	11.44	15.26	19.08
g) Total	142.88	190.54	238.16
h) miscellaneous	14.28	19.05	23.82
Grand total	157.16	209.59	261.98

Thus we have projected the annual requirement of burnt bricks in Kerala under alternative assumptions and even if we consider the worst (alternative F), the average annual requirement of burnt bricks will be 210 crores. The Central Kerala Tile Manufacturers Association applied some thumb rules for estimating the annual requirement of bricks in Kerala and they derived 248 crores as the annual requirement.[19]

The quantity wise production of bricks in the tile factories is not known, but based on the data collected from the sample units (10 per cent of the population) it was found that (see table 3.6) the sample units altogether produced 29 lakh bricks in 87-88, the unit price being Re.1/- Assuming this trend, the total quantity of bricks produced in tile factories in Kerala reaches about 3 crores. Even if we double the production it reaches only 6 crores against the requirement of about 210 crores. Naturally we have to believe that more

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19. Records maintained in the office of the Central Kerala Tile Manufacturers Association (unpublished).

than 200 crores of bricks required in the construction sector in Kerala are provided by the country bricks or even some other unorganised sources. Country bricks are cheap compared to company bricks mainly due to the following reasons.

i. The country bricks are produced in the paddy fields which are the source of clay also. Hence the transportation cost is not incurred in the case of country bricks.

ii. The country bricks production is strictly seasonal and hence no fixed investment is required.

iii. When compared to company bricks, country bricks require less firing because they claim low compressive strength. For instance the average compressive strength of a country brick is found to be 18-20 kg/cm^2 compared to 70-110 kg/cm^2 for company bricks.[20]

iv. Because of the seasonal nature of employment, the unorganised sector which produces country bricks does not come under the purview of Minimum Wages Act.

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20. Government of Kerala (1965), PWD Manual, Op.cit.p.23.

Hence the researcher is of the view that the tile industry in Kerala can survive if and only if the industry diversifies into the production of bricks. The industry can even capture a good portion of country bricks market provided the cost of bricks is lowered by 10-15 per cent. People will prefer only company bricks because cost advantage for country bricks is eliminated at this point (see table 6.24) and at the same time company bricks possess high compressive stress which is important for strength and durability.

Therefore, the researcher recommends the diversification of the tile industry in Kerala into the production of low cost bricks. Cost can be reduced if the clay content is reduced. This will further reduce the fuel cost also. (when the clay content is reduced, it will slightly affect the compressive strength. But for building bricks compressive strenngth 40-60 kg/cm^2 is sufficient compared the present strength of wire cut bricks, 70-110 kg/cm^2) [21] Reduction in clay content and fuel are well justified in the present day since both

21. Ibid.

Table 6.24. Cost comparison of country bricks and company bricks

Type	Quantity	Price (Rs)	Cost advantage (%)	cement required for plastering		Total cost (Rs)	Cost advantage (%)	Cost reduction required (%)
				Quantity (bags)	Price (Rs)			
Country	1100 @ Rs 500/ 1000 bricks	550	50	6	540	1090	11.74	
Company	1000 @ Rs 1100/ 1000 bricks	1100	-	1.5	135	1235	-	11.74

Note: i. Because of the small size of country bricks, 1000 company bricks are equivalent to 1100 country bricks.

ii. Country bricks consume larger quantity of cement because of the uneven surface

iii. Price of cement is treated as Rs 90/- per bag

iv. Labour cost is not considered

Source: Discussions made by the researcher with the masons.

are becoming very scarce and costly. Another advantage of diversification into bricks is that, the existing plant and machinery are sufficient ie, diversification is achieved without incurring any fixed cost.

Eventhough entrepreneurship is lacking in tile industry, a few dynamic and talented managers took keen interest in developing alternative products. As a result, certain types of low cost bricks have been developed which include hollow brick, ash brick, sand brick, mud block, terra block, Hurdis and PF Block.* But almost all the bricks except hollow brick are in the experiment stage. Commercial production of hollow bricks was started in 1986 and at present three factories in Kerala produce hollow bricks, but the product is yet to capture the market basically due to psychological reasons and lack of entrepreneurship from the part of the tile factory owners.

Hollow Brick:

Hollow bricks are hollow in nature with compressive strength 45-50 kg/cm^2. The clay content is forty per cent less compared to wire cut bricks. Because

*Note: PF brick (Arbitrary name) was developed by X. in 1987. But the model is yet to get the final approval from the authorities. Hence the name of the person and other details are kept anonymous at his/her request.

of the large size, about 500 hollow bricks are sufficient to cover the purpose of 1000 wire cut bricks. Even plastering is not compulsory when hollow bricks are used.

Ash brick:

Ash bricks are produced based on Australian technology. The basic raw material is wastes of the thermal plants. An advantage of this brick is that firing is not required. National Building Research Organisation, Roorkee, gave final approval for the product in 1988. The new thermal plant functioning in Kerala (Kayamkulam) can provide raw material to the tile industry for producing low cost ash bricks which are suitable for small buildings.

Sand brick:

Just like ash brick, sand brick is also suitable for small buildings. The major content is sand and consumes less fuel.

Mud block:

Even days immemorial mud blocks were used. In recent years, mud blocks are developed mixing cement which provide sufficient strength at low cost.

Terra block:

Terra blocks are developed on American technology. It includes clay, sand and cement. It also provides high compressive strength at low cost compared to wire cut bricks.

Hurdis:

Hurdis were primarly originated years back as an input for intermittant floors of multi storyed buildings. Because of its high compressive strength, engineers started using this as a wall material since 1980.

CHAPTER VII

SUMMARY AND CONCLUSIONS

Kerala was enjoying a dominant position in tile production in the country for a century. The demand for Kerala tiles was steadily increasing till 1965 both in the local and external markets. But the situation changed since 1965. Development of tile factories in other states like Tamil Nadu, Karnataka, Andhra Pradesh and Gujarat reduced Kerala's external markets. Preference for RCC houses further crippled internal markets. Scarcity of good clay, opposition from environmentalists towards clay mining, scarcity and high price off firewood and other inputs and persistent increase in the cost of labour adversely affected the tile industry and the majority of the factories are on the brink of sickness. Hence a study was attempted on tile industry in Kerala with the following objectives.

i. To study the economics of the tile industry in Kerala for the period 1978-79 to 1987-88.

ii. To examine the regional variations in the economics of the industry.

iii. To identify the major problems and constraints confronted by the tile industry in Kerala.

iv. To examine the prospects of tile industry in Kerala.

In order to study the stated objectives data were collected with the help of pre tested schedules from 32 factories spread over four regions namely Calicut, Trichur, Alwaye and Quilon for a ten year period (1978-79 to 1987-88). The findings emerged from the study are the following.

7.1. Location and ownership

The historical factors mainly the works of Basel Mission played an important role in starting tile factories in Kerala particularly Malabar area. Of the 32 factories surveyed, 80 per cent were established prior to 1947. The present generation inherited the factories and this was primarily responsible for lack of entrepreneurship in the industry.

Sixty nine per cent of the sample units had a rural location due to easy availability of clay and firewood in such areas.

93.75 per cent of the sample units were organised on partnership basis and the remaining two units were public limited companies. Individual proprietorship concerns are absent mainly due to the high order of investment required.

7.2. Capital structure

Significant changes have not taken place in the composition of fixed capital and it was seen that generally firms refrain from incurring much expenditure on items of fixed capital. Among the regions, two factories at Calicut made some attempt for modernisation in 1982-83.

An increasing tendency for the units to store materials particularly clay and firewood has been observed. For instance, the stock of materials increased by 259.11 per cent over the reference period. Among the regions, the stocking of materials was found to be maximum in Calicut region while the stock of finished goods was found to be minimum.

Trends in the composition of working capital revealed that the factories raised enough working capital by loans and advances for meeting day to day expenditure.

Substantial changes have not taken place in productive capital which further strengthen the view that the factories in general once established do not incur much expenditure for any of the fixed capital items.

7.3. Employment and emoluments

There was a marginal decline in the average number of workers from 93 in 1978-79 to 87 in 1987-88. This was not the consequence of any labour displacement whereas it arouse from the prospects of the industry arising from cyclical fluctuations in demand. Nevertheless, the industry continues to be labour intensive. But there has been a labour cost escalation which was more pronounced in the Alwaye region due to alternative employment opportunities in the area at higher wage rate.

The workers of the tile industry come under the purview of Minimum Wages Act and they enjoy ESI benefits also.

7.4. Inputs

While clay accounts for about 25-30 per cent of the input cost, firewood constitutes about 60 per cent. The major reasons responsible for a high price of firewood are,

i. the reduction in the forest area and stoppage of clear felling.

ii. the increasing demand for wood from other industries.

iii. growing demand for fuel wood in the domestic sector

iv. rise in the cost of all other sources of fuel.

7.5. Cost of production

The cost of production consists the input cost, labour cost and establishment cost. Input cost went up from 51.14 per cent in 1978-79 to 55.77 per cent in 1987-88. The corresponding labour cost and establishment cost however declined marginally from 36.91 per cent to 34.43 per ent and from 11.94 per cent to 9.80 per cent respectively. These trends reveal that the rise in labour cost was not acute in tile industry compared to input cost

Among the regions, rise in input cost was maximum in Quilon region and minimum in Calicut region. Similarly, labour cost was maximum in Alwaye region and minimum in Calicut region. Hence, among the regions, Calicut region was capable of producing tiles at low cost basically due to the easy availability of fire wood and economies of scale enjoyed by the factories in the region because of their large size.

7.6. Products

Among the products, roofing tiles had the preeminent position whose share had gone up from 74.97 per cent in 1978-79 to 81.55 per cent in 1987-88 when the demand for roofing tiles are stagnant if not fast declining. This shows the lack of product diversification and increasing reliance of the industry on roofing tiles.

7.7. Gross profit

The prosperity of the industry depends on the margin of profit earned. The margin of profit earned continuously declined inspite of fluctuations and these fluctuations occured due to,

a) fluctuations in sales

b) fluctuations in input cost

c) fluctuations in selling price.

Among the regions, Calicut region alone enjoyed better margin which was the result of,

i) goodwill of the factories in that region

ii) size economies enjoyed by the factories

iii) availability of inputs at low cost

7.8. Value added

Wide fluctuations were observed in the behaviour of value added and these fluctuations were due to fluctuations in demand and consequently production. Hence a direct proportional relationship between profit and value added could not be established particularly in Alwaye and Quilon regions.

7.9. Structural ratios

The structure of the industry was examined with the help of selected ratios and the findings emerged are,

i. fixed capital-invested capital ratio and fixed capital productive capital ratio were found to be low which reflects the high labour intensity of the industry. The ratios were found to be higher in Calicut region and this was due to some attempt for modernisation by two units.

ii. invested capital output ratio showed a rising tendency in all the regions as a result of accumulation of materials, semi finished goods and finished goods.

iii. the continuous increase in cost of inputs was revealed by the input output ratio. The ratio was found to be low in Calicut region.

iv. value added input ratio and value added invested capital ratio fluctuated over the years which strengthen the view that the prospects of this industry is subject to cyclical fluctuations.

v. input per worker, output per worker and value added per worker increased over the years as a result of price rise and wage rise which are only part of the economic changes that have taken place in the country over the years.

7.10. Capacity utilisation

The declining trend in capacity utilisation is shown by the fall in capacity utilisation from 70 per cent in 1978 to 40 per cent in 1988. The high cost of material inputs and inadequate demand for the products led to such a predicament. Capacity utilisation declined from 85 per cent to 60 per cent in Calicut region, 75 per cent to 40 per cent in Trichur region, 80 per cent to 45 per cent in Alwaye region and 75 per cent to 50 per cent in Quilon region over the reference period.

7.11. Productivity and economies of scale

The term productivity is broadly meant to connote the input use efficiency of a production process or any activity. The productivity of the tile industry was examined with the help of Cobb-Douglas production function treating monetary value of output as dependent variable, wages and salaries paid and invested capital as independent variables, respective coefficients being α and β. The value of α was quite large for all the regions except Trichur which confirms the finding that the industry is labour intensive. A comparatively higher value for β in Trichur may be the result of stock piling. The coefficient of capital (pooled) was found to be negative but insignificant due to,

i. over capitalisation as a result of stock accumulation

ii. low share of fixed capital in the capital structure.

The sum total of α and β was found to be less than one in all the regions which implies a state of decreasing returns to scale. The sum of coefficients was found to be higher in Calicut region reflecting higher economies of scale which confirms the earlier finding that Calicut region enjoyed better economies.

7.12. Intra regional and inter regional variations

Intra regional and inter regional variations were studied with the help of ANOVA (RBD type) and critical difference test. Intra analysis proved that there is significant difference in the behaviour of majority of the variables over the years which emphasis the view that the behaviour of this industry is subject to cyclical fluctuations. This argument was further supported by the results of critical difference test.

Similarly, with respect to the behaviour of variables between regions, Trichur, Alwaye and Quilon formed a homogenous group. The behaviour of Calicut region was found to be distinct from the behaviour of other three regions.

7.13. Technological problems

Barring a few units, the technology was seen to be outdated. Fuel efficiency can be achieved only if Hoff-man type kilns are used. But even today majority of the factories use the traditional intermittent kilns. Similarly, the traditional technique of drying the tiles by keeping them in pallets was followed by almost all the sample units.

As the quality of the product is determined by the quality of the clay, it is essential to make proper testing for ensuring the quality of the products. But the clay testing and product testing facilities are available in a handful of units only.

7.14. Marketing problems

The market for tiles consists of three sub markets namely export market, external domestic market and home market. The British colonies which became independent since 1950 started tile factories and this curtailed our exports drastically. Heavy export cost also reduced the incentive for export by our manufactures.

The marketing of tiles became further complicated due to the wrangle of domestic market. The main factors which led to this situation were,

i. higher labour cost in Kerala compared to other states

ii. rising transportation cost

iii. starting of tile factories in other states

iv. shifting of the industry from Kerala to neighbouring states due to wage advantage.

The home market also declined at a fast rate due to,

i. shifting preference for RCC houses

ii. heavy maintenance cost of tile roofed houses

iii. rising cost of wood which is a complementary for tiled roofs.

7.14. Organisational problems

The organisational structure is an important factor for the success of any industry. About 80 per cent of the tile factories continue to be family concerns and are not properly organised as industrial units. Hence, sentiments to maintain the inherited property is the only motive in running the units and not the entrepreneurship. Eventhough a good proportion of owners/managers are well experienced in the field, few are totally new. Similarly, among workers, skill based labour segmentation is almost absent.

7.16. Share of the tile industry in the housing sector

Census reports provide information on the proportion of houses used tiles as roofing material and bricks as wall material. The share of houses used tiles as roofing material increased from 37.6 per cent in 1961 to 48.5 per cent in 1971. Similarly, the share of houses used burnt bricks as wall material reached 23 per cent in 1971 compared to 1.71 per cent in 1961. Considerable changes have taken place in the materials used for building construction since 1970. But secondary information on recent developments was not available pending the publication of 1981 Census Report on Housing.

To bridge this gap, the details of roof material, wall material and plinth area of 600 residential houses built since 1975 were collected from the offices of local bodies. To get a cross section, the entire state was divided into three strata namely Northern Kerala, Southern Kerala and Central Kerala. From each strata 200 houses were examined, 100 each from rural and urban. The highlights of the enquiry are

i. Fifty per cent of houses constructed in Kerala since 1975 used tiles as roofing material.

ii. Sixty four per cent of houses used tile as roofing material had plinth area below 600 sq.ft.

iii. Twenty five per cent of houses constructed in Kerala since 1975 used burnt bricks as wall material.

iv. Five per cent of houses constructed in Kerala since 1975 used wire cut bricks as wall material. This constituted 18 per cent of houses constructed in Kerala since 1975 used burnt bricks as wall material.

v. Seventy nine per cent of houses used burnt bricks as wall material had plinth area above 900 sq.ft.

These criteria were used to project the annual requirement of roofing tiles in Kerala until 2001 AD and also to examine the prospects of diverting into the production of burnt bricks.

7.17. Prospects of tile industry in Kerala with reference to the production of roofing tiles

The requirement of tiles varies from design to design and hence a precise estimate of the requirement of tiles is rather difficult. However, projections made under alternative assumptions revealed that the external and home demand together is just sufficient to absorb the production when the factories are operating at about 50 per cent of the installed capacity. Also, there are no reasons to believe that the situation will turn in favour of roofing tiles. Hence the researcher concludes that the prospects of tile industry in Kerala with respect to the production of roofing tiles as major product is very bleak and therefore recommends urgent diversification.

Recommendations

i. From the estimates made by the researcher under alternative assumptions, it was revealed that even under the worst alternative, the average annual requirement of burnt bricks in Kerala will be above 200 crores of which the present contribution from the tile factories is only about 3-4 crores. Hence the industry in the state can diversify into the production of burnt bricks.

ii. While diversifying into the production of burnt bricks, preference should be given for the production of low cost bricks such as hollow brick, sand brick, terra cotta, mud block etc.

iii. The tile factories can also produce sewage pipes, floor tiles etc. without altering the present structure. Current production of sewage pipes is not sufficient to meet the demand. Similarly, well polished floor tiles are substitutes for mosaic tiles.

iv. Low cost housing technology such as 'Baker Technology' is becoming popular in Kerala in recent months. Hence the industry can diversify into the production of various materials required for low cost houses.

v. Clay is becoming scarce. Therefore attention should be diverted for discovering new forms of raw materials such as ash, sand etc.

vi. The quality of the product depends on the quality of clay. But clay testing facilities are not available at Trichur, Alwaye and Quilon regions where about 75 per cent of the tile factories are located. A handful of units only have the facility at Calicut region. Hence clay testing facilities should be immediately provided. Even the government can provide these facilities in the engineering colleges at Calicut, Trichur and Quilon.

vii. Measures should be strengthened to make available the sanctioned quota of firewood to the tile factories.

viii. Just like clay, firewood is also becoming scarce. Hence fuel substitution is also important and the best alternative is lignite (found suitable after repeated testing) which is easily available from Neyveli Lignites, Neyveli, Tamil Nadu. Even after considering transportation cost, lignite is found to be cheaper compared to firewood.

ix. Majority of the tile factories are not getting the sanctioned quota of oil. Remedial measures in this direction are welcome.

x. Eventhough storing of inputs is desirable, excess stocking is not advisable. Stocks can be kept at optimum only through scientific materials management.

xi. Just like providing clay testing facilities, product testing facilities should also be made available to ensure the quality of the products.

xii. Majority of the factories use outdated technology and aged old machinery. Technology upgradation and modernisation are important for a better future. For instance, fuel efficiency can be achieved if Hoff-man type kilns are introduced. Similarly, the present system of sun drying of tiles can be replaced by installing solar panels at very low cost.

xiii. Modernisation attempts presuppose the easy availability of finance. Hence the government and other financial institutions should make provisions for providing finance to the tile industry. Commercial banks should come forward to sanction loans at concessional rates with liberal terms as they are doing in the case of agriculture.

xiv. During the course of the survey, the researcher observed that majority of the tile factories do not have the practice of keeping proper records. Thus the accounting system in the factories should be strengthened through proper and timely audit, inspection etc.

xv. The home market for tile industry products can be widened if the Government of Kerala directs at least the government sponsored housing schemes to use the tile industry products only in the construction process.

xvi. It was also noticed that unhealthy competition prevail among the regions. This trend can be stopped if a common marketing agency is formed.

xvii. The government should extend tax concessions and other reliefs to promote external domestic sales.

xviii. The government should immediately stop the practice of issuing license for new factories when about 340 units struggle to survive.

xix. Diversification process can be encouraged if tax holiday and other incentives are declared for factories going for diversification.

xx. There are large number of factories in the state struggle to survive due to financial and marketing problems. The government should declare these units as sick units and do everything possible to give life for them as the government did in the case of textile industry.

xxi. The government may constitute an Advisory Board exclusively for tile industry.

xxii. As in the case of other traditional industries such as coir, cashew, beedi, etc. the government may form a Welfare Board for the welfare of the workers employed in tile factories.

xxiii. At present the workers in the tile factories are not properly segmented. Classification of workers into different categories such as skilled, unskilled etc. are important for achieving efficiency.

xxiv. The problem of lack of skilled persons in the tile factories can be solved by starting diploma or similar courses in tile technology in different polytechniques in the state.

xxv. The Samll Industries Service Institute and District Industries Centres can extent training facilities both for managers and workers of tile factories.

xxvi. Research and Development (R&D) facility should be made available in the state. At present this work is partially done by Regional Research Laboratory, Trivandrum.

xxvii. The government, Small Industries Service Institute, District Industries Centres and Tile Manufacturers Associations should come forward to inform and popularise the new developments in tile technology through various media.

xxviii. A major hurdle in the prosperity of the tile industry in Kerala is the lack of entrepreneurship So the government should launch different incentive schemes for creating dynamic and enterprising attitude among the owners and managers.

xxix. Certain earlier committees also recommended many measures, but only a few were implemented. Therefore, the owners and associations should come forward to implement the recommendations of expert committees and studies instead of giving a 'patient hearing' alone.

xxx. Scientific inventions and discoveries are flowing day by day and the entire technology undergoes revolutionary changes where housing technology is not an exemption. Also clay deposits and firewood reserves are getting exhausted. Hence the industry can survive after 20-25 years (2010-2015 AD) only if there is raw material substitution, fuel substitution, product innovation and replacement of plant and machinery. This highlights the need of a 'perspective plan' for the industry.

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