ECONOMICS OF TILE INDUSTRY IN KERALA

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By

MOHANADASAN N.

DEPARTMENT OF ECONOMICS
UNIVERSITY OF CALICUT
DR. JOHN MATTHAI CENTRE
ARANATTUKARA, THRISSUR

FEBRUARY 2008

Dr. C. KRISHNAN

Lecturer (Selection Grade)
Department of Economics
Government College
Kodencherry
Calicut

CERTIFICATE

Certified that this written account on "ECONOMICS OF TILE INDUSTRY IN KERALA", submitted for the award of the Degree of Doctor of Philosophy of the University of Calicut is a bonafide record of research work done by Mr. Mohanadasan N., under my supervision. No part of this work has been submitted earlier for any other degree or diploma.

Place : Calicut
Date : 08.02.2008

Dr. C. Krishnan
Supervising Teacher

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DECLARATION

I, MOHANADASAN N., do hereby declare that this written account entitled "ECONOMICS OF TILE INDUSTRY IN KERALA" is a bonafide record of research work done by me under the guidance of Dr. C. Krishnan, Lecturer (Selection Grade), Government College, Kodenchery, Calicut.

I also declare that this thesis has not been submitted by me earlier for the award of any degree, diploma, fellowship or other similar title of recognition.

Place : Thrissur

Date : 08.02.2008

MOHANADASAN N.

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CHAPTER I
INTRODUCTION

Economic development is the concern of everybody and as such the development theory has received particular attention of economists. Economic development is a very complex process involving not only economic, but also many social, political, technological and cultural changes. One could define economic development somewhat narrowly, as the process of increasing the degree of utilisation and improving the productivity of the available resources of a country which leads to an increase in the economic welfare of the community by stimulating the growth of national income. "Economic development has historically been associated with structural changes in the national economies" (Papola, 2006).[1] Among many structural changes, the most important is industrialization. The most important reason for the incessant craze for the rapid industrialization in the developing economies has been the identification of a positive nexus between industrialization and economic prosperity.

1.1 Industrial Development

Industrial development has become synonymous with the term 'economic development'. There is no denying the fact that effective industrial growth is very essential for successful economic development, particularly in a developing country like India.

Industrial development has a necessary and ultimately large role to play in almost every sound programme in the development of a country. Both industrial growth and the economic growth of any country are positively related. Industrialization enables a country to develop that technological consciousness which is needed in building up a modern nation in the age of globalisation. In less developed countries, the rapid industrialization is a *sine qua non* of rapid economic development (Mezerik, 1968).[2] Only rapid industrialization of a country can effectively solve the problems of the efficient use of the vast human and natural resources, inflation, removal of mass poverty and giving people satisfactory standard of living, above all ensuring the defence of the country.

Industrialization has been defined by Sutcliffe as a process which has invariably been the "outcome or accompaniment of economic development". In another sense, it denotes a set of policies, which more than any other set of policies, is seen as a means towards economic development (Sutcliffe, 1971).[3]

Myrdal brought out the relationship between industrialization and economic development as an answer to the economic problem. "Manufacturing industry represents, in a sense, a higher stage of production . . . . Industrialization and the growth of that part of the working population that is engaged in industry are, therefore, a means of raising national income per capita [...] " (Gunnar Myrdal, 1956).[4]

Industrialization has, therefore, become one of the greatest world crusades of our time. It is an effort in which the under-developed countries place a major hope of finding a solution to their problems of poverty, insecurity and overpopulation, and ending their newly realised backwardness in the modern economy (Bryce, 1960).[5]

Hence, there is a general consensus on the need for accelerating the pace of industrial growth as a means to achieve overall economic development of a region. Industries can broadly be divided into modern and traditional. Along with their prospects, they have their own problems also.

This study is aimed at analysing the performance of the tile industry, one of the traditional industries of Kerala.

Kerala is peculiarly suited to the development of the tile industry because of her rich resources of fine clay, her virgin forests, her backwaters and navigable rivers, her railway and shipping facilities and her potential resource of hydro-electric power to feed the wheels of this industry (Pillai, 1961)[6]. The tile industry has an important role in the housing schemes of the State. Roofing tiles and allied red clay products are the most suitable types of roofing and construction materials within the reach of the common man. The tile industry is labour intensive in nature and helps to solve the problem of unemployment. The industry requires only moderate capital and operates with locally developed technology and the various inputs of this industry are locally available.

There are about 300 industries manufacturing clay roofing tiles in the State. Production capacity of each varies from 2,000 to 40,000 tiles a day. The total annual production in 1997 was about 200 million tiles valued at Rs.32.5 crore. The total installed capacity is of the order of 400 million tiles per annum.

1.2 Significance of the Study

Kerala has been enjoying the monopoly of tile production in the country ever since this industry started to appear on the map of the State. The German Basel Missionary Society established the first tile factory in Mangalore region in the year 1865. Subsequently Kerala became the heartland of tile industry. The roofing tiles manufactured in Kerala were of international standard. Kerala had the monopoly of tile manufacturing industry till 1965. The products of the industry enjoyed good demand in the internal and external markets.

Kerala's commanding role in tile production began to dwindle after 1965. Tile manufacturing units were started in States like Tamil Nadu, Andhra Pradesh, Orissa, Maharashtra and Gujarat, and hence Kerala's external market share declined considerably. Today, the century-old tile industry faces a number of severe problems. Competition from substitutes and the increasing cost of tile roofing are mainly responsible for a decline in the demand for tiles. Moreover, the chief raw-material required for the industry, viz., clay, became scarce, costly and inferior in quality. There is an acute shortage of firewood and steep rise in its price. Besides, there is an abnormal hike in the transportation costs also. Further, problems like under utilisation of installed capacity, low productivity, non-upgradation of technology, change in the attitude of the people towards house construction and the abnormal increase in cost of production also account for the declining trend of tile industry in Kerala.

The situation changed for the worse in the 1990's. With the onslaught of the culture of concrete buildings, the demand for roof tiles drastically declined. Being an industry set up mostly by people without much financial resource base and modern entrepreneurial capabilities, initiatives for technological upgradations and product diversifications were lacking in this sector. But the most important factor that threatens the tile industry, in general, is the uncertainty about the availability of clay. With the rise of environmental consciousness in the State, there is an increasing protest against the removal of clay from paddy fields. Various factors have forced the closure of many of the tile factories in the State and the industry is now confined to the three districts - Kozhikode (Feroke), Trichur, and Ernakulam (Alwaye).

The majority of tile manufacturing units located in these three districts differ drastically in terms of organisational forms, technology adoption, resource base, capacity utilisation, entrepreneurial capabilities, physical performance and marketing strategies. These variations in input base and production pattern are reflected in the diverse performance of the tile manufacturing units located in these three regions. A meaningful analysis of the performance of this traditional industry in the changed industrial scenario of Kerala warrants an in-depth analysis of the different tile units in terms of the indices like location, technology adoption, capacity utilisation, physical and financial performance, production pattern and capital structure. Therefore, an exhaustive analysis of this traditional industry located in the three districts of Kerala, viz., Calicut, Trichur and Alwaye (Ernakulam) is imperative for deriving a meaningful conclusion about the overall performance and problems of this industry. Against this backdrop the present study is conducted. The study attempts to investigate the major profiles of tile industry in terms of different indices determining its overall performance. The empirical part of the study is designed by investigating the profile of sample tile units drawn from the three regions - Calicut, Trichur and Alwaye - where there is a major concentration of tile manufacturing units with diversified profiles.

Studies on tile industry and its related problems are very few in the State of Kerala. The few studies which were conducted mainly examined the growth, problems and prospects of this industry. But no exhaustive research work has so far come out giving more importance to the examination of the extent and causes of underutilisation of installed capacity and financial performance of tile manufacturing units. In addition, no study has come up taking into account the different levels of technology followed by various tile factories. The proposed study is the first of its kind, which focuses on the economics along with the physical and financial performance and capacity utilisation of tile factories in Kerala. The present study also takes into account the impact of different levels of technology, especially in the field of productivity. Thus, this study assumes significance in this context.

1.3 Review of Literature

The tile industry has been a subject of study for many. A number of researchers, institutions and agencies have studied the various aspects of the tile industry. A review of them would be helpful in directing the present study properly. Here, we make a chronological presentation of the available literature.

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, especially, the Atharva Veda, Rig Veda and Yajur Veda. Of the different ceramic products, the most popular are decorative tiles and bricks.

Edward Dobson's (1889)[7] attempt to analyse the tiles and bricks, was acclaimed the first work of its kind in the English language. The work was entitled “A Rudimentary Treatise on the Manufacture of Bricks and Tiles." In this work, he explained in detail the importance of tiles in the ancient period, and how this formed an important part of monuments in different parts of the world. The use of high quality bricks and tiles was prestigious to decorate monuments and other important public institutions. The book also gives a detailed account of different designs that existed in olden days.

The origin and development of tile industry in India was the result of the pioneer activities of Basel Mission. The Basel Mission also contributed to the entire development of northern Kerala. The various ventures undertaken by the Mission were well explained by H. Hofmann (1913)[8] in his book "The Basel Mission Industries." The socio-economic conditions then existing and the rationale of undertaking the industrial ventures were explained in this book. The Mission established the first tile factory at Mangalore. The object of starting the first tile factory was to provide livelihood to Christian converts. Availability of quality clay, firewood and the presence of natural humid climate contributed to the growth of this industry. Further information regarding the origin and development of tile industry is available from the work of Appaswamy *et al* (1948)[9], Bose (1948)[10], Chandler (1949)[11], Chaudhury (1949)[12], and Duby (1950)[13].

Karat (1955)[14] did the first research on tile industry in India. He examined the factors responsible for the concentration and development of tile industry in Mangalore. He held the view that the availability of good quality clay, cheap labour and good demand for the product was the chief factors responsible for the concentration of the industry in Mangalore. He also contended that the industry would have a bright future if timely modernisation and product diversification programmes were implemented.

The Department of Industries and Commerce, Government of Madras, (1957)[15] evaluated the merits and defects of different building construction technologies. The survey carried out in Madras city led the team to conclude that tiled roofing is comparatively cheap and ideally suited to Indian climatic conditions in comparison to reinforced cement roofing.

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 Pillai (1961)[16]. 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.

National Council of Applied Economic Research (1962)[17] in their report "Techno-Economic Survey of Kerala" narrated the factors responsible for the development of tile industry in Kerala. The team also examined the market potential of the products. They found that the demand for tiles and other products is much influenced by the high quality of the product and the brand name and reputation of the industrial unit.

The problems of tile industry in Kerala were examined by Poornam (1962)[18] in his article "Common Tile Factory in Kerala." He was of the view that modernisation is the only remedial measure to revive the industry in the State. Outdated technology, obsolete production design and machinery are prevailing in almost all units in Kerala. Unless the manufacturers are convinced of the urgent necessity of modernisation, the industry would continue in its sickness.

Bhaskaran (1963)[19] was of the opinion that modernisation is inevitable. He examined the important structural ratios and stated that the role of tile industry is declining in the industrial map of Kerala. Menon (1963)[20] 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 glazed tiles.

The tile industry in Kerala had a glorious past. But the situation started deteriorating by mid-1960s. This aspect was discussed in detail by Lokanathan (1965)[21]. According to him, the major factors responsible for the decline were the falling external market, high labour costs and non-availability of good quality clay.

The problems of small-scale tile factories in Madras, Andhra Pradesh and Kerala were identified by Maheswary (1966)[22]. The major problems identified by him were: (i) Unsatisfactory preparation of clay mix, (ii) Lack of driers fitted with humidity and temperature controllers, (iii) Excessive breakage during drying, (iv) High fuel consumption,

(v) High percentage rejects of tiles from kilns, (vi) Very low percentage of first quality tiles, and (vii) Lack of adequate technical know-how.

Contractor. D. Sorabji (1966)[23] stated that the deterioration in the quality of tiles adversely affected the foreign exchange earning capacity. The various bottlenecks of the industry are: (i) Overcharging and liberalised factory rules, (ii) Heavy taxation and new levies, and (iii) Restriction and paucity of power, clay and fuel. It is suggested that only a concerted effort by Government, manufacturers and labourers can overcome the problems of the industry.

Devaraj Iyer (1966)[24] examined the origin and development of the industry in Trichur district. He stated that it was the engineer in-charge of the construction of Manali river bridge who discovered the suitability of soil around the Manali river for manufacturing tiles. It was the turning point for setting up tile factories in the district.

The major problems of brick and tile industry in India were examined by Jain and Jain (1966)[25]. The major problems facing the brick industry pertain to increasing production, stabilising prices and improving quality. Increase in drying cracks and warps, rough appearance, warped surface, crooked alignment, air bubbles, blocked holes, etc. are some of the defects of Indian tiles.

John *et al*. (1966)[26] highlighted how 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.

In the paper prepared by the Economic Research Department of the Syndicate Bank (1968)[27], it was pointed out 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 conditions. It was also pointed out that 23 per cent of the rural houses in South Kanara district were made of tiles, as per 1961 census.

Nair (1968)[28] made a study on roofing tile industry in Kerala as the fourth series of progress and productivity study sponsored by Small Industries Service Institute, Trichur. The main findings of the study were: (i) Returns on investment are very low, (ii) High quality tiles have good demand and fetch high prices. (iii) Installed capacity of the industry is not exploited. (iv) The installation cost of timber frame is very high.

John Thomas Chirayath (1969)[29] made a study on the tile industry in Kerala. Apart from tracing the origin and growth of the industry, this study also includes a number of statistical data and other structural ratios.

Ayyappan Nair (1973)[30] in his article on clay deposits warned that our clay deposits are fast declining and adequate supply of clay deposits will be a problem in the immediate future.

Ananthan (1975)[31] examined the origin, history and features and problems of tile industry in South Kanara district. Most of the factories were not dependent on banks for long term or short term financial assistance. He found that most of the tile units were not able to take advantage of the facilities of small-scale industries, for they were not registered as small-scale industries due to the ignorance of the entrepreneurs.

The new trends emerging in tile industry were examined in detail by Karunakaran (1975)[32]. He recommended that the tile manufacturing process should be changed to suit the new trends in construction. A detailed account of different types of kilns, their relative merits and demerits was provided by Sreedharan Nair (1975)[33].

National Productivity Council (1978)[34] Bangalore, made a productivity study in selected tile factories in Kerala under the modernisation programme of Small Industries Service Institute. The object of the study was to recommend ways and means of improving the productivity of tile industry in the State, particularly in the areas of industrial engineering, fuel efficiency and marketing.

A comparative study on different construction methods was made by Anto (1979)[35] with the help of social cost-benefit analysis. He came to the conclusion that RCC roofing is not preferable under Kerala conditions.

Small Industries Service Institute (1980)[36] Trichur, prepared a Status Report of Mangalore Type Roofing Tiles. The study stressed the need of using de-airing pug mill and revolving press to reduce labour costs and to improve the quality of tiles. Mechanisation is required for material handling also. It is noted that fuel is the biggest problem of the industry. It is also suggested that furnaces have to be scientifically designed.

Aminya Rao (1981)[37] surveyed the pathetic condition of the tile industry workers in Gujarat. He opined that the workers were not organised and hence they were being exploited by the rich class.

Aravindakshan (1982)[38] examined the structure of tile industry in Kerala, giving particular importance to Trichur district. He classified the factories into large units and small units. The main conclusions of this study were the following: (i) There is housing shortage in Kerala, especially in the rural sector, due to low income and low savings of the rural people. (ii) There is technological stagnation in the industry. Hence, there should be modernisation agencies. (iii) Preference for tile roofed houses is fast declining. (iv) The industry has to diversify. (v) More units are becoming sick because of the high production cost. (vi) There should be Governmental assistance to the industry.

John Thomas Chirayath and S. Krishna Iyer (1983)[39] examined the problems of tile industry in Kerala. During the post II World War period, Kerala possessed a monopolistic position in the supply of roofing tiles in India. They recalled that once Kerala exported tiles to Burma, Malaysia, Singapore, Sumatra, Ceylon, Africa and even Australia.

The Government of Gujarat (1984)[40] published a report on the tile industry in Gujarat, concentrated in Morvi. It was observed that the problems prevailing in the State were quite similar to those in Kerala.

Thomas (1986)[41] mentioned the urgency of modernising the tile factories in Kerala to recapture their earlier eminence in tile production. Ananthasubramanian (1986)[42] held the view that modernisation is delayed due to the paucity of finance. Modernisation is possible only if banks and other financial institutions come forward to finance the industry.

National Productivity Council (1987)[43] made an attempt to measure the productivity of tile industry in Kerala. The study revealed that, even though the number of tile factories in Kerala increased, the capital and labour productivity had declined particularly since 1975, mainly due to higher labour cost and raw-material cost.

According to Kotti Reddy (1987)[44] it is necessary that all tile units in Kerala State should immediately form a single organisation to represent their problems to the government and take necessary steps to solve marketing and technical problems collectively, in association with various research bodies and other agencies.

Hajela (1988)[45] critically examined the problems and approaches for the modernisation of clay roofing tile industry. The major factors responsible for slow modernisation, according to him, are: (a) Industry is small-scale, labour intensive and rural based, (b) Lack of research and development facilities. He also suggested the following areas where modernisation is required.

(i) Standardisation of products, (ii) Diversification of kiln design and (iii) Introduction of semi-mechanisation at various stages of clay preparation.

A vivid account of the level of modernisation required at different levels is available from the work of Balachandran (1988)[46]. He pointed out that the cost of production of tile has been increasing which can be controlled only if modernisation is introduced at different levels.

'A Report on Tile Industry' was prepared by the State Bank of Travancore (1989)[47]. It examined the market potential, manufacturing process, input and the incidence of sickness. It is observed that the products are primarily sold in the local market, which is also stagnating. The productivity of workers in Quilon and Calicut is low. The market share in the neighbouring States has come down as they establish factories in their own States where cost of production is moderate.

Kulkarni (1989)[48] made an analysis of the present status of ceramic industry in Uttar Pradesh. He pointed out that there is good future for ceramic industry in the State because the Government gives very high priority to housing.

Lelitia Moneteiro (1989)[49] analysed the growth potential of tile industry in Dakshina Kannada. The major findings of the study were : (i) The inflow of gulf money shifted the attitude of the rural people from tiled roofs to Reinforced Cement Concrete (RCC). (ii) There is labour absenteeism in the tile industry. (iii) There is no market research centre. (iv) There is no accounting system in the tile units. (v) The managements have not taken any care to study the problems confronted by the units and there is deficiency of management skill.

Mani (1990)[50] in his Thesis examined the economics of tile industry in Kerala. The objectives of his study were: (i) To study the economics of the tile industry in Kerala. (ii) To examine the regional variations in the economics of the industry. (iii) To identify the major problems and constraints faced by the tile industry in Kerala, and (iv) To examine the prospects of tile industry in Kerala. He examined the economics of tile production in Kerala and also in four regions. The major findings of his study were the following: (a) Sixty per cent of the sample units had a rural location. (b) Significant changes had not taken place in the composition of fixed capital. (c) Among the regions, rise in input cost was the maximum in Quilon region. (d) Among the products, roofing tiles had the pre-eminent position. (e) Among four regions, Calicut enjoyed better margin, and productivity of Calicut region was found to be higher. He concluded that the prospect of roofing tile industry was very bleak.

Arunkumar (1994)[51] examined the structure and pattern of growth of tile industry in Kerala. He also examined the important problems that this industry faces today. The possibility of product diversification has been the thrust area of his study. He stated that the tile units do not face any demand problems of a permanent nature. He concluded by saying that product diversification is the best strategy for the survival and growth of the industry.

Sivalingam (1994)[52] elucidated the crucial issues afflicting tile industry in Kerala. The major objective of his study was to provide a detailed account of modern methods of working for small-scale roofing tile manufacturing units. Special emphasis had been laid on energy conservation, pollution control and quality control, besides appropriate technology for clay handling, mixing, pressing, drying and firing.

Small Industries Service Institute (1994)[53] in its report, "Study Report of Cluster Group of Industries on Roofing Tiles" stressed certain measures meant for the survival of this industry. These measures include energy conservation, cost reduction, modernisation and technology development.

Johnson (1998)[54] examined the various issues relating to tile industry in Kerala. The main objective of his study was to examine the marketing problems of tile products. Besides, he examined the productivity of labour in tile industry. K.G.K. Nair (1999)[55] in a report analysed the product range of the tile sector, salient features of the existing industrial units and procurement problems of raw-materials. He put forward certain recommendations for the revival of this industry, of which the most important one is product diversification and Research and Development.

Maleeha Raghaviah (2001)[56] examined the basic problems that the tile industry in Kerala faces today. The most serious problem of tile industry is the non-availability of clay. Singh Mor (2003)[57] looked into some of the aspects relating to housing, health, safety, education and welfare facilities of women workers of the brick kiln industry. The study concludes that these workers come from the poorest section of the society, especially from Scheduled Castes and Scheduled Tribes, earning meagre income. They are deprived of good living as well as working conditions. There are no fixed working hours. Unauthorised deductions and untimely payments are a common feature. The study concludes by stating that there is an urgent need of advocacy roles so that the Government and policy-makers can take some concrete steps for ameliorating the socio-economic conditions of these workers.

The Friday review of The Hindu (2003)[58] examined the problems of tile factories in Kerala under the title "Crisis in Tile Industry Continues". This report stated that the traditional industry of the region would disappear, if the Government did not protect it through concessions granted to similar industries such as cashew.

Ramavarman (2004)[59] examined the origin, phase of decline and rising costs of tile industry in Kerala. According to him various factors have forced the closure of many of the tile factories in the State and the industry is now confined to the four districts, viz., Kozhikode, Trichur, Ernakulam and Kollam.

Naresh Kumar and Sidhu (2005)[60] made an attempt to identify the push and pull factors which influence the brick kiln worker's inter-state migration on the basis of perception of workers. According to the study lack of development, inadequate agricultural land and poor economic conditions of family and so forth forced labourers to migrate. The study further found that economic factors have emerged more significant as compared to non-economic factors in the process of migration.

Though a number of studies were carried out by different individuals and agencies, majority of them except a few suffer from the following short-comings. (i) No systematic methodology is adopted to carry out the studies, (ii) The areas of modernisation, diversification and capacity utilisation are not dealt with, and (iii) Earlier studies are partial in the sense that the different economic aspects of the industry, viz., production, input, output, productivity and related problems are not dealt within a single study.

It is against this backdrop that the present study is carried out. It is an improvement over the earlier studies in the sense that it examines the economics of tile industry in Kerala by choosing samples from three regions which together account for 85 to 90 per cent of the tile factories in the State. This study also attempts region-wise analysis of capacity utilisation, productivity and financial performance of tile units in Kerala.

1.4 Objectives of the Study

The general objective of the study is to analyse the region-wise economics, capacity utilisation, productivity and financial performance of tile units in Kerala. The specific objectives of the study include:

i. To examine the economics of the tile industry in Kerala.

ii. To analyse the financial performance of tile manufacturing units in Kerala, and

iii. To identify the problems and constraints of the tile industry in Kerala.

1.5 Hypotheses

Based on the objectives of the study, the following hypotheses have been framed.

i. The economics of the tile industry is becoming unfavourable over the years.

ii. The financial feasibility of the tile industry is becoming unfavourable over the years.

iii. Modern technology based tile factories achieve higher level of productivity.

1.6 Research Design and Methodology

This study is based on both primary and secondary data. Primary data have been collected from the sample tile units selected through the scientific method. The research design and methodology adopted for this study are given below.

1.6.1 Sample Design

A list of the total number of registered units engaged in the production of tile products was obtained from the Office of the Directorate of Industries, and District Industries Centres. It indicated that there are 283 large and small tile manufacturing units in the State. This study is confined to Kerala. This is a sample study. A representative part of these tile units were selected for intensive analysis. A two-stage random sampling technique was used to select the samples. In the first stage, the regions in which the tile units are concentrated were identified. In the second stage, sample tile units were selected from these regions at random.

1.6.2 Selection of the Sample Regions

There are 283 tile manufacturing units in Kerala as on 31st December, 2006. The main concentration of the industry, however, was in three districts, namely, Kozhikode, Trichur and Ernakulam (Alwaye). These three districts together account for about 90 per cent of the total tile manufacturing units in Kerala. Hence, Kozhikode, Trichur and Ernakulam were selected as the sample districts. Each district is designated as a region for the purpose of the study. Thus, the sample regions are Calicut region, Trichur region and Alwaye region. Therefore, it has been decided to consider the units located in these regions as the universe for selecting sample units.

1.6.3 Selection of the Sample Units

In the second stage, sample units were selected. Random sampling was used in selecting the sample units from the sample regions. Six sample units were selected from Calicut region, 30 sample units were selected from Trichur region and 6 sample units from Alwaye region. Thus a total of 42 units were selected for the study. While drawing the samples, more consideration was given to the magnitude of concentration.

Since the population is relatively less in Calicut and Alwaye regions, about 50 and 60 per cent respectively of the population was included in the sample. But from the Trichur region, only 12 per cent of the population was included in the sample, as the population is fairly large. In the selection of sample units it is difficult to keep the proportionate sampling technique and hence the non-proportionate sampling technique was followed. The samples selected account for 16 per cent of the population of the sample region and 15 per cent of the universe of the State of Kerala. The list of sample units surveyed is given in the Appendix I.

The tile industry in Kerala makes use of different levels of technology. In the context of this study it is assumed that the level of technology is determined on the basis of the type of kilns used by the sample units. The kilns in operation include the Down-draught Intermittent Type, the Semi-continuous Type and Hoffmann Continuous Type. Sample units of down-draught kiln are treated as traditional technology-based units, samples of semi-continuous kiln are treated as intermediate technology-based units and the sample units of continuous kiln are considered as modern technology-based units. Since all the three types of technology-based units are operating in the sample region, the samples selected from these regions represent the three levels of technology also. Therefore, the samples selected qualify both the regional representation as well as technological specificities.

A classification of the selected samples on the basis of region and nature of technology is shown in Table 1.1.

TABLE NO 1.1

DISTRIBUTION OF THE SAMPLES BASED ON REGIONS AND NATURE OF TECHNOLOGY

Type of kiln (Technology)	Region			Total
	Calicut	Trichur	Alwaye	
Down-draught	1 (5.26) (16.67)	15 (78.95) (50.00)	3 (15.79) (50.00)	19 (100.00) (45.24)
Semi-continuous	2 (15.39) (33.33)	9 (69.23) (30.00)	2 (15.38) (33.33)	13 (100.00) (30.95)
Continuous	3 (30.00) (50.00)	6 (60.00) (20.00)	1 (10.00) 16.67)	10 (100.00) (23.81)
Total	6 (14.29) (100.00)	30 (71.42) (100.00)	6 (14.29) (100.00)	42 (100.00) (100.00)

Note: Figures in parentheses indicate percentage of the total.
Source: Survey Data.

The Table reveals that out of 6 sample units of Calicut region, 3 units follow continuous kiln, 2 units use semi-continuous kiln and 1 unit uses down-draught kiln. Out of the 30 units selected from Trichur region, 15 units belong to down-draught kiln, 9 units follow semi-continuous kiln and 6 units use continuous kiln. Out of the 6 units selected from Alwaye region, 3 units follow down-draught kiln, 2 units belong to semi-continuous kiln and 1 unit is of continuous kiln. As regards the nature or level of technology, out of the total 42 sample units drawn from three regions, 45.24 per cent belong to down draught kiln group, 30.95 per cent follow semi-continuous type kiln and 23.81 per cent are from the continuous kiln group. Out of 19 down-draught type kiln, the share of Trichur region is 78.95 per cent and that of Calicut and Alwaye regions are 5.26 per cent and 15.79 per cent respectively.

On the basis of status, tile manufacturing units in Kerala can be classified as small, medium and large units. However, while selecting samples for the purpose of this study status-wise classification is not considered.

1.7 Data Source

The methodology for an empirical analysis necessarily involves the use of extensive primary and secondary data. The present study comes under descriptive survey method. Both primary and secondary data have been used for the study. However, this study is mainly based on primary data. A well structured questionnaire was circulated among the units under study for the collection of primary data. Necessary information was also collected from the managers and employees of tile manufacturing units.

Secondary data were collected from various publications of the State Planning Board, Directorate of Economics and Statistics, National Productivity Council, Small Industries Service Institutes and so on. Secondary information was also gathered from books, reports, articles, working papers, published and unpublished works.

1.8 Tools of Data Analysis

The statistical tools used for data analysis include Arithmetic Mean, Analysis of Variance (ANOVA), Time Series Analysis, Critical Difference Analysis, Percentages, Ratios and 'Z' Score.

1.9 Pilot Study

Before finalising the questionnaire, it was considered necessary to rehearse the questionnaire under actual field conditions. For this purpose, a pilot study was initially carried out. For the pilot study, an unstructured interview schedule was used which helped to improve the quality of interview schedule. The pilot study was carried out in Calicut and Trichur regions by choosing 5 samples each. Necessary changes and modifications were effected in the interview schedule in the light of the pilot study. A pre-test of the scheduled was also executed.

Interview schedule (Appendix II) was finalised after making necessary corrections, deletions and additions in the light of experience gained through pre-test. In the present study, a pre-test was conducted among five sample units in Calicut region.

1.10 Field Work

Field work was conducted from April 2006 to December 2006. The respondents were interviewed at their manufacturing units using a well structured schedule.

1.11 Scheme of the Study

The study is presented in eight chapters. The introductory chapter introduces the topic and explains the significance of the study, review of literature, methodology and data source, sample design and also the limitations of the study. The origin and development of tile industry is provided in the second chapter. An attempt has also been made to discuss the manufacturing process of tile units in Kerala.

The economics of the tile industry in Kerala is analysed in the third chapter. This is done by analysing the capital structure, input cost, labour cost, product mix, gross profit, value-added and similar parameters of the sample units. Structural variations are also examined with the help of selected structural ratios. Similar analyses are done at the regional level also.

The fourth chapter analyses trends in productivity, especially labour productivity. After explaining theoretical issues relating to the concept of productivity, we measure labour productivity and total factor productivity of the sample tile units.

The conceptual and empirical contours of capacity utilisation are presented in the fifth chapter. The empirical part of the study pertains to region-wise analysis of capacity utilisation, size and capacity utilisation, capacity utilisation and profit, market demand and capacity utilisation and so on.

Financial performance of sample units using certain ratios is done in the sixth chapter. The overall performance assessment of tile units with the help of Altman's model is also presented here. The problems and constraints of the tile manufacturing units are discussed in the seventh chapter. The last chapter gives the summary of findings, conclusions and suggestions.

1.12 Limitations of the Study

As in the case of any social science research, this study has also some limitations.

First of all, most of the tile factories do not maintain proper records of their day-to-day activities. In the absence of proper records, the required data was gathered from the entrepreneurs and managers of the sample units through discussions. Hence, the reliability of the data depends to a greater extent on the information supplied by them. Secondly, besides roofing tiles, tile factories also produce various other clay products. But in this study major thrust is placed on roofing tiles. Thirdly, while selecting the samples, classification based on location and size is to be considered. But the samples for the present study were drawn on the basis of location and the selected samples were arranged on the basis of technology (nature of kiln). Fourthly, the economic variables included in the study were examined in current prices. Despite these limitations, maximum care has been taken to present the subject of research in a scientific manner.

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CHAPTER II

THE TILE INDUSTRY IN KERALA - AN OVERVIEW

INTRODUCTION

2.1 Ceramics

The discovery of ceramics ranks as one of man's earliest scientific achievements. The early history of man is traced mainly through his ceramics. Tile is a ceramic product made of clay. Ceramic materials are chiefly of a mineral nature, consisting mainly of silica, alumina, lime, magnesia, iron oxide, soda, potash and compounds of these substances.

The word 'Ceramic' is derived from the Greek word "*keramikos*", originally meaning burnt stuff (William Lee, 1961).[1] In a general sense ceramics may be defined as 'materials and articles made from naturally - occurring earths" (Searle and Grimshaw, 1960).[2] According to Encyclopaedia Britannica (1973)[3] , "all production of which the final result is baked clay in different grades of hardness and purity is to be considered as ceramics". "Ceramics is the art and technology of making objects of clay and similar materials treated by firing" (Ceramics: The Random House College Dictionary, 1988).[4] Ceramics is largely synonymous with pottery and other articles made of burned clay. The word "pottery in its widest sense includes all objects fashioned from clay and then hardened by fire" (Encyclopaedia Britannica, 1947)[5]. More recently, it was customary to define ceramic product as an article made from clay with or without the addition of other materials. It now includes cement, refractories, glass, whitewares and fired building materials and abrasives (R. Poornam, 1966)[6.]

2.1.1 Classification of Ceramic Products

Ceramic products are innumerable according to their physical and chemical properties. Ceramic products are generally classified into four groups, viz., structural clay products, refractories, pottery and miscellaneous ceramic products (Searle and Grimshaw, 1960)[7.] A general classification of ceramic products is given in Table 2.1.

TABLE 2.1

A GENERAL CLASSIFICATION OF THE DIFFERENT CERAMIC PRODUCTS

	Industry			
	Structural Clay Products	Refractories	Pottery	Miscellaneous ceramic products
Type of product	Building bricks of all types Hollow blocks; Terra-cotta Roofing tiles and floor tiles, Flower pots, Chimney pots and flues, Unglazed (land) drain-pipes, Glazed pipes and accessories	Fireclay bricks and raw fireclay, Silica and siliceous-bricks and raw stone, Magnesite bricks, Chrome bricks, Chrome-magnesites, Dolomite bricks, Carbon bricks, Silicon carbide bricks and shapes, Insulating refractories, Sillimanite bricks, High (over 50 per cent) alumina bricks, Retorts, Crucibles, Ladles, etc., for metallurgical, gas-plant, scientific and other applications.	Glazed wall and earth tiles, Domestic and Sanitary Earthen-ware, Bone china (chinaware), Porcelain (domestic, laboratory, industrial) Stoneware, Glazes and Engobes	Fused silica, Special Refractories, Electrical ware, Cements, Glasses, Glazes, Enamels

Source: A.B. Searle and R.W. Grimshaw: "The Chemistry and Physics of Clays and other Ceramic Materials", 3rd ed. Ernest Benn Ltd., London, 1960, p.38.

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.

The ceramic products in Kerala are classified as follows.

TABLE 2.2

CLASSIFICATION OF CERAMIC PRODUCTS IN KERALA

White ware Products	Stoneware Products	Refractory Products	Red Clay Products
Crockery ware Sanitary ware Plates Electrical-insulators (L.T), etc.	Stoneware pipes Stoneware containers	Refractories and fire clay insulation bricks	Roofing tiles Flooring tiles and other types of tiles, Ridges, Wirecut bricks and other casual type bricks.

Source: M.K. Nair, "Modernisation Guide for Clay Products Industry", SISI, Trichur, pp.8&9.

The classification of ceramic products shows that tile and brick form an important constituent of ceramic group. Clay is the basic raw-material of tile and brick making.

2.2 Clay Products as Roofing Materials

Clay products as roofing material began to replace straw and leaf thatching only in a much later era of human civilization. Tile is "a *thin, flat slab, usually of burnt clay, glazed or unglazed, used either structurally or decoratively in building" (Encyclopaedia Britannica, 1947. ed).*[8] The American Educator Encyclopaedia (1962, ed.)[9] defines tile as "a slab of baked clay used in covering roofs, paving floors decorating walls and carrying of drainage". Tile industry embraces a wide variety of terracotta clay products.

Tiles used for roofing purpose are generally known as roofing tiles. These sophisticated materials were first developed primarily with the intention of providing a somewhat permanent roofing to the sacred places of worship. Historical evidence goes to prove that the early man gave much priority in the matter of a permanent roofing to the abode of Gods.

2.2.1 Roofing Tiles in Different Countries

Roofing tiles of different size and nature are used in different countries. The Arabs and Moors produced beautiful tiles and used them in palaces and prayer halls (Lelitia Moneteiro, 1989)[10]. In ancient Greece, terracotta roofing tiles were used for common residential buildings. The Romans roofed their houses with clay tiles called Tegula (Lelitia Moneteiro, 1989)[11.] It is known that bronze roofing tiles were relatively common on the most monumental buildings of the Roman empire (Searle and Grimshaw, 1960)[12]. In 1851 Gilardine invented Marseilles tiles and France is considered as the place of origin of this pattern of roofing tile (Lelitia Moneteiro, 1989)[13] . In 1852, a kind of Marseilles tile called 'Mountain tile' was introduced by Sechmidturez in Switzerland (Moneteiro, 1989)[14]. There are evidences of wide use of roofing tiles named 'pantiles' in Italy. In India, it is evident that the houses in Mangalore used rounded roofing tiles in the seventeenth century. 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 (Searle & Grimshaw, 1960)[15.] The following Table shows the nature of tiles in different countries.

TABLE 2.3

WORLD CENTRES OF TILE PRODUCTION

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

Source: Searle, A.B. & Grimshaw, R.W. (1960) Op.cit.,

For convenience of analysis and presentation, the chapter is organized in two sections. Section A contains an analysis of the origin and growth of tile industry in India and Kerala. This is followed by a brief description regarding the manufacturing process of the tile industry in Section B.

SECTION A

2.3 Origin and Growth of Tile Industry in India

It was in the year 1865 that the first tile making industry established in India at Mangalore by the Basel Mission. Mr. Karl George Andreas Plebst was the brain behind this venture who encouraged the Mission to start the first tile factory at Jeppo. The Missionaries introduced the pattern of tiles which were so far being produced in France and Germany. Therefore, the tiles of this pattern were known as Mangalore pattern tiles, wherever they were produced in India. The tiles manufactured by them have been found to be of immense use to the public and the Government, and the latter, as a mark of its appreciation, issued order to their Public Works Department to use Mission tiles for all public buildings. The Government further evinced their appreciation by giving as an encouragement to this industry, a considerable quantity of firewood grates from their forests. The second tile factory was started at Calicut in the year 1873. Later it was deemed necessary to start new factories in other Mission stations as well. Accordingly in the year 1882, a factory was started at Kudroli. Another factory at Malpe, near Udipi was started in the year 1886; the fifth at Codacal was established in 1894 and the sixth at Palghat was started in the year 1887. The seventh factory was established at Feroke in the year 1905. The products of these seven factories were sold throughout the Indian Empire, Burma and Ceylon and were also exported to other foreign countries.

Till the year 1960, tile industry was concentrated in a few areas like Mangalore in Karnataka State and Calicut, Alwaye, Trichur and Quilon in Kerala State. Gradually, tile units came to be established in other parts also. The most important centres are Morvi (Gujarat), Godavari, Samalkot, Hyderabad, Jagganpet (A.P) and Kundapur, Mysore and Bangalore (Karnataka). The growth performance of the industry in India is presented in Table 2.4.

Table 2.4

Growth Performance of Tile Industry in India

Particulars	1961	1971	1981	1991
No. of units	266	345 (29.70)	509 (47.54)	560 (10.01)
Average No. of working days	270	279 (3.33)	280 (0.36)	280 (0.00)
Productive capital (Rs. in lakh)	352.68	859.16 (143.61)	898.30 (4.56)	902.32 (0.45)
Fixed capital (Rs. in lakh)	246.55	627.77 (154.62)	713.84 (13.71)	790.24 (10.70)
Working Capital (Rs. in lakh)	106.12	231.39 (118.04)	284.43 (22.92)	312.23 (9.77)
Persons Employed	19,976	22,470 (12.48)	23,686 (5.41)	24,840 (4.87)
Gross Value of output (Rs. in lakh)	499.41	1290.20 (158.34)	2816.63 (118.30)	3415.21 (21.25)
Gross value of input (Rs. in lakh)	230.45	696.20 (202.10)	966.19 (38.78)	1012.12 (4.75)
Value-added (Rs. in lakh)	268.96	595.00 (121.22)	1850.44 (210.99)	1986.10 (7.33)

Note: (1) Figures in parenthesis indicate the growth rate over the previous year. (2) Data are not available regarding latest statistics on Tile industry.
Source: Compiled from Annual Survey of Industries, Census Sector, Industrial Statistics, CSO.

2.4 Tile Industry in Kerala: Origin and Growth

If paradise is green, Kerala is truly the garden of Eden. It is appropriate to call it God's own country for reasons like nature's bounty, ever green land with two monsoons, synthesis of various cultures and a land where there is a confluence of many religions. The peculiar development pattern of Kerala having high Human Development Index (HDI) at a low per capita income has attracted the attention of reputed development economists, anthropologists as well as scholars of different disciplines.

The State of Kerala was formed on 1st November, 1956 by integrating the princely States of Travancore, Cochin and the Malabar part under the Madras presidency. Kerala is a narrow strip of land along the western coast of India. Nature has been bountiful to this narrow strip of the country sandwiched between the Arabian sea and the Western Ghats. Kerala, a tropical paradise, is a land of colours and contrasts where yesterday, today and tomorrow blend in graceful harmony.

The development experience of Kerala received so much international acclaim that some scholars even encoded the "Kerala Model" of development, defined as a set of high material quality of life indicators coinciding with low per capita income through a set of wealth and resource redistribution programmes (Franke and Chasin, 1992).[16]

Broadly, Kerala passed through three phases of economic growth, (1) a period of slow growth in the sixties, (2) a period of stagnation from the early 1970’s until the late 1980’s and, (3) a period of revival and high growth thereafter. Its growth recovery during the nineties is remarkable and more impressive than the all India average. The State's GDP grew by 9.2 per cent in 2004-05and by 11.8 per cent in 2005-06. Indeed one might characterize

Kerala's economy as a crouching tiger, harnessing its power and ready to leap (Arun Kumar, 2007).[17]

Kerala is an industrially backward State. There are two phases of industrialization in Kerala during pre-independence period. The first phase was characterized by the pondering of small and cottage industries which were dominated by agro-based units. The second phase started with certain policy initiatives of Government of Travancore. The changes in the industrial policies of Travancore are generally attributed to the Dewan of Travancore, Sir. C.P. Ramaswamy Aiyer.

In the post 1950 period, in Kerala, there have been three important players in industrial development; the Government of India, the State Government and the private sector. The real big push to industrialization of the State came in the seventies with big investment in modern industries and stabilization of traditional industries.

However, after 1950s, Kerala's industrial growth performance was worse than the all-India record and worse than the other three south Indian States. According to the Central Statistical Organisation's (CSO's) advance estimate, real GDP growth originating from the industrial sector was only 7.4 per cent in 2004-05 which increased to 7.6 per cent in 2005-06.

Kerala has been the traditional home of several small-scale industries in India. There has been a continuous increase in the number of small-scale units in Kerala. As on March 2006 there were 1,93302 working small-scale units in Kerala with an investment of Rs. 5,91439.65, providing employment to 7,10508 persons (Government of Kerala, 2006).[18] This sector contributes to 40 per cent of industrial production and 35 per cent of direct exports. Tile industry is an important small-scale industry of Kerala.

Kerala has been an attractive destination for traditional industries. However, the industrial basket in Kerala has expanded in the last decade to include tea, ceramics, bricks and tiles, soaps, oils and fertilizers.

Easy availability of raw-materials and ensured market for the finished goods are the two essential pre-requisites for the development of industry. In this respect Kerala is favourably placed as far as clay products manufacturing industry is concerned. Tile industry is one of the traditional industries of Kerala. The first tile factory was established at Calicut in 1873. A review of the growth of tile industry in Kerala would suggest three distinct stages in its development. These stages correspond to a period prior to the First World War, the interwar period and post Second World War period. The establishment of the pioneer factories in Kozhikode and Quilon districts towards the end of the 19th century constituted the first stage. It was an Englishman by name Cameron who established the first tile factory in Quilon in 1880 (Pillai, 1958).[19] The products of these factories were of high quality. The proliferation of tile factories, especially in Trichur area may be considered as the second stage in the development of tile industry in Kerala. The first tile factory in the erstwhile Cochin State was established by Chakola Kunju Vareed Davasy in 1900 at Manali in the present Trichur district. 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 their products were inferior to the older factories at Feroke and Quilon with higher mechanisation. The third stage in the development of tile 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 industry. As a result, mechanisation could be implemented in most of the medium and small-scale factories in the State at a faster rate.

2.4.1 Status of Tile Industry in Kerala

The growth performance of the tile industry since the formation of Kerala State is presented in Table 2.5. The growth performance has shown ups and downs during different periods. The number of factories in Kerala rose from 154 in 1960 to 337 in 1985. The number of factories increased to 427 in 1996. In the mid 1990s, there were about 430 major and minor tile manufacturing units in the State spread over almost all the districts barring Idukky.

But the situation changed for the worse in the late 1990s. Various factors have forced the closure of many of the tile factories in the State and the industry is now confined to the four districts - Kozhikode, Trichur, Ernakulam, (Alwaye) and Kollam. In Trichur, out of the 253 units only 160 are functioning, while in Kozhikode the number has come down from 30 to 7, in Ernakulam from 26 to 12 and in Kollam from 40 to just 2 (District Industries Centre, Trichur).

The pattern of growth was rather uneven as shown by the quinquennial growth rates. The growth rate in the number of factories between 1960 and 1965 was 48.7 per cent which was only 0.87 per cent during the period between 1965-70. There was an increase in the growth rate during 1970-75; the growth rate being 23.38 per cent. However, the growth rates remained more or less constant during 1975-80 and 1980-85 (8.42 per cent and 9.06 per cent respectively). The growth rate in the number has become negative after 1995.

Table 2.5

Growth Performance of Tile Industry in Kerala

Particulars	1960	1965	1970	1975	1980	1985	1990-91	1995-96
Units	154	229 (48.70)	231 (0.87)	285 (23.38)	309 (8.42)	337 (9.06)	344 (2.07)	430 (25.00)
Employment (Workers)	13323	10287 (-22.78)	12460 (21.12)	11287 (-9.14)	11686 (3.54)	12174 (4.17)	11915 (-2.13)	30000 (151.78)
Productive Capital (Rs. in lakh)	154.62	216.75 (40.18)	201.50 (-7.04)	342.54 (69.99)	898.30 (162.24)	989.20 (10.12)	3467.30 (250.52)	6458.33 (86.26)
Value of Output (Rs. in lakh)	270.00	299.06 (10.76)	306.73 (2.56)	749.16 (144.24)	1806.63 (141.15)	1959.65 (8.47)	4375.32 (123.27)	9604.36 (119.51)
Value of Input (Rs. in lakh)	134.69	144.81 (7.51)	142.51 (-1.59)	325.19 (128.18)	866.19 (166.36)	950.55 (9.73)	2297.70 (141.72)	5545.05 (141.37)
Value - added (Rs. in lakh)	135.31	154.25 (13.99)	164.22 (6.46)	423.97 (158.17)	940.44 (121.81)	1009.10 (7.30)	2077.62 (105.88)	4059.31 (95.38)

Note: (1) Figures in parenthesis indicate the growth rate over the previous year.
Source: Compiled from (a) Government of Kerala, Economic Review, State Planning Board, Trivandrum.
(b) Government of Kerala, Statistics for Planning, Directorate of Economics and Statistics, Trivandrum.
(c) D. Anantha Subramanian, President, The Central Tile Manufacturers Association, Trichur.

An analysis of employment potentiality in tile industry reveals the fact that there has been a decline in employment over the reference period. This trend is more remarkable during the period 1985-1990, despite an increase in the factories during the same period.

Productive capital has shown a mixed trend which recorded a negative growth rate during the period 1965-70 and positive growth rate during the period since 1970. The output and value-added figures have shown the lowest growth rates during the period 1965-1970.

2.4.2 Spatial Distribution

Table 2.6 depicts the district-wise distribution of tile factories in Kerala. Even though there are tile factories in 12 districts of the State, the highest concentration of factories is now found in Trichur (90 per cent) followed by Kozhikode (5 per cent) and Alwaye (3 per cent).

The major factors influencing the location or concentration of tile industry were the easy availability of good quality clay and firewood in the near vicinity. Historical factors were also responsible for the concentration of tile industry in certain districts in the State. Transport facilities are equally important in the location of this industry.

Table 2.6

District-wise Distribution of Tile Factories in Kerala for the Period 1965-2006

Districts	1965	% to total	1985	% to total	1990	% to total	1995	% to total	2006	% to total
Trivandrum	1	0.4	2	0.6	2	0.55	3	0.69	-	-
Quilon	33	14.4	49	14.5	57	15.57	40	9.30	2	0.71
Alleppey	3	1.3	7	2.1	5	1.37	3	0.69	-	-
Kottayam	5	2.2	19	5.6	20	5.47	3	0.69	-	-
Ernakulam	16	6.9	36	10.7	35	9.56	26	6.04	9	3.18
Trichur	120	52.4	157	46.6	180	49.18	253	58.83	253	89.40
Palghat	14	6.2	14	4.2	14	3.83	12	2.79	1	0.35
Kozhikode	26	11.4	33	9.8	32	8.74	30	6.97	12	4.24
Cannanore	11	4.8	10	2.9	11	3.00	9	2.15	3	1.06
Wayanad	--	--	--	--	1	0.27	15	3.48	-	-
Kasaragod	--	--	----	--	-	-	8	1.86	-	-
*Pathanamthitta	--	--	2	0.5	2	0.55	-	-	-	-
Idukki	--	--	--	--	-	-	-	-	-	-
** Malappuram	--	--	8	2.4	7	1.91	28	6.51	3	1.06
Total	229	100.00	337	100.00	366	100.00	430	100.00	283	100.00

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

Source:
1. Government of Kerala, Economic Review, State Planning Board, Trivandrum (various years).
2. D. Anantha Subramanian, President, The Central Tile Manufacturers Association, Trichur.
3. District Industries Centre in Kerala.

2.5 Clay

Clay is the most important raw-material required for the manufacture of tiles. Clay deposits vary so greatly in physical conditions and chemical compositions that it is extremely difficult to group them into classes. An attempt has been made in this section to describe the basic characteristics of different kinds of clay.

2.5.1 Different kinds of Clay

It seems impossible to give a definition for clay that is inclusive and yet free from exceptions. The best that can be done is to define clay broadly as a hydrated earthy material, containing a considerable portion of alumina or silica and showing the property of plasticity (Norton, 1949).[20] 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 (Bose, 1948).[21] The term "clay" is applied to those natural earthy deposits which possess the singular property of plasticity (Felix Singer & Singer, 1963).[22] A concise definition of clay by the American Ceramic Society is as follows: "clay is a fine grained rock which, when suitably crushed and pulverised, becomes plastic when wet, leather-hard when dried and on firing is converted to a permanent rock-like mass" (Searle and Grimshaw, 1960).[23]

The term 'clay' is used both as a rock-term and as a particle - size term. As a rock-term, clay implies a natural, earthy, fine-grained material which acquires varying degrees of distinct plasticity when mixed with a limited amount of water, and becomes hard and stone-like when heated to a suitable temperature. As a particle-size term, the clay is used to designate the smallest particles of sedimentary rocks and soils. The maximum size of particles in the clay size grade is commonly considered to be 2μ (0.002 mm in diameter).

Daniel Rhodes has defined clay in his own words - "The clay may be defined as an earthy material substance composed largely of an hydrous silicate of alumina which becomes plastic when wet and hard and rocklike when fired" (Daniel Rhodes, 1969).[24] The clay is a product of decomposition of rocks, rich in alumino-silicate minerals. The decomposition may be due to superficial weathering by atmospheric factor or the hydrothermal action. Geologically clays are composed of various minerals of primary and secondary origin. The principal components in clay may be classed as follows: silica, alumina, alkali-bearing minerals, iron compounds, calcium compounds, barium compounds, magnesium compounds, titanium compounds, manganese and other compounds, complex alumino-silicates, carbonaceous matter, moisture and colloidal water and exchangeable bases. Clay material includes clay, shales and argillites.

Clay is a very common substance, abundant in nature, in a great many types and varieties with differing physical and chemical properties which make it suitable for an amazing variety of uses. The different geological conditions produce clay of various chemical compositions and physical properties.

2.5.2 Classification

Clay deposits may be classified according to their origin, uses or combinations of any or all of these. However, no classification can be perfect, for one clay may be adapted for several widely differing uses. Of greater industrial use is a classification according to the properties and therefore uses of the clay as given by Norton (Singer and Singer, 1963)[25]: (a). White burning clay (used in whiteware). (b). Refractory clay (having a fusion point above 1600^{o}C but not necessarily white burning). (c). Heavy clay product clays (of low plasticity but containing fluxes). (d) Stoneware clays (Plastic, containing fluxes). (e). Brick clay (Plastic, containing iron oxide) (f). Slip clay (containing more iron oxide).

The clay commonly found is generally classified into five kinds, viz., china clay, ball clay, fire clay, refractory clay and brick and tile clay.

i) China Clay

It is white burning clay. China clay is a white powdery mineral with specific gravity of 2.6 and fusion point of 1785^{o}c (William Lee. p.1961).[26] China clay is synonymous with Kaolin. The term 'Kaolin' is derived from the two Chinese words 'Kao-Liang,' meaning "high ridge," a local designation for the area where white china clay is found. Kaolins include the purest clay known, and consists of alumina, silica and water. The Kaolins are notable for their great resistance to heat, their whiteness when fired, and their slight plasticity (Alfred B. Searle, 1953).[27] It is extracted from felspathic rocks having no iron oxide. China clay has the characteristic behaviour of less shrinkage because of its coarse grain structure. China clay is widely used for making high quality alumino-silicate refractories owing to its high purity and refractoriness. It is also used in industries like paper, plastics, insecticides, fertilizers, textiles, paint, rubber and many other industries.

ii) Ball Clay

Ball clay is secondary clay. It is transported from the place of its origin by natural agencies. It is sedimentary clay of fine-grain size usually containing some organic matter and having good plasticity, high green strength and white or cream colour after firing. "*It is sedimentary white burning clay of fine particle size, excellent plasticity and dry strength*" (Kingery, n.d).[28] It is similar to kaolin in mineral composition but its physical properties are quite different. Its common characteristics are the presence of organic matter, high plasticity and strength, long vitrification range and exceptional whiteness when fired. Compared to china clay, ball clay is richer in silica and powder alumina. It contains a larger proportion of alkalies, iron-oxide and carbonaceous matter. The ball clay is so called because it is usually mined in the form of balls. The main characteristic of ball clay is that it can be put into use directly after extraction from the mines. It is sometimes used in refractories but its greatest use is in whiteware to make the body more plastic and workable. Ball clay is now used in the making of pottery articles, table wares, white wall tiles, electrical equipments, iron enamelling clays and fillers for paints.

iii) Fire Clay

Fire clay is the backbone of refractories industry. The so-called "fireclays" include nearly all clays that have a fusion point above approximately 1600°C (about 2900°F) and are not white burning. Fireclay may be described as an earthy plastic, detrital material in which the percentages of iron oxide, lime, magnesia and alkalies are sufficiently low to enable the material to withstand a temperature of at least 1500°C and preferably over 1600°C (Rao, 1966).[29] Fire clay may be regarded as a variety of impure Kaolin. Fire clay is generally greenish, grey in colour, compact and dense in structure and varies in degree of hardness. Fireclay is generally found beneath the coal seams. It varies widely in composition and properties. It can be roughly divided into three types (Rao, 1966).[30]

i). Flint fire clay which usually occurs as rock like masses; ii). Plastic fire clay, 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.

Classification according to fusibility is also of importance.

(a) Highly refractory clay fusing above cone 33; (b) Refractory clay fusing from cone 31-33 inclusive; (c) Semi-refractory clay fusing between cones 27 and 30; (d) Clay of low refractoriness, low heat duty clay fusing between cones 20 and 26.

Thus, the basic characteristic of the fire clay is refractoriness. Fireclay is used in large quantities, especially in the manufacture of glazed bricks and other sanitary appliances.

(iv) Brick and Tile Clay

These comprise wide varieties of clay of varying composition, the clay mineral being of the kaolinitic or illitic type. It is invariably high in iron content and often contains gross amounts of other impurity, notably calcium compounds. Because of the high impurity content, fluxing additions are not normally necessary and the clay can be fired at a relatively low temperature. Some deposits are high in organic matter, which ignites on firing and reduces the amount of fuel necessary to fire the ware.

For a judicious selection of brick and tile clay, more importance is usually given to its physical properties rather than to its chemical composition. The clay employed in the manufacture of bricks and tiles should be sufficiently plastic for being moulded into the required shape. It is generally found that clay containing mixed grains has better plasticity. There are two main types of tile clay deposits, viz. the lacustrine type and the flood plain type deposits. The clay is generally fine, plastic, dull, white or variegated. Certain organic substances like horse dung can increase the plasticity of the clay. Such clay shall retain its shape in both wet and dry states and that it shall be capable of being sufficiently vitrified at

950ºC/1100ºC to form hard bricks without excessive shrinking or deformation (Rao, 1966).[31]

If the clay is too plastic, the drying of tiles will not be even and they 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. Therefore, a judicious combination of lean and plastic clay is usually employed for tile manufacturing.

Clay suitable for the manufacture of tiles is found in Trivandrum, Quilon, Ernakulam, Trichur, Kottayam, Alleppey, Palakkad, Kozhikode and Kannur districts. A typical brick and tile clay may have the approximate chemical compositions as given in Table 2.7.

TABLE 2.7

CHEMICAL COMPOSITION OF TYPICAL TILE CLAY

(in percentage)

Silica (SiO_2)	59.23
Alumina (Al_2O_3)	18.92
Iron oxide (Fc_2O_3)	5.61
Lime (CaO)	1.39
Magnesia (MgO)	1.03
Potash (K_2O)	1.61
Soda (Na_2O)	0.92
Loss on Ignition	11.29

Source: Rao (1966): "Clays and their uses". Small Industries Service Institute, Trichur.

SECTION B

2.6 Manufacturing Process of Tiles

The manufacturing process of tiles consists of the preparation and processing of the clay, the making of blocks and slabs, the pressing of clay slabs into tiles, drying of green tiles and burning green tiles to the final product. The essential minimum equipment for running a tile factory must include the grinding rollers, pug mill, tile presses, drying racks and pallets and kiln. There are considerable variations in the efficiency of each of these items depending on the degree of sophistication.

2.6.1 Preparation of the Clay

Clay is usually obtained by open-pit methods. Usually the bed clay is covered by an overburden of gravel or earth, which may run as thick as 10 to 20 ft. (Norton, 1949).[32] The first process is the stripping off the over burden in the most economical manner. The main bulk of usable clay below the over burden is then obtained by digging with spades and picks. When the clay deposit is too deep for stripping, underground mining is used. Practically all underground clay is taken out by drilling and blasting. Clay is usually transferred to the plant on rails with dump cars.

It is the usual practice to keep a comparatively large quantity of clay in store in the clay yards of tile factories so as to avoid shortage of clay during the rainy season. Storage of clay for a long time will lead to increasing plasticity, uniform distribution of moisture, workability, etc. due to proper weathering and aging.

2.6.2 Weathering

It is seldom that clay can be used without some kind of a treatment which shall enable it to mix easily with water, and to be easily worked. The natural agencies of wind, rain and frost may well be made use of in this connection, supplemented, if necessary by washing, grinding and pugging.

Weathering is an essential process in the preparation of tile clay. The object of exposing the clay to the action of the weather, especially in the winter months, is to bring about its disintegration. The chief agents concerned in the weathering of clay are water, air and frost; the water soaks into the pores of the clay, and at a sufficiently low temperature is converted into ice. The disintegration of clay resulting from weathering makes the clay more homogeneous. Besides, exposure to atmospheric influences results in the oxidization of certain impurities. Weathering improves the plasticity of clay due to the decomposition of the organic compounds present. The characteristic red colour of red bricks and terra-cotta is usually enhanced by weathering the clay. However, excessive weathering should be avoided, or else the clay particles may be washed away by rain, leaving a non-plastic residue behind. A period of one year is considered sufficient for weathering tile clay.

After weathering, the clay may require purifying, if not, it may be sent direct to the crushing or tempering mill, or it may be thrown into pits and covered with water in order to further ripen and mellow it.

2.6.3 Souring

After proper weathering, the clay is removed from the clay yard to the souring pits. While storing clay in the sour pits, care is to be 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. It is desirable to mix several types of clay together so that the product may possess properties not possessed by any one type of clay and this is known as blending. A heap of clay is thus formed one above the other and is allowed to sour for about fifteen days. Generally, there will be three or four such pits in a factory; each pit is capable of holding clays for the working of the factory for about a week. The clay-mix for each day's requirement is obtained by digging out the clay vertically from the souring pit. A certain proportion of sand is also mixed with the clay; if necessary to get the required consistency. When the sand content is more, water absorption is more, but shrinkage reduces. However, too high a percentage of sand leads to brittleness. Some factories have no souring pits for souring 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 highly mechanised and is done with the help of belt conveyors or excavators.

2.6.4 Pan Mill

Practically all types of clay must be crushed before it is taken to the tempering and brick making machinery. It is necessary to grind and mix the clay properly before it is used. Grinding is a term used to express two distinct processes, viz: the crushing of clay and the formation of a paste. The exact amount of grinding required will depend on the clay itself and on the articles into which it is to be manufactured. Limey clay and others in which the grinding must be carried out so as to produce a fine clay-are most suitably treated in edge runners, pan mills, or pug mills. The dry pan is used for grinding flint clay, ganister and burned grog. By the prolonged rubbing and grinding operations in a pan mill, the clay-mix is converted into a more homogeneous mass. For the plastic mixing and grinding of clay, water is added in required quantities.

2.6.5 Box Feeder and Mixer

The box feeder is an essential part of any sophisticated equipment employed in a tile factory. A proportionate and consistent supply of clay is made possible with the help of a box feeder.

It was noticed that the clay passes through double shaft mixer first and later through the coarse grinder. This is a wrong practice, for the clay being in comparatively hard lumps to begin with, if processed through the double shaft mixer directly, the blades of the mixer may get worn out too soon. The coarse grinder should precede the double shaft mixer, so that clay is broken up and some grinding has been already done when it is fed to the mixer.

The box feeder is the most popular machine which consists of a trough divided into as many parts as there are materials to be mixed. If there are three materials – lean clay, plastic clay and sand, for instance – the lean clay would be tipped into the end chamber of the trough, the plastic clay in the middle chamber and the sand into the chamber nearest the outlet.

The clay is properly mixed by means of a mixer. The mixer is provided with two shafts; each of which has a number of blades fixed to it. When the clay is fed to the mixer and worked, the two shafts will rotate in opposite direction. The blades provided on the shafts effect shaving, cutting and mixing of the clay.

2.6.6 Pug Mill

The pug mill can be considered as one of the most important devices used in a tile manufacturing unit.

From the mixer, the clay is conveyed to a high speed roller to achieve fine grinding and reduce limestone, if present to small pieces to render it harmless. High speed rollers enable fine particle size and thus contribute to quality. The clay is then pugged in a pug-mill. Before pugging, the clay should be de-aired, if necessary. The de-airing is done to increase the workability of the clay by a *vacuum* pump attached to the pug mill. Clay of high plasticity does not require de-airing whereas for clay with average plasticity and also inferior quality, de-airing is an absolute necessity.

It is the pug mill which extrudes the clay in the form of blocks sliced into slabs of the required size for pressing them into tiles. At the pug mill, the cutting of the blocks is done manually in most cases. In this case, the block size is not consistent and slight variations occur. In order to avoid this, it is recommended that the pugged blocks be cut automatically.

The pug mill is provided with a double set of rollers, one at the top and the other at the bottom. The top pair is known as grinding and crushing rollers and the bottom pair, the feed rollers. Here the clay is again cut, kneaded, properly mixed and finally extruded in the form of square blocks in a continuous manner. In order to cut the blocks into slabs, an automatic cutter (wires) is installed at the mouth of the pug mill which controls the size of the block and ensures economy in the use of labour and clay. A certain amount of oil is smeared on the blocks to take off the stickiness of the clay and give it smoothness.

The blocks extruded from the pug mill will contain excess moisture. Hence, the blocks are kept for a day or two for curing. After curing, the blocks are taken to the press. The outer surface of the blocks is to be kept damp. 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.

2.6.7 Pressing of Tiles

The pressing of slabs into tiles is perhaps the most important operation performed in a tile factory. The sliced blocks (i.e. slabs), if de-aired, can go directly to the press. If no de-airing has been done, the blocks have to be cured. After curing, the blocks are taken to the press. The individual slabs are separated, placed on the table, beaten and oiled. Generally, the oil used for this purpose is a mixture of crude oil and other inferior types of oils or oil wastes. In certain places fish oil also forms part of the oil mixture.

Both power as well as hand presses is employed for pressing. In the hand-operated screw press, the pressing is done manually. The power driven revolver press generally has 5 dies and a speed of 15 strokes/min. This will give a capacity of 7000 tiles per 8 hours. The hand press generally gives about 3000 tiles per 8 hours. Apart from these two types some factories have crank press where the pressing is done by electric power. By using suitable dies, ceiling or ridge tiles can be made in the presses. The moulds used for pressing tiles have the name of the manufacturer and the distinctive trade marks inscribed on them. The green tiles coming out of the press have to be properly trimmed so that the extra clay is removed. Trimming the edges of the green tiles is to be done with utmost care and is considered to be a highly skilled operation. The trimming can be done either manually, or by an automatic trimmer which is attached to the power driven press.

2.6.8 Drying Tiles

Pressed tiles contain 25 per cent or more of their weight of water. This has to be reduced to below 10 per cent before the tiles are sent to the kiln.

Drying of tiles is a very delicate process, since it is necessary to dry them under such conditions that they will remain sound and free from distortion before they are sent to the kiln. The object of drying is to confer sufficient rigidity to withstand the tile being placed in the kiln and to remove the excessive water in it, which may introduce difficulties during firing.

In ordinary plastic clay, the water present fills all the interstices between the clay particles but as the clay dries, this water evaporates and air takes its place. The actual removal of the water takes place at first on the surface of the clay. This is the first stage of the drying process. As soon as the loss in weight commences to be greater than the loss in volume of the block by shrinkage, the first stage of drying is complete. In the second stage of drying, evaporation takes place far more rapidly than the change in volume of the goods, and the completion of this stage is characterised by no further shrinkage taking place; the clay is then no longer plastic. In the third stage of drying, evaporation of the water takes place entirely from the inner parts of the clay, no shrinkage or change in volume of the clay occurs, and the spaces left by the removal of the water are filled with air; there is now little or no danger of distortion and the drying may be carried out as rapidly as desired (Searle, 1953).[33]

Although various methods are employed for drying clay goods, they may be arranged in two groups, according to whether cool or warm air is used. They are natural drying and artificial drying. However, in both cases it is the air which acts as a vehicle for the removal of the water. The amount of air required depends upon (a) the dryness of the air; (b) the pressure; (c) the temperature of the air and the goods; (d) the volume of air and (e) the area of exposed surface of the goods. (Searle, 1953).[34]

2.6.9 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 necessarily big with several chambers for the economic working of the factory. The tiles are removed from the pallets and arranged in sets inside the kiln chambers for firing. When the dried product is placed in a kiln and then heated, numerous physical and chemical processes occur, including oxidization of the organic impurities such as coal, decomposition of carbonates, sulphates and other salts, dehydration, which involves the removal of the physically bonded water and also the water of crystallisation in the clay. The firing process is not simply a matter of applying a steady supply of heat and then cooling. Different stages of the process require different quantities of heat input. The firing of the kiln and the regulation of heat require much experience and knowledge on the part of the concerned workers. The tiles are burned in kiln at a temperature varying from 800^{o}c to 900^{o}c (Nayak, 1988).[35] 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 16to 24 hours.

2.7 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 chimney to discharge waste gases and to create drafts (Ambigapathy, 1988).[36] The efficiency of the kiln is usually defined as the ratio of the heat required to bring up the ware to its maximum temperature divided by the amount of heat supplied by the fuel. (Norton, 1949).[37] It is obvious that the insulation of kilns will increase their efficiency.

The kilns used for burning of tiles are classified as 'intermittent' and "continuous" - the former term being applied to those which are lit, heated to the finishing point, and are then allowed to cool completely before being emptied; and the latter being used for what is really a series of "intermittent" kilns, all connected in such a manner that, although some portions are at the full heat and others are heating, cooling, being filled or discharged, yet the fire is never allowed to die out in every part of the kiln. (Alfred. B. Searle. 1953).[38]

Intermittent kilns are of three types (a) Top-draught or up-draught, (b) Down-draught and (c) Horizontal-draught. Down-draught kiln may further be divided into four main classes, viz:- (i) Rectangular kilns. (ii) Round kilns (iiii) Round kilns with an upper chamber, and (iv) Round kilns with a lower chamber.

There are now two main classes of intermittent kilns. Firstly, the traditional ones. Secondly, the modern intermittent kiln. The traditional intermittent kilns, especially the up-draught bottle kilns compare so unfavourably with modern kilns as regards performance and life. Modern intermittent kilns, generally gas fired or electrically heated, have a number of points in their favour.

The traditional industrial intermittent kilns were originally all fired with solid fuel. The floor plan may be round, oval, square or rectangular. The round kiln has the advantage of low construction and maintenance cost compared with its capacity and more even temperature distribution; its snags are the uneconomical use of the site, more awkward attendance and setting, and that it is less adaptable to mechanical stoking. It is used extensively where the ware is placed in round saggars. The rectangular kiln has the advantage of full use of a site, easy transport arrangements for fuel and ware and the possibility of using suspended arches. The rectangular kiln is used for stoneware and sanitary ware that cannot be economically packed into a round one. Each kiln has one or two doorways or 'wickets' for access to place and draw the ware. The heating of kilns by burning fuels depends on establishing a draught.

2.7.1 Up-draught Kilns

In the simplest type of kiln the hot products of combustion are allowed to enter the main part of the kiln directly from the firebox, surrounded by only a low bag wall, and to make their way upwards towards the flue(s) which open(s) out of the top of the kiln. The introduction of dampers as well as the main central flue in the crown, if used skilfully, makes the fixing of an up-draught kiln much less crude than it seems. Nevertheless very much heat is allowed to go up the chimney in the gases and the fuel consumption and smoke emission is very high. Inspite of these disadvantages, most of the earthenware made in the country are still fired in up-draught kilns, which are simple in construction, easy to repair and satisfactory in results.

2.7.2 Down-draught Kilns

The most common type of kiln found in the tile factories is the down-draught country kiln. In the true down-draught kiln, flame and hot gases are to travel first to the top of the kiln and then be drawn down and away at the bottom. Strictly speaking, they should be termed "up and down-draught" as the heat has a strong upward direction before it descends. (Searle, 1953).[39] This much greater length of travel is the cause of the high efficiency of this type in the matter of fuel, and it also helps considerably in the production of a uniform temperature. In this type of kiln, firing cannot be done continuously. Only certain number of chambers are fired at a time. When one set of chamber is fired, others will be free and tiles can be loaded or unloaded. Also, in this type of kiln, the flue gas cannot be delivered from one chamber to another. Therefore, considerable heat is wasted. Besides, in this type of kiln, fire has to be started in each set of chambers separately and this is done from the sides of kiln. Down-draught kilns are very uneconomic because of the higher firewood consumption.

2.7.3 Horizontal-draught Kilns

Horizontal kilns are characterised by the use of a single fireplace. It is placed at one end of a rectangular chamber through which the hot gases move more or less horizontally to the chimney. In this type of kiln, the floor may be solid or furnished with a perforated (false) bottom through which the gases may ascend or descend according to the design of the kiln. This class of kiln is far from economical but has the advantage of a sufficiently even distribution of temperature combined with a moderate first cost. It can be chiefly confined to the production of certain classes of bricks, tiles and quarries.

2.7.4 Continuous Kilns

With the pursuit for economy in firing came the invention of the continuous kiln in which a number of chambers are so connected to a system of flues that the heat from any one of them may be conveyed to the rest or not at pleasure. The first kiln built on this principle was the famous 'Ringo fen' designed by Hoffmann in 1856. Since its first introduction many modifications have been made but the underlying principle is the same in all cases. The simple Hoffmann kiln was originally circular in shape with chimney at the centre. Now it has been modified with a more or less ring-shaped tunnel in which the goods are set, the firing being so arranged that whilst part of the kiln is being fixed, other parts may be filled or discharged, the kiln being divided into a number of chambers by means of movable partitions. The number of chambers varies from 18 to 36 with a capacity of 3000 to 5800 per chamber. "Paper dampers" or large sheets of a specially made paper are used to separate the rooms while loading. These sheets are later automatically burned down by contact with the travelling fire. The interior of the modified Hoffmann kiln now most in use consists of an endless tunnel to which access is gained by 12 to 18 doorways, the space between these being divided into 12 to 18 imaginary 'chambers', though no actual partitions exist.

The kiln proper consists of a circular or elliptical tunnel of suitable section, which receives the goods through doors placed in the circumference or outside wall and built up in the firing. The fuel is fed through apertures in the roof of the tunnel. The biggest advantage of this type of kiln is that the fire once started need not be put out and the flue gas can be regulated and directed from one chamber to the other. In this type of kilns, firing, loading and unloading of the tiles can be done in different chambers simultaneously. No heat is lost in the process since the flue can be directed to the appropriate chamber. The Hoffmann continuous kiln is the best kiln for maximum production (10,000 to 30,000 daily) of tiles and the firewood consumption is observed to be 0.4 to 0.5 M.T per thousand tiles burned. A saving of about 25 to 50 per cent of firewood is effected by employing this type of kiln. (Nayak, 1988).[40]

The Hoffmann kiln may be represented as in Figure 2(1) and 2(2). The circular form Figure 2(1) is now seldom constructed. The oblong annular form shown in Figure 2(2) is usually preferred.

Different Views of Hoffmann Kiln

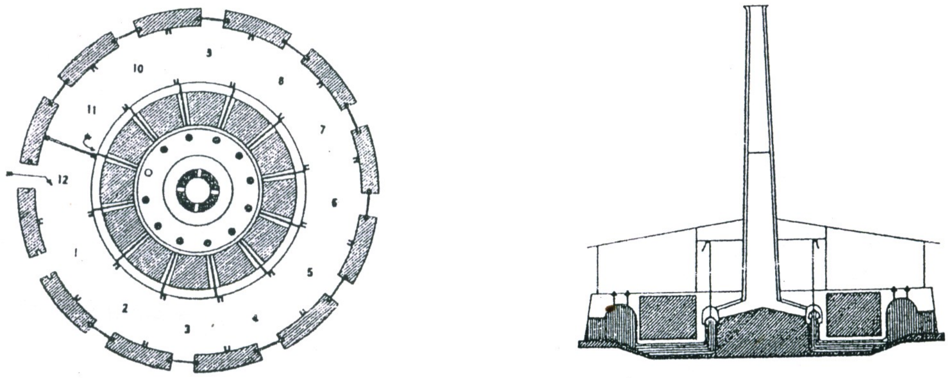


Fig:2(1) Original

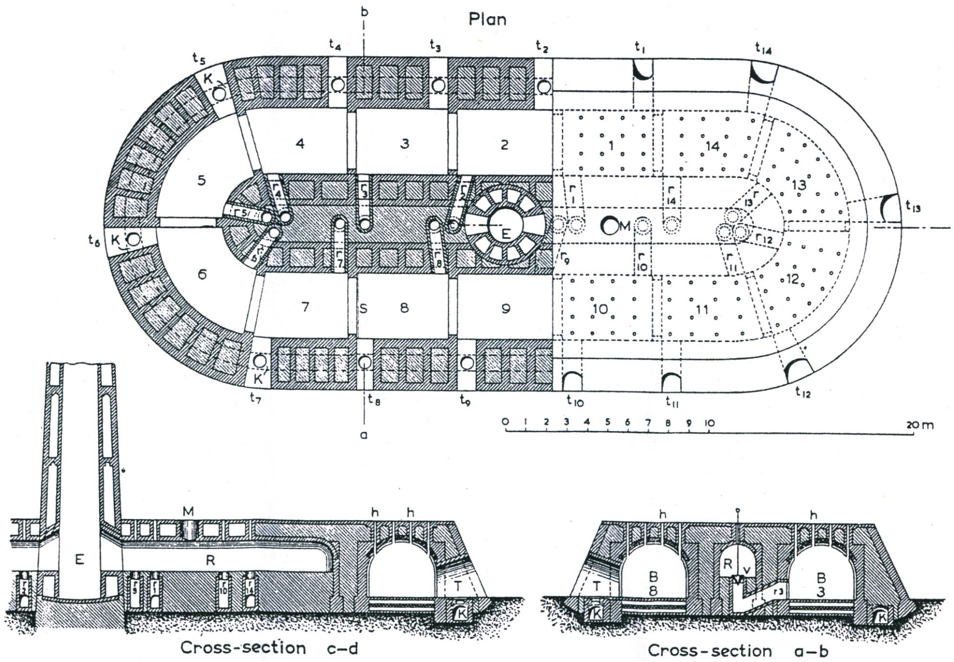


Fig:2(2) Annular

In Kerala, three types of kilns are generally found in the tile factories – intermittent, continuous and semi-continuous kilns (Nayak, 1988).[41]

2.7.5 Semi-continuous Kilns

A new type of kiln combining the advantages of continuous and down-draught kilns has also been evolved. As in the case of continuous kiln, firing can be done on a continuous basis in this type of kiln, by directing the flues from one chamber to the other. The feeding of firewood is from the sides as in the case of down-draught kiln. A chief advantage of this type of kiln over the down draught kiln is that there is economy in the use of firewood. This type of kiln is ideally suited for the medium-sized factories because it involves less capital investment for its installation.

A comparative picture of the intermittent, continuous and semi-continuous kilns in terms of fuel consumption efficiency and capacity is given in Table 2.8.

TABLE 2.8

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	0.5-07. MT/1000 tiles
ii) Coal	0.4-05 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

Note: MT= Metric Tonnes

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

2.8 Fuel

The important fuels used in clay products manufacturing are wood, coal, coke, oil and gas. Fuels used in ceramic firing are classified as solid, liquid, gaseous and electric energy (Ambigapathy, 1983).[42] It is recommended to use agricultural waste such as sawdust, paddy husk and coffee husk to get higher calorific values (Ambigapathy, 1983).[43] All these materials vary greatly in composition, so that if the maximum efficiency is to be obtained, continuous watchfulness must be kept and frequent analyses of the fuel and of its combustion products made.

Wood, at one time the principal fuel for the potter, is now only used in those cases where it is absolutely necessary to avoid any chance of the goods being spoiled by the sulphur which is always present in coal. The total calorific power of all varieties of wood is practically the same, viz; 6000 B.T.U per pound of thoroughly air-dried wood. Oak, beech, hickory and maple are usually more economical than coal.

Coal is of many varieties and of varying compositions. In choosing coal for kiln-firing, it is very important to select a fuel with a large heating power. Coal with a high percentage of sulphur compounds yield a strong odour of burning sulphur. Another disadvantage possessed by coals rich in sulphur compounds is their readiness to catch fire spontaneously. However, coal gives better economy than firewood in the long run.

Coke is of little use in the kiln, as it produces too short a flame. Coke is excellent for stoves and dryers where a long flame is not necessary. It is also more economical than coal as combustion is more complete and little or no smoke is produced.

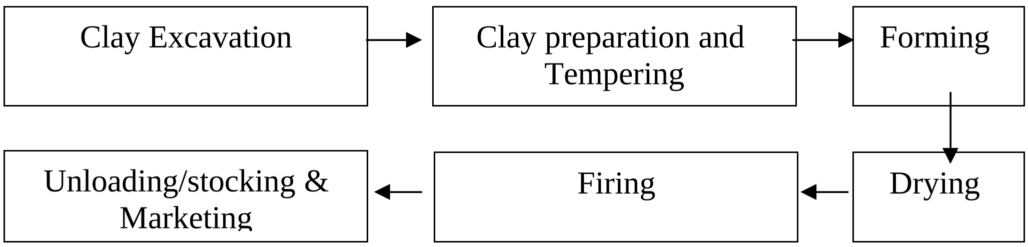
Oil is being increasingly used abroad as a fuel in connection with engines and kilns. It is not used to a large extent in this country as, at present, it has to be imported, and so is more expensive than coal or producer gas.

2.9 Sorting of Tiles

After burning in the kiln, the tiles are unloaded and sorted manually by judging the quality from the ringing sound produced when tapped by a thin iron rod. Usually tiles are sorted into different grades taking into consideration their metallic sound, colour and nature of cracks (Labour and Industrial Bureau, 1969).[44] Tiles with defects or cracks are rejected and the good tiles are graded into four or six classes. The nature of the clay used, the sophistication of the machinery employed, the type of kiln and the general efficiency of production have all a bearing on the quality of the tiles produced.

The graded tiles are removed to the stockyard and stacked separately. They are then transported to different destinations by motor lorries and railway wagons.

The production flow chart for tiles is given below



Conclusion

In the foregoing analysis, we examined the origin and growth of the tile industry in India and Kerala. The manufacturing process of tile industry is also examined. The first tile factory in India was established in 1865 and that in Kerala was set up in 1873. Tile industry in Kerala has passed through different phases, affecting all aspects of manufacturing. At present the tile industry in Kerala is mainly concentrated in three districts, viz: Kozhikode, Trichur and Ernakulam. An examination of the manufacturing process showed that preparation of clay, pressing, drying, firing and stocking are the various stages of manufacturing of tile.

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CHAPTER III

ECONOMICS OF THE TILE INDUSTRY IN KERALA

INTRODUCTION

The present chapter makes an attempt to discuss the economics of tile industry by analysing the sample units of three regions in Kerala, viz, Calicut, Trichur and Alwaye. The data base of this study represents a sample of tile industries registered with the State Directorate of Industries. The sample units were drawn from the State giving due weight for regional concentration. More than 80 per cent of the sample units were set up 100 years ago. Majority of the sample units are currently under individual proprietorship and partnership.

The methodology adopted is both descriptive and analytical. The economics of the industry is studied by a detailed examination of the capital structure, inputs used including labour, product mix, value of output, profit and value-added. Structural changes over the period of reference are discussed with the help of selected structural ratios namely, fixed capital to invested capital, fixed capital to productive capital, input-output, value-added to output, fixed capital to output, invested capital to output, value-added to invested capital, value-added to input, output-input, output-invested capital, and input-invested capital.

For convenience of analysis and presentation the summary of the chapter is organised as follows: Profile of the sample tile units is presented in Section A. In Section B an aggregate analysis of economics of the industry is given. A regional (disaggregate) analysis of economics of tile industry is presented in Section C.

SECTION A

3.1 A Brief Profile of the Sample Tile Units

In order to make a meaningful analysis of the sample units taken for this research, a brief profile of the units in terms of location, factors influencing location, form of ownership, nature of acquisition, type of kiln and average production of the sample units are examined in this section. The community, occupation, academic and technical qualification of the entrepreneurs of the sample units are also analysed to assess the factors influencing entrepreneurial capabilities.

3.1.1 Distribution of Sample Units Based on Type of Kiln Used in the Production Process

The tile industry, being a traditional industry in Kerala, makes use of different levels of technology. In the context of this study it is assumed that the level of technology is determined on the basis of the type of kilns used to burn tiles by the sample units. The level of technology used at different stages in the production process determines the quality and quantity of the product. Majority of the tile units in Kerala still depend upon the traditional technology. Tiles are burned at temperature varying from 50°c to 950°C. The kilns used for burning tiles are classified as:

(i) Single chamber down-draught type kilns, (ii) Continuous Hoffmann type kilns, and (iii) Semi-continuous kilns. Down-draught type kiln makes use of traditional technology whereas continuous type kiln depends upon modern technology and realise economies of scale in production. Semi-continuous type kiln adopts rather an intermediate technology. Table 3.1

provides a detailed analysis of the sample units based upon the type of kiln used.

TABLE 3.1

DISTRIBUTION OF SAMPLE UNITS BASED ON THE TYPE OF KILN USED

Type of Kiln	No. of Units	Per cent
Down-draught	19	45.24
Semi-continuous	13	30.95
Continuous	10	23.81
Total	42	100.00

Source: Survey Data.

Perusal of data given in Table 3.1 shows that majority of sample units (45.24 per cent) selected for the study still depend upon single chamber down-draught type kiln, whereas the units depending upon modern continuous type kiln constitute only 23.81 per cent. Another 30.95 per cent of units adopt semi-continuous type kiln for burning tiles. Hence, survey data clearly indicates that the traditional method of burning tiles exert a constraint in production and capacity utilisation aspect of tile industry.

As a corollary to the data analysed in Table 3.1, an attempt was made to find out whether there is any regional variation in the type of kilns (technology) used. A region-wise distribution of the sample units based on the type of kilns used is processed and presented in Table 3.2.

TABLE 3.2

REGION-WISE DISTRIBUTION OF
SAMPLE UNITS BASED ON THE TYPE OF KILN USED

Type of Kiln	Calicut	Trichur	Alwaye	Total
Down-draught	1 (16.67)	15 (50.00)	3 (50.00)	19 (45.24)
Semi-continuous	2 (33.33)	9 (30.00)	2 (33.33)	13 (30.95)
Continuous	3 (50.00)	6 (20.00)	1 (16.67)	10 (23.81)
Total	6 (100.00)	30 (100.00)	6 (100.00)	42 (100.00)

Source: Survey Data.

Analysis of data given in Table 3.2 clearly shows that there is regional variation with regard to the type of kilns used in the process of burning tiles. In the case of Calicut region, 50 per cent of the sample units were found depending upon modern continuous type kiln for burning tiles, whereas this percentage corresponding to Trichur and Alwaye regions were 20 per cent and 16.67 per cent respectively. In Trichur and Alwaye regions 50 per cent of the tile units still depend upon down-draught kiln. About 30 to 33 per cent of the tile units in these three regions make use of semi-continuous kilns for burning tiles. The analysis gives the inference that the Calicut region is better in terms of the level of technology or type of kiln used for burning tiles.

3.1.2 Forms of Organisation

Industrial enterprises may be organised in different forms, such as individual ownership, partnership firms, private and public limited companies (joint-stock companies) or co-operatives. The partnership firms have much larger capital than the individual firms. Their output is also much more than the individual establishment.

The region-wise distribution of sample units based on the form of organisation is presented in Table 3.3.

TABLE 3.3

REGION-WISE DISTRIBUTION OF SAMPLE UNITS BASED ON THE TYPE OF BUSINESS ORGANISATION

Form of organisation	Calicut	Trichur	Alwaye	Total
Individual Ownership	-	12 (40.00)	1 (16.67)	13 (30.95)
Partnership	2 (33.33)	15 (50.00)	3 (50.00)	20 (47.62)
Private Ltd. Company	3 (50.00)	3 (10.00)	2 (33.33)	8 (19.05)
Co-operatives	1 (16.67)	-	-	1 (2.38)
Total	6 (100.00)	30 (100.00)	6 (100.00)	42 (100.00)

Note: Figure in parenthesis indicates percentage of the total.
Source: Survey Data.

The break-up of the units in terms of organisational pattern shows that single/individual proprietorship and partnership units dominate in the organisational structure. In several cases the partnership firms consist of family members though there were significant exceptions. Single proprietorship and partnership concerns form about 78.57 per cent of the sample units. Most of the private limited companies under study were for all practical purposes manned by one or two persons who could very well be identified as entrepreneurs.

The distribution of sample units based on the form of organisation and type of kiln used is shown in Table 3.4.

Table 3.4

Technology-wise Distribution of Sample Units Based on The Form of Organisation

Form of organisation	Continuous	Semi-continuous	Down-draught	Total
Individual Ownership	1 (10.00)	3 (23.08)	9 (47.37)	13
Partnership	5 (50.00)	8 (61.54	7 (36.84)	20
Private Ltd. Company	3 (30.00)	2 (15.38)	3 (15.79)	8
Co-operatives	1 (10.00)	-	-	1
Total	10 (100.00)	13 (100.00)	19 (100.00)	42 (100.00)

Note: Figures in parenthesis indicate percentage of the total.
Source: Survey Data.

It is found from Table 3.4 that 10 per cent of continuous kilns and 23.08 per cent of semi-continuous kilns are organised as sole trades (individual ownership) whereas 50 per cent of continuous kilns and 61.54 per cent of semi-continuous kilns are organised as partnership.

3.1.3 Nature of Acquisition

The industrial units have been acquired by the sample entrepreneurs by different methods. Some of them have purchased the units from others, while some others have inherited them from their parents or relatives. There are also units which are newly started or taken on lease basis. The distribution of sample entrepreneurs based on the nature of acquisition of their units is given in Table 3.5.

Table 3.5

Distribution of Sample Units Based on Nature of Acquisition

Nature of Acquisition	No. of Units	Percentage
Purchased	15	13.72
Inherited	22	52.38
Leased	3	7.14
Newly started	2	4.76
Total	42	100.00

Source: Survey Data.

Distribution of sample units according to nature of acquisition shows that outright purchase constitutes 13.72 per cent and 52.38 per cent of sample units are inherited, whereas only 7.14 per cent are leased and only 4.76 per cent are newly started. From the above analysis it is very clear that the proportion of newly started units among the selected sample units is very low.

3.1.4 Distribution of Sample Units Based on Educational Status

Educational qualification represents the formal education received in schools and colleges. Higher educational qualifications can have a positive influence on an entrepreneur's effectiveness. The educational qualification of entrepreneurs of the sample units is presented in Table 3.6.

Table 3.6

Educational Qualification of Sample Entrepreneurs

Level of Education	Frequency	Percentage
Primary	10	23.81
Secondary	20	47.62
Graduation	8	19.05
Post-graduation	4	9.52
Total	42	100.00

Source: Field Survey Data.

Educational status of the sample entrepreneurs is considered here by classifying the level of education into four types: (a) primary, (b) secondary, (c) graduation, and (d) post-graduation. It is seen from Table 3.6 that 23.81 per cent of the sample entrepreneurs have got primary education only. Out of 42 sample entrepreneurs, 20 have secondary level education (47.62 per cent), 8 (19.05 per cent) have graduation level education and only 4 (9.52 per cent) entrepreneurs have post-graduate level education.

3.1.5 Technical Education

Some of the entrepreneurs in the sample units have technical qualification such as I.T.I or I.T.C training, engineering diploma or degree. These technical qualifications are expressed to be more specifically relevant to their industrial activity. The distribution of sample enterprises according to the technical qualification of entrepreneurs is given in Table 3.7.

TABLE 3.7

DISTRIBUTION OF SAMPLE ENTERPRISES BASED ON TECHNICAL EDUCATION

Technical Education	No. of Enterprises	Percentage
I.T.I/I.T.C.	1	2.38
Eng. Diploma	1	2.38
Eng. Degree	1	2.38
None	39	92.86
Total	42	100.00

Source: Survey Data.

Table given above reveals that most of the entrepreneurs of sample enterprises do not possess technical qualification.

To examine whether there is any link between the technical education of entrepreneurs and type of technology used by them, the distribution of sample enterprises based on technical education of entrepreneurs and type of technology is presented in Table 3.8.

TABLE 3.8

TECHNOLOGY-WISE DISTRIBUTION OF SAMPLE ENTERPRISES BASED ON TECHNICAL EDUCATION

Technical Education	Continuous	Semi-continuous	Down-draught	Total
Having Technical Education	2 (20.00)	1 (7.69)	-	3 (7.14)
Not Having Technical Education	8 (80.00)	12 (92.31)	19 (100.00)	39 (92.86)
Total	10 (100.00)	13 (100.00)	19 (100.00)	42 (100.00)

Note: Figures in parenthesis indicate percentage of the total.
Source: Survey Data.

In the case of enterprises using continuous kiln, 20 per cent entrepreneurs possess technical education. But in the case of the other two types of kiln, the proportion of entrepreneurs having technical qualification is only 7.69 per cent and zero per cent respectively. There seems to be a weak link between the type of technology and technical education of entrepreneurs as majority of entrepreneurs operating continuous type kiln lack technical education.

3.1.6 Distribution of the Sample Units Based on Occupation of Entrepreneurs

The entrepreneurs of the sample units are engaged in different occupations, such as Government services, private services and other services. The occupational status of the sample entrepreneurs is presented below.

TABLE 3.9

OCCUPATIONAL STATUS OF THE SAMPLE ENTREPRENEURS

Occupation	No. of Enterprises	Percentage
Engaged in the unit	35	83.34
Private Employment	5	11.90
Others	2	4.76
Total	42	100.00

Source: Survey Data

Table 3.9 gives the occupational background of the entrepreneurs. Nearly 83.34 per cent of the entrepreneurs are fully engaged in the unit, whereas 11.90 per cent are mainly private employees and 4.76 per cent are engaged in other occupations also.

3.1.7 Religion-wise Distribution of Entrepreneurs

Religion refers to the caste of the entrepreneurs. The major religious groups of Kerala includes Christians, Muslims and Hindus. For the purpose of the study the entire religions or castes are further divided into other backward communities (OBC), forward communities and others.

TABLE 3.10

RELIGION-WISE COMPOSITION OF ENTREPRENEURS

Community	Calicut	Trichur	Alwaye	Total
OBC (Hindu backward and Muslims)	5 (83.33)	9 (30.00)	4 (66.67)	18 (42.86)
Forward (Hindus, Christians)	1 (16.67)	6 (20.00)	2 (33.73)	9 (21.43)
Others (SC, ST and OEC)	-	15 (50.00)	-	15 (35.71)
Total	6 (100)	30 (100)	6 (100)	42 (100)

Note: Figures in parenthesis indicate percentage of the total.
Source: Survey Data

Other backward communities mainly include Hindu backward and Muslims. Forward communities include Hindu forward and Christian communities. Others mainly include Scheduled Castes, Scheduled Tribes and Other Eligible Communities.

The data reveal that 42.86 per cent of the sample entrepreneurs belong to OBC, 21.43 per cent belong to forward community and nearly 35.71 per cent belong to others. It is evident from Table 3.10 that majority of the sample enterprises are owned or managed by OBC, followed by others.

3.1.8 Location

Once the industry line is fixed, the location site of the firm immediately arises. Location of industrial unit determines whether an industry is rural or urban. Industrial units may be located in Panchayats, Municipalities or Corporations. The distribution of the sample units in each region according to their location is presented in Table 3.11.

TABLE 3.11

REGION-WISE DISTRIBUTION OF SAMPLE UNITS BASED ON LOCATION

Location	Calicut	Trichur	Alwaye	Total
Panchayat	4 (66.67)	27 (90.00)	6 (100.00)	37 (88.00)
Municipality	-	2 (6.67)	-	2 (4.76)
Corporation	2 (33.33)	1 (3.33)	-	3 (7.14)
Total	6 (100.00)	30 (100.00)	6 (100.00)	42 (100)

Note: Figures in parenthesis indicate percentage of the total.
Source: Survey Data

Table 3.11 reveals that 92.86 per cent of the total sample units are located in Panchayats and Municipalities and only 7.14 per cent are located in cities or Corporation.

3.1.9 Factors Influencing Location of the Industry

Location means the place where an industrial unit is situated. An ideal location is one of the pre-requisites of successful working of an industrial undertaking. Location decisions are generally influenced by a multiplicity of factors. The development of tile industry in Kerala was due to the influence of a number of factors such as availability of clay, cheap labour, transportation facility and historical factors. The pattern of influence of various factors on the location of sample units is presented in Table 3.12.

TABLE 3.12

DISTRIBUTION OF SAMPLE UNITS AS PER LOCATION CONSIDERATION

Reasons	No. of Units
Cheap labour	2 (4.76)
Availability of raw-materials	34 (80.96)
Domestic reasons	3 (7.14)
Availability of Infrastructure facilities	1 (2.38)
Miscellaneous	2 (4.76)
Total	42 (100.00)

Note: Figures in parenthesis indicate percentage of the total.
Source: Survey Data

The Table reveals the various factors which influence the location of tile units in Kerala. The most important single reason reported about the choice of location was the availability of raw-materials, especially clay and firewood.

3.1.10 Distribution of Sample Units Based on Benefits Provided

We also examine how far the sample entrepreneurs in Kerala provide various welfare schemes to the workers. Table 3.13 gives the distribution of the sample units based on the benefits provided. It could be seen from the Table that only a few companies, especially in Calicut region, provided all the benefits such as ESI, Provident Fund, Bonus and Gratuity to the workers.

TABLE 3.13

DISTRIBUTION OF SAMPLE UNITS BASED ON BENEFITS PROVIDED 1997-2006

Benefits Provided	Calicut	Trichur	Alwaye	Total
1. Units not giving any welfare facilities	-	-	-	-
2. Bonus only	-	14 (46.67)	1 (16.67)	15 (35.71)
3. Bonus & ESI	-	6 (20.00)	4 (66.66)	10 (23.81)
4. ESI, Production incentives, Gratuity, P.F. and Bonus	5 (83.33)	-	-	5 (11.90)
5. P.F. and ESI	-	4 (13.33)	1 (16.67)	5 (11.90)
6. ESI, PF and Gratuity	1 (16.67)	6 (20.00)	-	7 (16.67)
Total	6 (100.00)	30 (100.00)	6 (100.00)	42 (100.00)

Note: Figures in parenthesis indicate percentage of the total.
Source: Survey Data

The Table reveals that almost all units provide benefits in greater or lesser degree. However, sample units in Calicut region provide greater amount of benefits to its employees compared to similar units in other regions. 83 per cent of the total units in Calicut region provide ESI, Production incentives, gratuity, P.F. and bonus to its workers. Welfare facilities are relatively lower in Trichur and Alwaye regions. Only very few firms provide non-wage benefits in Kerala.

3.11 Average Production

The finished products of tile manufacturing units include roofing tiles, flooring tiles, ridges, decorative tiles, hourdis and allied products. The traditional technology-based units produce roofing tiles and ridges only. The modern tile units make use of idle capacity to manufacture decorative and ceiling tiles.

The roofing tiles manufactured by the sample units is presented in Table 3.14 below.

TABLE 3.14

DISTRIBUTION OF SAMPLE UNITS
BASED ON ANNUAL PRODUCTION OF ROOFING TILES

Annual Production (in numbers)	No. of units	Percentage
Less than 10 lakh	13	30.96
10 – 20 lakh	8	19.05
20 – 30 lakh	6	14.29
30 – 40 lakh	5	11.90
40 – 50 lakh	5	11.90
Above 50 lakh	5	11.90
Total	42	100.00

Source: Survey Data

The Table reveals the fact that 30.1 percentage of the establishments have production of less than 10 lakh and nearly 20 percentage of the establishments have production of 10 lakh plus but less than 20 lakh. Establishments producing roofing tiles above 50 lakh come to about 11.90 per cent. Annual production of roofing tiles is comparatively high in Calicut region.

SECTION B

3.2 Economics of Tile Industry - An Aggregate Analysis

Kerala is considered the home of tile industry in India. The roofing tiles manufactured in Kerala were of international standard. Kerala's commanding role in tile production began to dwindle after 1965. The century old tile industry faces a number of severe problems. In order to solve these problems effectively, 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 random sample of factories which are spread over three regions, namely, Calicut, Trichur and Alwaye. The survey results of the data collected from 42 establishments are presented here. The data were analysed to obtain the various economic parameters such as fixed, working and productive capital; output, input, wages, value-added and their inter relationships during the period from 1996-97 to 2005-06. The various technical coefficients, namely, input-output ratio, value-added-output ratio and fixed capital-output ratio are also computed and analysed.

3.2.1 Capital Structure

Capital structure of an enterprise includes fixed capital (FC), physical working capital (PWC), working capital (WC), invested capital (IC), and productive capital (PC).

Table 3.15 gives the structural composition of the fixed capital for the period 1996-97 to 2005-06. The components of the fixed capital include land, buildings and plant and machinery. The fixed capital of the entire sample units came to Rs.2190.38 lakh in 1996-97. Of this, 54.32 per cent was constituted by land, buildings shared 27.54 per cent and the rest i.e. 18.14 per cent was constituted by plant and machinery. By the end of the year 2005-06, fixed capital increased to Rs.3363.25 lakh recording 53.55 per cent increase over the reference period. During 2005-06, the share of land in total capital investment was 61.70 per cent whereas the shares of the other two items i.e., buildings and plant and machinery were 21.48 per cent and 16.82 per cent respectively. This shows an improvement in the share of land in fixed capital in 2005-06 compared to 1996-97. This was primarily due to appreciation in land value.

Table 3.16 gives the information pertaining to physical working capital and working capital. Physical working capital comprises material stock, stock of semi-finished goods and stock of finished goods. Working capital consists of physical working capital plus cash and net balance of the amount receivable and amount payable.

The stock of materials of the sample units was Rs 353.00 lakh in 1996-97, which rose to Rs.574.09 lakh in 2005-06, recording an increase of 62.63 per cent. The value of semi-finished goods, which was Rs.170.55 lakh in 1996-97 rose to Rs.251.08 lakh in 2005-06, registering an increase of 47.21 per cent. During the 2005-06 period the value of finished goods which was Rs.251.46 lakh in 1996-97 increased to Rs.262.46 lakh, recording a meagre increase of 4.37 per cent only. From this, it is clear that the sample units 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 increase in the quantity of production. In the same manner, large quantities of firewood also have to be stocked.

TABLE 3.15

COMPOSITION OF FIXED CAPITAL OF THE SAMPLE UNITS IN KERALA DURING 1996-97 TO 2005-06

(Figures in Rs . lakh)

YEAR	LAND	BUILDINGS	PLANT & MACHINERY	FIXED CAPITAL	FC PER UNIT
(1)	(2)	(3)	(4)	(5)	(6)
1996-1997	1189.71 (54.32)	603.30 (27.54)	397.37 (18.14)	2190.38 (100.00)	52.15
1997-1998	1219.22 (54.72)	599.62 (26.91)	409.07 (18.36)	2227.91 (100.00)	53.05
1998-1999	1242.90 (53.36)	628.39 (26.98)	457.92 (19.66)	2329.21 (100.00)	55.46
1999-2000	1315.24 (53.93)	639.75 (26.23)	483.77 (19.84)	2438.76 (100.00)	58.07
2000-2001	1446.32 (55.55)	655.89 (25.19)	501.35 (19.26)	2603.56 (100.00)	61.99
2001-2002	1534.01 (56.56)	668.33 (24.63)	510.08 (18.81)	2712.42 (100.00)	64.58
2002-2003	1648.17 (57.73)	687.03 (24.06)	519.80 (18.21)	2855.00 (100.00)	67.98
2003-2004	1777.80 (58.91)	689.24 (22.84)	550.64 (18.25)	3017.68 (100.00)	71.85
2004-2005	1919.47 (60.33)	704.49 (22.14)	557.59 (17.53)	3181.55 (100.00)	75.75
2005-2006	2075.07 (61.70)	722.32 (21.48)	565.86 (16.82)	3363.25 (100.00)	80.08
Percentage change over the	74.41	19.73	42.40	53.55	53.40

period					

Note: Figures in parenthesis indicate percentage of the total.
Source: Survey Data

Table 3.16

Composition Of Physical Working Capital And Working Capital of The Sample Units In Kerala During 1996-97 to 2005-06

(Figures in Rs. lakh)

YEAR	MATERIALS	SEMI-FINISHED	FINISHED	PWC (2+3+4)	CASH	(R-P)*	WC 5+6+7	PWC PER UNIT	WC PER UNIT
1	2	3	4	5	6	7	8	9	10
1996-1997	353.00 (45.55)	170.55 (22.01)	251.46 (32.45)	775.01 (100)	18.27	-117.20	676.08	18.45	16.10
1997-1998	394.87 (47.00)	172.54 (20.54)	272.79 (32.47)	840.20 (100)	18.36	-116.17	742.39	20.00	17.68
1998-1999	360.43 (44.29)	190.78 (23.45)	262.51 (32.26)	813.72 (100)	18.05	-190.69	641.08	19.37	15.26
1999-2000	469.62 (48.30)	194.15 (19.97)	308.57 (31.73)	972.34 (100)	19.09	-172.93	818.50	23.15	19.49
2000-2001	381.70 (38.28)	193.95 (19.45)	421.48 (42.27)	997.13 (100)	16.03	-277.07	736.09	23.74	17.53
2001-2002	454.33 (41.83)	208.64 (19.21)	423.04 (38.95)	1086.01 (100)	17.07	-204.07	899.07	25.86	21.41
2002-2003	451.15 (43.32)	220.27 (21.15)	369.93 (35.52)	1041.35 (100)	17.57	-145.94	912.98	24.79	21.74
2003-2004	490.23 (46.22)	249.00 (23.48)	321.43 (30.30)	1060.66 (100)	20.76	-195.90	885.52	25.25	21.08
2004-2005	570.91 (51.26)	249.65 (22.42)	293.15 (26.32)	1113.71 (100)	19.09	-194.42	938.38	26.52	22.34
2005-2006	574.09 (52.78)	251.08 (23.09)	262.46 (24.13)	1087.63 (100)	23.85	-204.59	906.89	25.90	21.59
Percentage change over the period	62.63	47.21	4.37	40.33	30.5	74.5	34.13	40.3	34.09

Figures in parenthesis give percentage composition of physical working capital
* (R-P) = Receipts - Payments

Source: Survey Data

Analysis of the composition of working capital revealed that the sample units raised enough working capital by loan and advances for meeting the day-to-day expenditure. The cash component recorded an appreciable increase in 2003-04 and 2005-06 compared to the remaining years during the period of reference.

A detailed analysis of another component i.e., invested capital is given in Table 3.17. Invested capital is the sum total of the fixed capital and the physical working capital. Table 3.17 also includes the details of the productive capital which is the summation of the total fixed capital and working capital. The invested capital which was only Rs.2965.39 lakh in 1996-97 rose to Rs.4450.88 lakh in 2005-06, recording an increase of 50.09 per cent. Of this, major share came from fixed capital and this is due to the tremendous increase in the market value of land.

The productive capital employed by the sample units has progressively increased over the reference period. In 1996-97, the share of productive capital amounted to Rs. 2866.46 lakh which increased to Rs. 4270.14 lakh in 2005-06. Over the years, the share of the working capital increased from Rs. 676.08 lakh to Rs. 906.89 lakh. The share of productive capital recorded an increase of 48.97 per cent over the reference period. During this period the share of working capital marked an increase of 34.14 per cent.

An attempt has been made in this context to examine the average capital requirements of sample units. (Table 3.17 cols 7 & 8). The productive capital per factory at the close of the year 1996-97 was found to be Rs. 68.25 lakh, which comprises Rs.52.15 lakh as fixed capital and Rs. 16.10 lakh as working capital. By the end of the reference period, i.e., 2005-06, the productive capital per factory rose to Rs.101.67 lakh, consisting of Rs.80.08 lakh as fixed capital and Rs. 21.59 lakh as working capital.

In terms of percentage, over the reference period, the fixed capital per factory increased by 53.40 per cent, while the working capital per factory increased by 34.09 per cent. In the same way, invested capital per factory rose from Rs.70.60 lakh in 1996-97 to Rs.105.97 lakh in 2005-2006, recording an increase of 50.09 per cent.

From the above discussion, it can be seen that in capital structure, the share of the fixed capital is relatively high as compared to the share of the working capital. This may be due to the much greater appreciation in the value of land, and plant and machinery.

TABLE 3.17

DETAILS OF PRODUCTIVE CAPITAL AND INVESTED CAPITAL OF THE SAMPLE UNITS IN KERALA DURING 1996-97 TO 2005-06

(Figures in Rs. lakhs)

YEAR	FC	PWC	WC	PC (2)+(4)	IC (2)+(3)	PC PER UNIT	IC PER UNIT
1	2	3	4	5	6	7	8
1996-1997	2190.38	775.01	676.08	2866.46	2965.39	68.25	70.60
1997-1998	2227.91	840.20	742.39	2970.30	3068.11	70.72	73.05
1998-1999	2329.21	813.72	641.08	2970.29	3142.93	70.72	74.83
1999-2000	2438.76	972.34	818.50	3257.26	3411.10	77.55	81.22
2000-2001	2603.56	997.13	736.09	3339.65	3600.69	79.52	85.73
2001-2002	2712.42	1086.01	899.07	3611.49	3798.43	85.99	90.44
2002-2003	2855.00	1041.35	912.98	3767.98	3896.35	89.71	92.77
2003-2004	3017.68	1060.66	885.52	3903.20	4078.34	92.93	97.10
2004-2005	3181.55	1113.71	938.38	4119.93	4295.26	98.09	102.27
2005-2006	3363.25	1087.63	906.89	4270.14	4450.88	101.67	105.97

Source: Survey Data

3.2.2 Inputs

The major inputs of the tile industry are clay, firewood, electricity, oil, sawdust and others which include sand, basket and so on. The details of the inputs consumed are presented in Table 3.18. Inputs purchased are distinguished from inputs consumed by making stock-adjustment. Stock-adjustment is defined as opening stock minus closing stock. In this case inputs consumed equal opening stock of inputs plus purchase of inputs during the current year minus closing stock of inputs.

(a) Clay

Clays are, by far, the raw-material most extensively used in the manufacture of ceramic articles. Clays account for about 43 per cent of the total value of the raw-materials consumed by the sample tile factories. The sample units altogether purchased clay worth Rs. 398.26 lakh in 1996-97 which increased to Rs. 555.45 lakh in 2005-06. The per unit purchase of clay in 1996-97 was valued at Rs. 9.48 lakh which increased to Rs. 13.22 lakh in 2005-06. This increase in value may be attributed to two factors, namely, increase in the amount of clay used and the enhancement in the price of clay.

(b) Firewood

Another important input used in the tile factory is firewood. The wood is used for burning the tiles in the kiln. Firewood accounts for about 38 to 42 per cent of the total input cost of tile units. One of the most important reasons for this high level of input cost is the relative scarcity of firewood. The sample units purchased firewood worth Rs. 389.29 lakh in 1996-97 ,which rose to Rs. 486.20 lakh in 2005-06. It shows that there has taken place 24.89 per cent increase in the cost of firewood during the reference period. The per unit purchase of firewood came to Rs. 9.26 lakh in 1996-97, which rose to Rs. 11.57 lakh in 2005-06.

(c) Electricity and Oil

The share of electricity purchased is found to have increased gradually from Rs. 74.29 lakh in 1996-97 to Rs. 134.91 lakh in 2005-06. There has taken place 81.59 per cent increase in the cost of electricity during the reference period. The value of per unit purchase of electricity was Rs. 1.76 lakh in 1995-96 which rose to Rs. 3.21 lakh in 2005-06.

The share of oil purchased is found to have increased from Rs. 47.62 lakh in 1996-97 to Rs.64.52 lakh in 2005-06. During the reference period, cost of oil purchased recorded 35.48 per cent increase. The value of oil purchased per unit came to the tune of Rs. 1.13 lakh in 1996-97, which rose to Rs. 1.54 lakh in 2005-06. Both the electricity and oil purchased together accounted for roughly 13 to 16 per cent of the total inputs purchased. The share of electricity and lubricating oil in the value of total inputs consumed has slightly increased from 13.21 per cent in 1996-97 to 15.85 per cent in 2005-06.

From the above analysis one can construe that nearly 82 per cent of the total inputs purchased is composed of clay and firewood. This pinpoints the urgent need of bringing down the cost of inputs purchased either by controlling the rise in price or by increasing the supply of critical inputs like clay and firewood. These two measures are not within the reach of the firms. Therefore, alternative sources of fuel should be excavated and at the same time tile units should develop alternative products which require lesser quantity of clay.

TABLE 3.18

COMPOSITION OF INPUTS CONSUMED BY THE SAMPLE UNITS IN KERALA DURING 1996-97 TO 2005-06

(Figures in Rs. lakh)

YEAR	CLAY	FIRE WOOD	OIL	ELECTRI CITY	SHELL	OTHERS	TOTAL INPUTS PURCHASED	INPUTS CONSUMED (IC)	IC PER UNIT
1	2	3	4	5	6	7	8	9	10
1996-1997	398.26 (43.14)	389.29 (42.17)	47.62 (5.15)	74.29 (8.05)	2.30 (0.25)	11.46 (1.24)	923.22 (100)	925.79	22.04
1997-1998	407.73 (44.24)	363.59 (39.45)	49.77 (5.40)	86.22 (9.35)	2.42 (0.26)	11.93 (1.29)	921.66 (100)	893.24	21.27
1998-1999	410.47 (44.37)	372.74 (40.29)	42.62 (4.61)	86.51 (9.35)	2.36 (0.26)	10.41 (1.13)	925.11 (100)	854.77	20.35
1999-2000	466.99 (43.34)	436.76 (40.54)	44.24 (4.11)	113.96 (10.58)	2.50 (0.23)	12.94 (1.20)	1077.39 (100)	1011.42	24.08
2000-2001	422.69 (41.42)	413.62 (40.53)	49.80 (4.88)	118.50 (11.61)	2.67 (0.26)	13.31 (1.30)	1020.59 (100)	845.64	20.13
2001-2002	454.22 (43.04)	404.74 (38.35)	51.65 (4.89)	127.96 (12.12)	2.75 (0.26)	14.05 (1.33)	1055.37 (100)	1009.44	24.03
2002-2003	497.38 (43.06)	460.59 (39.88)	55.40 (4.80)	126.33 (10.94)	3.29 (0.28)	12.04 (1.04)	1155.03 (100)	1218.01	29.00
2003-2004	518.63 (41.29)	523.78 (41.70)	58.94 (4.69)	138.69 (11.04)	3.75 (0.30)	12.39 (0.99)	1256.18 (100)	1220.46	29.06
2004-2005	545.61 (43.31)	486.13 (38.59)	64.17 (5.09)	147.29 (11.69)	4.31 (0.34)	12.29 (0.98)	1259.80 (100)	1285.41	30.60
2005-2006	555.45 (44.13)	486.20 (38.63)	64.52 (5.13)	134.91 (10.72)	4.35 (0.35)	13.16 (1.05)	1258.59 (100)	1308.97	31.17

Note: (1) Figures in parenthesis indicate percentage of the total input purchased.
(2) Necessary stock adjustments are made.

Source: Survey Data

3.2.3 Cost of Production

Cost of production is a highly useful tool to assess the present position of tile factories. The cost of production is the sum total of the input cost, wages and salaries and other establishment costs (Table 3.19). An analysis of cost of production shows that total cost of production amounted to Rs. 1929.79 lakh in 1996-97 which comprises inputs consumed worth Rs. 925.79 lakh (47.97 per cent), wages and salaries valued at Rs. 879.19 lakh (45.56 per cent) and other establishment costs amounted to Rs. 124.86 lakh (6.47 per cent). During the end of the reference period, i.e. 2005-06, the total cost increased to Rs. 2457.75 lakh which is being constituted by inputs consumed worth Rs. 1308.97 (53.26 per cent), wages and salaries worth Rs.989.00 lakh (40.24 per cent) and other establishment costs worth Rs. 159.78 lakh (6.50 per cent). Over the period of reference total cost of production increased by 27.35 per cent. A close examination of the components of total cost of production makes it clear that during the reference period, rate of increase in wages and salaries was low in tile factories compared to the rate of increase in other costs such as raw-material cost, particularly clay and firewood.

TABLE 3.19

COST OF PRODUCTION OF THE SAMPLE UNITS IN KERALA DURING 1996-97 TO 2005-06

(Figures in Rs. lakh)

YEAR	INPUTS CONSUMED	WAGES AND SALARIES	OTHER ESTABLISHMENT COST	TOTAL COST (2+3+4)	TOTAL COST PER UNIT
1	2	3	4	5	6
1996-1997	925.79 (47.97)	879.14 (45.56)	124.86 (6.47)	1929.79 (100.00)	45.95
1997-1998	893.24 (58.33)	489.29 (31.95)	148.90 (9.72)	1531.43 (100.00)	36.46
1998-1999	854.77 (43.50)	961.66 (48.93)	148.76 (7.57)	1965.19 (100.00)	46.79
1999-2000	1011.42 (46.31)	1020.60 (46.74)	151.80 (6.95)	2183.82 (100.00)	52.00
2000-2001	845.63 (44.25)	904.99 (47.35)	160.44 (8.40)	1911.07 (100.00)	45.50
2001-2002	1009.44 (45.42)	1053.66 (47.40)	159.58 (7.18)	2222.68 (100.00)	52.92
2002-2003	1218.01 (53.12)	925.59 (40.36)	149.52 (6.52)	2293.12 (100.00)	54.60
2003-2004	1220.46 (56.56)	782.38 (36.25)	155.20 (7.19)	2158.04 (10.00)	51.39
2004-2005	1285.41 (53.26)	962.85 (39.90)	165.00 (6.84)	2413.26 (100.00)	57.46
2005-2006	1308.97 (53.26)	989.00 (40.24)	159.78 (6.50)	2457.75 (100.00)	58.52

Note: Figures in parenthesis give percentage of the total cost

Source: Compiled from the Survey Data

3.2.4 Products

Tile factories manufacture a variety of clay products ranging from roofing tiles, ridges, flooring tiles, hourdis, ceiling tiles and bricks to jallies (Figure 3.1). Some of the tile factories specialize in the manufacture of a few selected products with the intention of catering to local demands. Table 3.20 given below exhibits the composition of the main products produced by the sample units during the reference period. The Table makes it clear that the value of production has increased from Rs.2025.36 lakh in 1996-97 to Rs. 2775.35 lakh in 2005-06. Among the multifarious products, roofing tiles had preponderance. The share of roofing tiles in terms of total value of production had gone up from 67.98 per cent in 1996-97 to 71.89 per cent in 2001-02 but declined slightly to 65.38 per cent in 2005-06. It is interesting to note that even today the product mix is in favour of roofing tiles, even though the demand for roofing tiles is stagnant. Ridges secured the second position among the product mix by contributing around 10 to 15 per cent during the reference period. The per unit output was Rs. 48.29 lakh in 1996-97 which rose to Rs. 65.98 lakh in 2005-06; the percentage growth being 36.63, whereas the cost of production per unit increased by 27.36 per cent over the same period. This is a clear indication that the rise in the price of inputs and labour were much lower than the rise in the market value of output. This again pinpoints the trend in productivity and profitability of the sample units. The magnitude of change in profitability is shown in Table 3.21.

TABLE 3.20

COMPOSITION OF PRODUCTS PRODUCED BY THE SAMPLE UNITS IN KERALA DURING 1996-97 – 2005-06

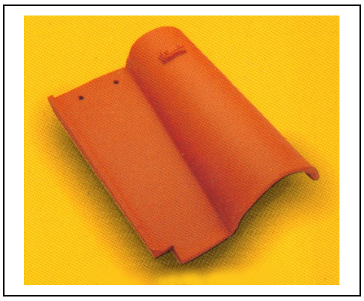
(Figures in Rs. lakhs)

YEAR	ROOF TILES	RIDGES	FLOOR TILES	HOURDIS	BRICK	CEILING TILES	JALLIES	OTHERS	TOTAL PRODU-CTION	TOTAL OUT PUT	OUTPUT PER UNIT
1	2	3	4	5	6	7	8	9	10	11	12
1996-1997	1376.88 (67.98)	242.77 (11.99)	162.36 (8.02)	55.00 (2.72)	69.72 (3.44)	41.98 (2.07)	14.50 (0.72)	62.15 (3.06)	2025.36 (100)	2028.26	48.29
1997-1998	1291.46 (70.25)	180.77 (9.83)	103.88 (5.65)	68.46 (3.72)	70.60 (3.84)	45.44 (2.47)	14.80 (0.80)	63.03 (3.43)	1838.44 (100)	1843.39	43.89
1998-1999	1391.25 (66.99)	287.67 (13.85)	178.02 (8.57)	45.08 (2.17)	51.87 (2.50)	46.46 (2.24)	15.50 (0.75)	60.89 (2.93)	2076.74 (100)	2093.14	49.83
1999-2000	1500.83 (64.27)	342.22 (14.65)	206.34 (8.84)	22.06 (0.94)	121.01 (5.18)	71.32 (3.05)	16.00 (0.69)	55.50 (2.38)	2335.28 (100)	2364.43	56.30
2000-2001	1630.74 (69.82)	255.10 (10.92)	157.54 (6.75)	29.68 (1.27)	133.99 (5.74)	50.04 (2.14)	16.60 (0.71)	61.65 (2.64)	2335.34 (100)	2358.36	56.15
2001-2002	1723.37 (71.89)	254.20 (10.60)	157.67 (6.58)	17.80 (0.74)	112.04 (4.67)	54.02 (2.25)	17.20 (0.73)	60.90 (2.54)	2397.20 (100)	2414.74	57.49
2002-2003	1727.78 (69.53)	315.16 (12.68)	177.26 (7.13)	17.78 (0.72)	103.38 (4.18)	72.50 (2.91)	10.80 (0.43)	60.35 (2..42)	2485.01 (100)	2569.71	61.18
2003-2004	1794.71 (67.02)	283.47 (10.58)	176.86 (6.60)	16.32 (0.61)	250.90 (9.37)	80.30 (3.00)	11.00 (0.42)	64.40 (2.40)	2677.96 (100)	2761.68	65.75
2004-2005	1808.04 (65.36)	278.09 (10.05)	177.92 (6.43)	16.72 (0.60)	330.18 (11.93)	76.61 (2.77)	11.80 (0.43)	66.76 (2.42)	2766.12 (100)	2825.97	67.29
2005-2006	1814.56 (65.38)	273.99 (9.88)	225.78 (8.14)	16.20 (0.58)	299.20 (10.78)	73.12 (2.63)	12.00 (0.43)	60.50 (2.18)	2775.35 (100)	2770.95	65.98

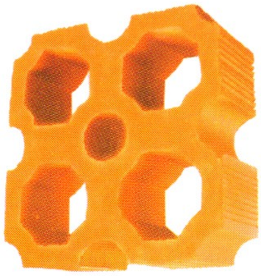
Note: (1) Figures in parenthesis give percentage of the total production (2) Necessary stock adjustments are made.
Source: Survey Data

FIGURE 3.1 - VARIOUS TILE PRODUCTS

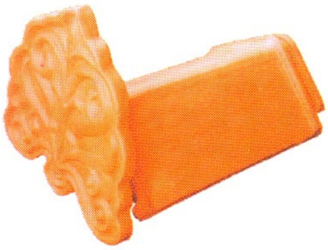
Roofing Tile



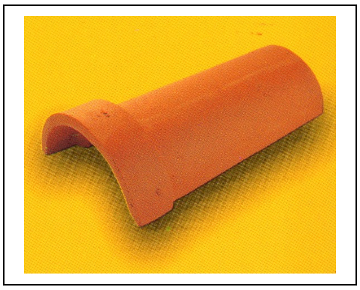
Taylor Tile



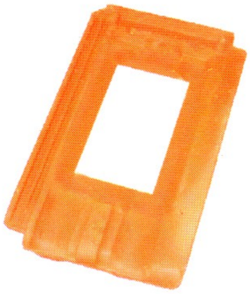
Ventilator Brick



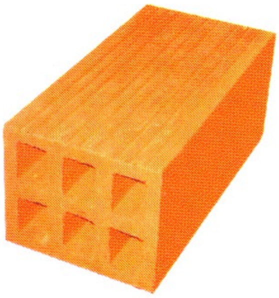
Decorative Ridge



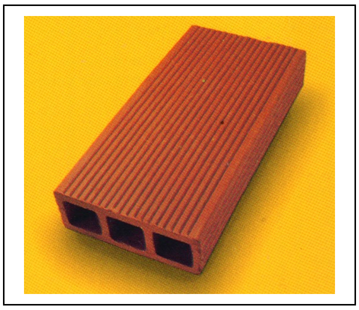
Taylor Ridge



Sky Light (Glass Tile)



Hollow Brick



Hourdis

Ventilator Tile

Ridge Tie

Ceiling Tiles

Dome

3.2.5 Gross Profit

The very existence of an industry depends on the margin of profit earned. The sample units together earned profit worth Rs. 98.47 lakh in 1996-97, which increased to Rs. 313.20 lakh in 2005-06 (Table 3.21). During the reference period gross profit per unit increased from Rs. 2.34 lakh in 1996-97 to Rs. 7.46 lakh in 2005-06. The amount of profit earned by the sample units has shown a fluctuating character during the reference period. It is evident from the analysis that the tile factories in the State are susceptible to periodic fluctuations and these fluctuations are attributed to the following factors: (i) Fluctuations in sales, (ii) Fluctuations in input costs, and (iii) Fluctuations in selling price.

TABLE 3.21

GROSS PROFIT (OUTPUT COST) AND VALUE-ADDED BY THE SAMPLE UNITS IN KERALA DURING 1996-97 TO 2005-06

(Figures Rs. lakh)

YEAR	INPUT	OUTPUT	TOTAL COST	GROSS PROFIT (3)-(4)	GROSS PROFIT /UNIT	VALUE-ADDED (3)-(2)	VALUE ADDED /UNIT
1	2	3	4	5	6	7	8
1996-1997	925.79	2028.26	1929.79	98.47	2.34	1102.47	26.25
1997-1998	893.24	1843.39	1531.43	311.96	7.43	950.15	22.62
1998-1999	854.77	2093.14	1965.19	126.95	3.04	1238.37	29.67
1999-2000	1011.42	2364.43	2183.82	180.61	4.30	1353.01	32.21
2000-2001	845.64	2358.36	1911.07	447.29	10.65	1512.72	36.02
2001-2002	1009.44	2414.74	2222.68	192.06	4.57	1405.30	33.46
2002-2003	1218.01	2569.71	2293.12	276.59	6.59	1351.70	32.18
2003-2004	1220.46	2761.68	2158.04	603.64	14.37	1541.22	36.70
2004-2005	1285.41	2825.97	2413.26	412.71	9.83	1540.56	36.68
2005-2006	1308.97	2770.95	2457.75	313.20	7.46	1461.98	34.81

Source: Compiled from Survey Data

3.2.6 Value - added

Value-added is a measure of the relative importance of the industrial sector in the State's 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 other words, value-added is the sum total of factor incomes such as wages, interest, rent and profit. The tile industry, being a highly labour intensive industry, the relative share of value-added will be more. A comparative analysis of the value-added by the sample units clearly shows that in 1996-97, the sample units enjoyed Rs. 1102.47 lakh as value-added which rose to Rs. 1461.98 lakh in 2005-06. During this period value-added per unit increased from Rs. 26.25 lakh to Rs. 34.81 lakh.

The fluctuations in value-added may be due to the variations in employing workers, depending on the nature of work in the factories in accordance with time and season. During 1996-97, the share of wages and salaries to value-added was 79.94 per cent which came down to 67.64 per cent in 2005-06.

3.2.7 Employment and Emoluments

A perusal of persons employed in the sample units in Kerala reveals that (Table 3.22, Col. 8) during 1996-97, it was 4057 which decreased to 2724 in 2005-06; making 32.86 per cent decrease over the reference period. Maximum number of workers was employed in 1996-97 (4057). The per unit employment was 97 in 1996-97 and 65 in 2005-06. This decline in employment can be interpreted as withdrawal of workers from this traditional industry sector to other occupations on account of unattractive wage structure in tile factories. During the beginning of the reference period i.e. 1996-97, a sum of Rs. 879.14 lakh was paid as wages and salaries (Table 3.19 Col. 3).

By the end of the reference period, i.e 2005-06, this amount came to Rs. 989.00 lakh (Table 3.19, Col. 3). The workers also enjoyed other benefits like bonus, E.S.I., and so on.

3.2.8 Structural Ratios

Structural ratios can be put to considerable use for fixation of targets and for making comparisons. But care should be taken to see that the available data on comparative co-efficients are reliable. Otherwise, it may be leading us to false conclusions. In the case of tile factories, there is paucity of reliable statistical data so that there is every possibility of minor error creeping into the ratios calculated.

An attempt has been made in this section to calculate the important structural ratios of the tile industry for the entire reference period and also to examine whether any major shift has taken place in these ratios over the years. The most important ratios employed (Table 3.23) for the analysis are: (i) Fixed capital - Invested capital ratio, (ii) Fixed capital - Productive capital ratio, (iii) Fixed capital - Output ratio, (iv) Invested capital - Output ratio, (v) Input - Output ratio, (vi) Input - Invested capital ratio, (vii) Output - Input ratio, (viii) Output - Invested capital ratio, (ix) Value-added - Output ratio, (x) Value-added - Input ratio and (xi) Value-added - Invested capital ratio.

TABLE 3.22

SELECTED AGGREGATES OF THE SAMPLE UNITS IN KERALA DURING 1996-67 TO 2005-06

(Figures in Rs. lakh)

YEAR	FC	IC	PC	INPUT	OUTPUT	VA	WORKER	SELECTED AGGREGATES PER UNIT						
								FC	IC	PC	INPUT	OUTPUT	VA	WORKER
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1996-1997	2190.38	2965.39	2866.46	925.79	2028.26	1102.47	4057	52.15	70.60	68.25	22.04	48.29	26.25	97
1997-1998	2227.91	3068.11	2970.30	893.24	1843.39	950.15	4045	53.05	73.05	70.72	21.27	43.89	22.62	96
1998-1999	2329.21	3142.93	2970.29	854.77	2093.14	1238.37	3900	55.46	74.83	70.72	20.35	49.83	29.67	93
1999-2000	2438.76	3411.10	3257.26	1011.42	2364.43	1353.01	3735	58.07	81.23	77.55	24.08	56.30	32.21	89
2000-2001	2603.56	3600.69	3339.65	845.64	2358.36	1512.72	3552	61.99	85.73	79.52	20.13	56.15	36.02	84
2001-2002	2712.42	3798.43	3611.49	1009.44	2414.74	1405.30	3178	64.58	90.44	85.99	24.03	57.49	33.46	76
2002-2003	2855.00	3896.35	3767.98	1218.11	2569.71	1351.70	3089	67.98	92.77	89.71	29.00	61.18	32.18	74
2003-2004	3017.68	4078.34	3903.20	1220.46	2761.68	1541.22	2982	71.85	97.10	92.93	29.07	65.75	36.70	71
2004-2005	3181.55	4295.26	4119.93	1285.41	2825.97	1540.56	2792	75.75	102.27	98.09	30.60	67.29	36.68	66
2005-2006	3363.25	4450.88	4270.14	1308.97	2770.95	1461.98	2724	80.08	105.97	101.67	31.17	65.98	34.81	65

Note: Workers in numbers
Source: Compiled from Survey Data

At the beginning of the reference period, the fixed capital-invested capital ratio stood at 0.74 and the fixed capital-productive capital ratio at 0.76. The relatively low ratio reflects the high labour intensity of the industry. These ratios have remained more or less constant during the later years. 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 raw-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 money terms. The analysis of the ratios computed for various years clearly revealed the fact that the cost of inputs had shown a persistent increase. The input-output ratio which was 0.46 in 1996-97 rose to 0.47 in 2005-06. During the same period output-input ratios were 2.19 and 2.12 respectively. Input-output ratio had shown only a marginal increase whereas output-input ratio had shown a marginal decline during the period under study. Inputs are related to invested capital also. This ratio varied between 0.31 in 1996-97 and 0.29 in 2005-06.

Value-added is another important variable 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 a proportional relationship between the ratio and the contribution. Value-added-input ratio which was 1.19 in 1996-97 declined to 1.12 in 2005-06, which shows low input use efficiency. Similarly, value-added-invested capital ratio which was 0.37 in 1996-97 declined to 0.33 in 2005-06. These trends strengthen the view that the relative importance of the tile industry has been declining in Kerala.

Other important ratios which are of importance are input per worker, output per worker and value-added per worker. The input per worker increased from Rs. 0.23 lakh in 1996-97 to Rs. 0.48 lakh in 2005-06. Correspondingly output per worker increased from Rs. 0.50 lakh in 1996-97 to Rs. 1.02 lakh in 2005-06. Figures pertaining to value-added per worker increased from Rs. 0.27 lakh in 1996-97 to Rs. 0.54 lakh in 2005-06. The above mentioned trends took place mainly as a result of rise in the price of inputs and output and rise in wages.

TABLE 3.23

IMPORTANT STRUCTURAL RATIOS OF THE SAMPLE UNITS IN KERALA DURING 1996-97 – 2005-06

(Figures in Rs. lakh)

YEAR	FC/ IC	FC/ PC	INPUT/ OUTPUT	VA/ OUTPUT	FC/ OUTPUT	IC/ OUTPUT	VA/IC	OUTPUT/ WORKER	INPUT/ WORKER	VA/ WORKER	VA/ INPUT	OUTPUT/ INPUT	OUTPUT/ IC	INPUT/ IC
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1996-1997	0.74	0.76	0.46	0.54	1.08	1.46	0.37	0.50	0.23	0.27	1.19	2.19	0.68	0.31
1997-1998	0.73	0.75	0.48	0.52	1.21	1.66	0.31	0.46	0.22	0.23	1.06	2.06	0.60	0.29
1998-1999	0.74	0.78	0.41	0.59	1.11	1.50	0.39	0.54	0.22	0.32	1.45	2.45	0.67	0.27
1999-2000	0.71	0.75	0.43	0.57	1.03	1.44	0.40	0.63	0.27	0.36	1.34	2.34	0.69	0.30
2000-2001	0.72	0.72	0.36	0.64	1.10	1.53	0.42	0.66	0.24	0.43	1.79	2.79	0.65	0.23
2001-2002	0.71	0.75	0.42	0.58	1.12	1.57	0.37	0.76	0.32	0.44	1.39	2.39	0.64	0.27
2002-2003	0.73	0.76	0.47	0.53	1.11	1.52	0.35	0.83	0.39	0.44	1.11	2.11	0.66	0.31
2003-2004	0.74	0.77	0.44	0.56	1.09	1.48	0.38	0.93	0.41	0.52	1.26	2.26	0.68	0.30
2004-2005	0.74	0.77	0.45	0.55	1.13	1.52	0.36	1.01	0.46	0.55	1.20	2.20	0.66	0.30
2005-2006	0.76	0.79	0.47	0.53	1.21	1.61	0.33	1.02	0.48	0.54	1.12	2.12	0.62	0.29

Source: Compiled from Survey Data

SECTION C

3.3 Economics of Tile Industry - A Regional Analysis

The tile factories in Kerala State are concentrated in certain regions. Even though there are tile factories in most of the districts of the State, the highest concentration of factories is found in Trichur, followed by Kozhikode and Ernakulam. The primary factor influencing the location of tile factory is the easy availability of suitable types of clay and firewood in the immediate vicinity. Regional concentration necessitates specific region-wise study, for aggregate analysis of the sample units is likely to conceal regional peculiarities of the economics of the industry. Therefore, an effort has been made in this chapter to analyse the specific behaviour of the variables in three regions. The sample consists of 42 factories which include 30 factories from Trichur region, six factories from Calicut region and six factories from Alwaye region belonging to Ernakulam district.

3.3.1 Capital Structure

Capital structure, as mentioned earlier, includes fixed capital, physical working capital, working capital, invested capital and productive capital. The composition of fixed capital of the three regions, i.e., Calicut, Trichur and Alwaye for the period from 1996-97 to 2005-06 are given in Tables 3.24 to 3.26 respectively. In Calicut region fixed capital of 6 sample units stood at Rs.385.54 lakh in 1996-97, which consists of Rs.185.47 lakh as land, Rs.122.91 lakh as buildings and Rs.77.16 lakh as plant and machinery. In this region, fixed capital per unit stood at Rs.64.26 lakh in the initial year of the reference period which composed of 48.11 per cent land, 31.88 per cent buildings and 20.01 per cent plant and machinery. Fixed capital rose to Rs.396.32 lakh by the end of the reference period (2005-06), recording an increase of 2.79 per cent. Land shared 42.60 per cent, buildings 24.98 per cent and plant and machinery 32.41 per cent in 2005-06. This analysis reveals that not much increase has taken place in land acquisition in Calicut region. Instead, it has been found that certain sample units in Calicut region sold out their land so as to meet the expenses of the factory. But the share of plant and machinery in total fixed capital increased from 20.01 per cent in 1996-97 to 32.41 per cent in 2005-06. This was partly due to the attempt to introduce modernisation programme by some companies in that region.

TABLE 3.24

COMPOSITION OF FIXED CAPITAL OF THE SAMPLE UNITS IN CALICUT REGION DURING 1996-97 TO 2005-06

(Figures in Rs. lakh)

Year	Land	Buildings	Plant & Machinery	Fixed capital	F.C per unit
1	2	3	4	5	6
1996-1997	185.47 (48.11)	122.91 (31.88)	77.16 (20.01)	385.54 (100.00)	64.26
1997-1998	217.55 (55.18)	102.35 (25.96)	74.32 (18.85)	394.22 (100.00)	65.70
1998-1999	185.76 (44.46)	120.79 (28.91)	111.27 (26.63)	417.82 (100.00)	69.64
1999-2000	185.69 (43.60)	117.79 (27.72)	121.42 (28.58)	424.90 (100.00)	70.82
2000-2001	183.42 (43.60)	115.97 (27.57)	121.25 (28.83)	420.64 (100.00)	70.11
2001-2002	181.39 (43.60)	111.75 (26.86)	122.85 (29.53)	415.99 (100.00)	69.33
2002-2003	173.11 (42.95)	108.11 (26.82)	121.85 (30.23)	403.07 (100.00)	67.18
2003-2004	171.89 (41.03)	105.00 (25.06)	142.06 (33.91)	418.95 (100.00)	69.83
2004-2005	174.64 (42.54)	101.48 (24.72)	134.38 (32.74)	410.50 (100.00)	68.42
2005-2006	168.85 (42.60)	99.02 (24.98)	128.45 (32.41)	396.32 (100.00)	66.05

Note: Figures in parenthesis give percentage of the total
Source: Compiled from Survey Data

An examination of the situation in Trichur region reveals a slightly different picture. Fixed capital in Trichur region, which was Rs.1606.58 lakh in 1996-97, rose to Rs.2578.61 lakh in 2005-2006 (60.50 per cent increase). Fixed capital per unit which stood at Rs. 53.55 lakh in 1996-97, rose to Rs.85.95 lakh in 2005-06 (60.50 per cent increase). Land, buildings, plant and machinery respectively constituted 55.76 per cent, 26.91 per cent and 17.33 per cent in 1996-97 and their share in 2005-06 was 64.46 per cent, 21.04 per cent and 14.50 per cent respectively. This analysis shows a slight improvement in the share of land and a decline in the share of buildings and plant and machinery during the reference period.

TABLE 3.25

COMPOSITION OF FIXED CAPITAL OF THE SAMPLE UNITS IN TRICHUR REGION DURING 1996-97 TO 2005-06

(Figures in Rs. lakh)

Year	Land	Buildings	Plant & Machinery	Fixed capital	F.C per unit
1	2	3	4	5	6
1996-1997	895.84 (55.76)	432.38 (26.91)	278.36 (17.33)	1606.58 (100.00)	53.55
1997-1998	885.27 (54.65)	445.26 (27.49)	289.42 (17.87)	1619.95 (100.00)	54.00
1998-1999	922.53 (55.20)	451.45 (27.01)	297.28 (17.79)	1671.26 (100.00)	55.71
1999-2000	978.63 (55.91)	460.10 (26.29)	311.65 (17.80)	1750.38 (100.00)	58.35
2000-2001	1078.20 (57.42)	472.18 (25.14)	327.51 (17.44)	1877.89 (100.00)	62.60
2001-2002	1158.61 (58.61)	486.39 (24.60)	331.98 (16.79)	1976.98 (100.00)	65.90
2002-2003	1256.78 (59.81)	503.80 (23.97)	340.78 (16.22)	2101.36 (100.00)	70.05
2003-2004	1377.75 (61.64)	508.24 (22.74)	349.18 (15.62)	2235.17 (100.00)	74.51
2004-2005	1504.33 (62.92)	524.52 (21.94)	362.11 (15.14)	2390.96 (100.00)	79.70
2005-2006	1662.22 (64.46)	542.49 (21.04)	373.90 (14.50)	2578.61 (100.00)	85.95

Note: Figures in parenthesis give percentage of the total
Source: Survey Data

In Alwaye region the total fixed capital stood at Rs.198.26 lakh in 1996-97. This region has an average fixed capital of Rs.33.04 lakh in 1996-97. Total fixed capital of this region increased to Rs.388.32 lakh in 2005-06, average fixed capital being Rs.64.72 lakh. In 1996-97 the share of land, buildings, and plant and machinery respectively was 54.68 per cent, 24.22 per cent and 21.10 per cent which was 62.83 per cent, 20.81 per cent and 16.36 per cent respectively in 2005-06. This analysis clearly exhibits an increase in the share of land and a decline in the share of buildings, and plant and machinery in fixed capital during the reference period.

TABLE 3.26

COMPOSITION OF FIXED CAPITAL OF THE SAMPLE UNITS IN ALWAYE REGION DURING 1996-97 - 2005-06

(Figures in Rs. lakh)

Year	Land	Buildings	Plant & Machinery	Fixed capital	F.C per unit
1	2	3	4	5	6
1996-1997	108.40 (54.68)	48.01 (24.22)	41.85 (21.10)	198.26 (100.00)	33.04
1997-1998	116.40 (54.46)	52.01 (24.33)	45.33 (21.21)	213.74 (100.00)	35.62
1998-1999	134.61 (56.06)	56.15 (23.38)	49.37 (20.56)	240.13 (100.00)	40.02
1999-2000	150.92 (57.28)	61.86 (23.48)	50.70 (19.24)	263.48 (100.00)	43.91
2000-2001	184.70 (60.55)	67.74 (22.21)	52.59 (17.24)	305.03 (100.00)	50.84
2001-2002	194.01 (60.73)	70.19 (21.97)	55.25 (17.30)	319.45 (100.00)	53.24
2002-2003	218.28 (62.26)	75.12 (21.43)	57.17 (16.31)	350.57 (100.00)	58.43
2003-2004	228.16 (62.76)	76.00 (20.90)	59.40 (16.34)	363.56 (100.00)	60.59
2004-2005	240.50 (63.27)	78.49 (20.65)	61.10 (16.08)	380.09 (100.00)	63.35
2005-2006	244.00 (62.83)	80.81 (20.81)	63.51 (16.36)	388.32 (100.00)	64.72

Note: Figures in parenthesis give percentage of the total
Source: Survey Data

Tables 3.27 to 3.29 give the composition of physical working capital (PWC) and working capital (WC) for the regions Calicut, Trichur and Alwaye respectively. A close examination of total physical working capital and working capital of Calicut region shows that total physical working capital which stood at Rs.410.76 lakh in 1996-97 rose to Rs.538.77 lakh in 2005-06, whereas working capital of this region was Rs.417.42 lakh in 1996-97, which increased to Rs.418.24 lakh in 2005-06. Average physical working capital of Calicut region in 1996-97 was Rs.68.46 lakh which rose to Rs.89.80 lakh in 2005-06. The percentage contribution of material stock, semi finished goods and finished goods was 39.62, 12.04 and 48.34 respectively in 1996-97 which changed to 49.35, 13.84 and 36.80 respectively in 2005-06.

TABLE 3.27

COMPOSITION OF PHYSICAL WORKING CAPITAL AND WORKING CAPITAL OF THE SAMPLE UNITS IN CALICUT REGION DURING 1996-97 TO2005-06

(Figures in Rs lakh)

Year	Materials	Semi-finished	Finished	PWC (2+3+4)	Cash	R-P	WC 5+6+7	PWC per unit	W.C per unit
1	2	3	4	5	6	7	8	9	10
1996-1997	162.74 (39.62)	49.45 (12.04)	198.57 (48.34)	410.76 (100)	8.71	-2.05	417.42	68.46	69.57
1997-1998	190.79 (42.69)	44.56 (9.97)	211.52 (47.33)	446.87 (100)	8.67	3.58	459.12	74.48	76.52
1998-1999	151.17 (36.62)	60.41 (14.64)	201.18 (48.74)	412.76 (100)	7.88	-83.82	336.82	68.79	56.14
1999-2000	240.29 (44.66)	55.71 (10.35)	242.01 (44.98)	538.01 (100)	7.81	-63.28	482.54	89.67	80.42
2000-2001	134.60 (25.38)	54.53 (10.28)	341.11 (64.33)	530.24 (100)	5.04	-172.71	362.57	88.37	60.43
2001-2002	198.35 (33.65)	59.41 (10.08)	331.75 (56.28)	589.51 (100)	5.15	-101.05	493.61	98.25	82.27
2002-2003	184.13 (33.65)	64.94 (11.87)	298.10 (54.48)	547.17 (100)	5.60	-50.49	502.28	91.20	83.71
2003-2004	201.41 (38.26)	73.67 (13.99)	251.36 (47.75)	526.44 (100)	7.75	-106.92	427.27	87.74	71.21
2004-2005	263.94 (47.38)	73.09 (13.12)	220.04 (39.50)	557.07 (100)	6.07	-116.22	446.92	92.85	74.49
2005-2006	265.90 (49.35)	74.58 (13.84)	198.29 (36.80)	538.77 (100)	6.08	-126.61	418.24	89.80	69.71

Note: Figures in parenthesis give percentage composition of PWC
Source: Survey Data

Total physical working capital of Trichur region in 1996-97 was Rs.329.45 lakh which rose to Rs.452.28 lakh in 2005-06 (Table 3.28). During the reference period working capital increased from Rs.251.17 lakh to Rs.419.02 lakh. Physical working capital per unit increased from Rs.10.98 lakh in 1996-97 to Rs.15.08 lakh in 2005-06, whereas that of working capital per unit increased from Rs.8.37 lakh to Rs.13.97 lakh during the period under study. The contribution of stock of raw-materials, semi-finished goods and finished goods in physical working capital which was 49.85 per cent, 34.72 per cent and 15.43 per cent respectively in 1996-97 changed to 51.20 per cent, 35.87 per cent and 12.93 per cent respectively in 2005-06.

TABLE 3.28

COMPOSITION OF PHYSICAL WORKING CAPITAL AND WORKING CAPITAL OF THE SAMPLE UNITS IN TRICHUR REGION DURING 1996-97 TO 2005-06

(Figures in Rs. lakh)

Year	Materials	Semi-finished	Finished	PWC (2+3+4)	Cash	R-P	WC 5+6+7	PWC per unit	WC per unit
1	2	3	4	5	6	7	8	9	10
1996-1997	164.24 (49.85)	114.39 (34.72)	50.82 (15.43)	329.45 (100)	9.30	-87.58	251.17	10.98	8.37
1997-1998	174.08 (49.19)	120.77 (34.13)	59.03 (16.68)	353.88 (100)	9.57	-92.85	270.60	11.80	9.02
1998-1999	174.26 (49.02)	122.37 (34.42)	58.86 (16.56)	355.49 (100)	9.67	-78.28	286.88	11.85	9.56
1999-2000	190.13 (49.50)	130.26 (33.91)	63.73 (16.59)	384.12 (100)	10.68	-82.79	312.01	12.80	10.40
2000-2001	201.95 (49.41)	129.69 (31.73)	77.05 (18.85)	408.69 (100)	10.53	-78.18	341.04	13.62	11.37
2001-2002	205.67 (47.68)	137.91 (31.97)	87.80 (20.35)	431.38 (100)	11.30	-74.35	368.33	14.38	12.28
2002-2003	211.07 (49.96)	143.83 (34.04)	67.58 (16.00)	422.48 (100)	11.67	-68.44	365.71	14.08	12.19
2003-2004	221.12 (49.28)	161.94 (36.09)	65.64 (14.63)	448.70 (100)	12.59	-63.03	398.26	14.96	13.28
2004-2005	228.67 (50.05)	160.46 (35.12)	67.78 (14.83)	456.91 (100)	12.59	-51.30	418.20	15.23	13.94
2005-2006	231.56 (51.20)	162.23 (35.87)	58.49 (12.93)	452.28 (100)	17.34	-50.60	419.02	15.08	13.97

Note: Figures in parenthesis give percentage composition of PWC.
Source: Survey Data

An examination of total physical working capital of Alwaye region (Table 3.29) shows that total physical working capital which was Rs.34.80 lakh in 1996-97 rose to Rs. 96.58 lakh in 2005-06. Working capital of the sample units increased from Rs.7.49 lakh in 1996-97 to Rs.69.63 lakh in 2005-06. The percentage contribution of stock of raw-materials, semi-finished goods and finished goods came to 74.77, 19.28 and 5.95 respectively in 1996-97, which changed to 79.34, 14.78 and 5.88 respectively in 2005-06. Average physical working capital of Alwaye region in 1996-97 was Rs.5.80 lakh which increased to Rs.69.63 lakh in 2005-06. Average working capital of the same region during the reference period increased from Rs.1.25 lakh in 1996-97 to Rs.11.61 lakh in 2005-06.

TABLE 3.29

COMPOSITION OF PHYSICAL WORKING CAPITAL AND WORKING CAPITAL OF THE SAMPLE UNITS IN ALWAYE REGION DURING 1996-97 TO 2005-06

(Figures in Rs. lakh)

Year	Materials	Semi finished	Finished	PWC (2+3+4)	Cash	R-P	WC 5+6+7	PWC per unit	WC per unit
1	2	3	4	5	6	7	8	9	10
1996-1997	26.02 (74.77)	6.71 (19.28)	2.07 (5.95)	34.80 (100)	0.26	-27.57	7.49	5.80	1.25
1997-1998	30.00 (76.05)	7.21 (18.28)	2.24 (5.68)	39.45 (100)	0.12	-26.90	12.67	6.58	2.11
1998-1999	35.00 (76.97)	8.00 (17.59)	2.47 (5.43)	45.47 (100)	0.50	-28.59	17.38	7.58	2.90
1999-2000	39.20 (78.07)	8.18 (16.29)	2.83 (5.64)	50.21 (100)	0.60	-26.86	23.95	8.37	3.99
2000-2001	45.15 (77.58)	9.73 (16.72)	3.32 (5.70)	58.20 (100)	0.46	-26.18	32.48	9.70	5.41
2001-2002	50.31 (77.26)	11.32 (17.38)	3.49 (5.36)	65.12 (100)	0.62	-28.61	37.13	10.85	6.19
2002-2003	55.95 (78.03)	11.50 (16.04)	4.25 (5.93)	71.70 (100)	0.30	-27.01	44.99	11.95	7.50
2003-2004	67.70 (79.16)	13.39 (15.66)	4.43 (5.18)	85.52 (100)	0.42	-25.95	59.99	14.25	10.00
2004-2005	78.30 (78.51)	16.10 (16.14)	5.33 (5.34)	99.73 (100)	0.43	-26.90	73.26	16.62	12.21
2005-2006	76.63 (79.34)	14.27 (14.78)	5.68 (5.88)	96.58 (100)	0.43	-27.38	69.63	16.10	11.61

Note: Figures in parenthesis give percentage composition of PWC
Source: Survey Data

A close examination of the percentage changes in the composition of physical working capital over the reference period for the three regions revealed that the average stock of raw-materials accumulated mostly in Trichur and Alwaye regions (50 per cent and 78 per cent respectively). The accumulated stock of finished goods is found to be relatively greater in Calicut region and relatively less in Trichur and Alwaye regions. This may be due to higher price of the product in Calicut region and lower price in the other two regions.

The other two important constituents of capital structure are invested capital and productive capital. The information pertaining to invested capital and productive capital for the three regions are given in Tables 3.30 to 3.32.

The invested capital of Calicut region (Table 3.30) which was Rs. 796.30 lakh in 1996-97 rose to Rs. 935.09 lakh in 2005-06; recording a 17.42 per cent increase over the reference period. The productive capital of this region was Rs.802.96 lakh in 1996-97 which increased to Rs.814.56 lakh in 2005-06, registering only 1.44 per cent increase over the reference period. Average productive capital of the region was Rs.133.83 lakh in 1996-97 which slightly changed to Rs.135.76 lakh in 2005-06. During the reference period invested capital per unit increased from Rs.132.72 lakh to Rs.155.85 lakh.

TABLE 3.30

DETAILS OF PRODUCTIVE CAPITAL AND INVESTED CAPITAL OF THE SAMPLE UNITS IN CALICUT REGION DURING 1996-97 TO 2005-06

(Figures in 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
1996-1997	385.54	410.76	417.42	802.96	796.30	133.83	132.72
1997-1998	394.22	446.87	459.12	853.34	841.09	142.22	140.18
1998-1999	417.82	412.76	336.82	754.64	830.58	125.77	138.43
1999-2000	424.90	538.01	482.54	907.44	962.91	151.24	160.49
2000-2001	420.64	530.24	362.57	783.21	950.88	130.54	158.48
2001-2002	415.99	589.51	493.61	909.60	1005.50	151.60	167.58
2002-2003	403.07	547.17	502.28	905.35	950.24	150.89	158.37
2003-2004	418.95	526.44	427.27	846.22	945.39	141.04	157.57
2004-2005	410.50	557.07	446.92	857.42	967.57	142.90	161.26
2005-2006	396.32	538.77	418.24	814.56	935.09	135.76	155.85

Source: Survey Data

Over the reference period invested capital of Trichur and Alwaye regions increased by 56.55 per cent and 108.05 per cent respectively, whereas the percentage increase of productive capital came to 61.35 and 122.57 respectively. A relatively higher growth in both the productive and the invested capital in Trichur and Alwaye regions are due to the increased stock of raw-materials in these regions. Average productive capital of Trichur and Alwaye regions was Rs.61.93 lakh and Rs.34.29 lakh respectively in 1996-97 which rose to Rs.99.92 lakh and Rs.76.33 lakh respectively in 2005.06. In the same manner, average invested capital in 1996-97 was Rs. 64.53 lakh in Trichur region and Rs.38.84 lakh in Alwaye region which rose to Rs.101.03 lakh and Rs.80.82 lakh respectively by the end of 2005-06.

TABLE 3.31

DETAILS OF PRODUCTIVE CAPITAL AND INVESTED CAPITAL OF THE SAMPLE UNITS IN TRICHUR REGION DURING THE PERIOD 1996-97 TO 2005-06

(Figures in 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
1996-1997	1606.58	329.45	251.17	1857.75	1936.03	61.93	64.53
1997-1998	1619.95	353.88	270.60	1890.55	1973.83	63.02	65.79
1998-1999	1671.26	355.49	286.88	1958.14	2026.75	65.27	67.56
1999-2000	1750.38	384.12	312.01	2062.39	2134.50	68.75	71.15
2000-2001	1877.89	408.69	341.04	2218.93	2286.58	73.96	76.22
2001-2002	1976.98	431.38	368.33	2345.31	2408.36	78.18	80.28
2002-2003	2101.36	422.48	365.71	2467.07	2523.84	82.24	84.13
2003-2004	2235.17	448.70	398.26	2633.43	2683.87	87.78	89.46
2004-2005	2390.96	456.91	418.20	2809.16	2847.87	93.64	94.93
2005-2006	2578.61	452.28	419.02	2997.63	3030.89	99.92	101.03

Source: Survey Data

TABLE 3.32

DETAILS OF PRODUCTIVE CAPITAL AND INVESTED CAPITAL OF THE SAMPLE UNITS IN ALWAYE REGION DURING 1996-97 TO 2005-06

(Figures in 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
1996-1997	198.26	34.80	7.49	205.75	233.06	34.29	38.84
1997-1998	213.74	39.45	12.67	226.41	253.19	37.74	42.20
1998-1999	240.13	45.47	17.38	257.51	285.60	42.92	47.60
1999-2000	263.48	50.21	23.95	287.43	313.69	47.91	52.28
2000-2001	305.03	58.20	32.48	337.51	363.23	56.25	60.54
2001-2002	319.45	65.12	37.13	356.58	384.57	59.43	64.10
2002-2003	350.57	71.70	44.99	395.56	422.27	65.93	70.38
2003-2004	363.56	85.52	59.99	423.55	449.08	70.59	74.85
2004-2005	380.09	99.73	73.26	453.35	479.82	75.56	79.97
2005-2006	388.32	96.58	69.63	457.95	484.90	76.33	80.82

Source: Survey Data

3.3.2 Inputs

The following description gives an idea regarding the intake of inputs like clay, firewood, electricity and oil by the sample units in three regions. In Calicut region, sample units purchased inputs worth Rs.442.12 lakh in 1996-97, which rose to Rs.579.79 lakh in 2005-06 (Table 3.33). Of the total inputs purchased, 43.74 per cent was constituted by clay, 44.61 per cent by firewood, 5.19 per cent by oil, 5.85 per cent by electricity, 0.11 per cent by shell and 0.49 per cent by others in 1996-97 which changed to 44.58 per cent, 41.62 per cent, 3.76 per cent, 9.65 per cent, 0.07 per cent and 0.32 per cent respectively in 2005-06. After stock-adjustment, total inputs consumed amounted to Rs.442.20 lakh in 1996-97 which rose to Rs. 635.72 lakh in 2005-06. The percentage share of various inputs purchased almost remained constant during the reference period. The average consumption of inputs stood at Rs.73.70 lakh in 1996-97, which increased to Rs.105.95 lakh in 2005-06.

TABLE 3.33

COMPOSITION OF INPUTS CONSUMED BY THE SAMPLE UNITS IN CALICUT REGION DURING 1996-97 TO 2005-06

(Figures in Rs. lakh)

Year	Clay	Firewood	Oil	Electricity	Shell	Others	Total inputs purchased	Inputs consumed	I.C. Per unit
1	2	3	4	5	6	7	8	9	10
1996-1997	193.39 (43.74)	197.24 (44.61)	22.94 (5.19)	25.88 (5.85)	0.49 (0.11)	2.18 (0.49)	442.12 (100)	442.20	73.70
1997-1998	191.63 (45.76)	168.77 (40.31)	23.09 (5.51)	32.54 (7.77)	0.50 (0.12)	2.20 (0.53)	418.73 (100)	390.42	65.07
1998-1999	189.06 (46.20)	174.30 (42.60)	13.93 (3.40)	29.61 (7.24)	0.24 (0.06)	2.05 (0.50)	409.19 (100)	344.40	57.40
1999-2000	236.23 (44.12)	230.51 (43.05)	14.33 (2.68)	52.07 (9.73)	0.32 (0.06)	1.96 (0.37)	535.42 (100)	469.99	78.33
2000-2001	178.47 (39.96)	195.82 (43.84)	16.35 (3.66)	53.55 (11.99)	0.18 (0.04)	2.30 (0.51)	446.67 (100)	275.15	45.86
2001-2002	201.59 (44.15)	177.79 (38.94)	16.28 (3.57)	58.56 (12.83)	0.19 (0.04)	2.16 (0.47)	456.57 (100)	412.18	68.70
2002-2003	233.18 (43.60)	228.90 (42.80)	16.77 (3.14)	53.71 (10.04)	0.39 (0.07)	1.85 (0.35)	534.80 (100)	607.82	101.30
2003-2004	241.46 (39.64)	284.64 (46.73)	18.71 (3.07)	62.13 (10.20)	0.37 (0.06)	1.75 (0.29)	609.06 (100)	582.35	97.06
2004-2005	252.14 (43.34)	239.89 (41.23)	21.41 (3.68)	66.00 (11.34)	0.37 (0.06)	1.96 (0.34)	581.77 (100)	615.30	102.55
2005-2006	258.50 (44.58)	241.31 (41.62)	21.80 (3.76)	55.95 (9.65)	0.38 (0.07)	1.85 (0.32)	579.79 (100)	635.72	105.95

Note: (1) Figures in parenthesis give percentage of the total inputs purchased
(2) Necessary stock-adjustments are made.

Source: Survey Data

In Trichur region, of the total inputs purchased i.e., Rs.406.52 lakh in 1996-97, 41.82 per cent is constituted by clay, 40.54 per cent by firewood, 5.48 per cent by oil, 9.77 per cent by electricity, 0.45 per cent by shell and 1.94 per cent by others. Inputs consumed by the sample units in 1996-97 were Rs.408.16 lakh and inputs consumed per unit were Rs.13.61 lakh. The total inputs purchased in 2005-06 was Rs.568.78 lakh, of which 42.64 per cent is constituted by clay, 36.31 per cent by firewood, 6.91 per cent by oil, 11.78 per cent by electricity, 0.70 per cent by shell and 1.66 per cent by others. Total inputs consumed by the sample units in 2005-06 were Rs.562.62 lakh and inputs consumed per unit was Rs.18.75 lakh during the same period.

TABLE 3.34

COMPOSITION OF INPUTS CONSUMED BY THE SAMPLE UNITS IN TRICHUR REGION DURING 1996-97 TO 2005-06

(Figures in Rs. lakh)

Year	Clay	Fire wood	Oil	Electri-city	Shell	Others	Total inputs purchased	Inputs consum-ed	I.C.per unit
1	2	3	4	5	6	7	8	9	10
1996-1997	170.02 (41.82)	164.81 (40.54)	22.27 (5.48)	39.72 (9.77)	1.81 (0.45)	7.89 (1.94)	406.52 (100)	408.16	13.61
1997-1998	179.50 (42.23)	166.47 (39.16)	24.23 (5.70)	44.77 (10.53)	1.92 (0.45)	8.21 (1.93)	425.10 (100)	425.73	14.19
1998-1999	182.76 (41.96)	169.99 (39.03)	26.19 (6.01)	47.53 (10.91)	2.12 (0.49)	6.94 (1.59)	435.53 (100)	430.64	14.35
1999-2000	189.26 (41.44)	176.44 (38.63)	27.39 (6.00)	52.31 (11.45)	2.18 (0.48)	9.18 (2.01)	456.76 (100)	456.10	15.20
2000-2001	201.07 (41.45)	186.82 (38.51)	30.83 (6.36)	54.90 (11.32)	2.49 (0.51)	9.00 (1.85)	485.11 (100)	483.02	16.10
2001-2002	207.13 (40.98)	194.36 (38.45)	32.66 (6.46)	59.00 (11.67)	2.56 (0.51)	9.72 (1.92)	505.43 (100)	504.86	16.83
2002-2003	215.70 (41.28)	198.19 (37.93)	35.69 (6.83)	61.72 (11.81)	2.90 (0.55)	8.38 (1.60)	522.58 (100)	513.15	17.11
2003-2004	226.07 (41.57)	203.39 (37.40)	37.13 (6.83)	64.86 (11.93)	3.38 (0.62)	9.04 (1.66)	543.87 (100)	538.46	17.95
2004-2005	238.97 (41.87)	209.99 (36.79)	39.48 (6.92)	69.55 (12.18)	3.94 (0.69)	8.88 (1.56)	570.81 (100)	562.87	18.76
2005-2006	242.51 (42.64)	206.54 (36.31)	39.29 (6.91)	67.02 (11.78)	3.97 (0.70)	9.45 (1.66)	568.78 (100)	562.62	18.75

Note: (1) Figures in parenthesis give percentage of the total inputs purchased
(2) Necessary stock-adjustments are made.

Source: Survey Data

An examination of input structure of Alwaye region reveals that sample units purchased inputs worth Rs.74.58 lakh in 1996-97 and consumed inputs worth Rs.75.42 lakh during the same period. Of the total inputs purchased in 1996-97, 46.73 per cent was constituted by clay, 36.52 per cent by firewood, 3.23 per cent by oil, 11.65 per cent by electricity, and 1.86 per cent by others. The share of shell was zero. The percentage composition remained more or less constant in 2005-06 also. Average input consumption, which was Rs.12.57 lakh in 1996-97 rose to Rs.18.44 lakh in 2005-06; percentage increase being 46.69.

TABLE 3.35

COMPOSITION OF INPUTS CONSUMED BY THE SAMPLE UNITS IN ALWAYE REGION DURING 1996-97 TO 2005-06

(Figures in Rs. lakh)

Year	Clay	Fire wood	Oil	Electri city	Shell	Others	Total inputs purchased	Inputs consu med	IC per unit
1	2	3	4	5	6	7	8	9	10
1996-1997	34.85 (46.73)	27.24 (36.52)	2.41 (3.23)	8.69 (11.65)	0.00 (0.00)	1.39 (1.86)	74.58 (100)	75.42	12.57
1997-1998	36.60 (47.03)	28.35 (36.43)	2.45 (3,15)	8.91 (11.45)	0.00 (0.00)	1.52 (1.95)	77.83 (100)	77.10.	12.85
1998-1999	38.65 (48.08)	28.45 (35.39)	2.50 (3.11)	9.37 (11.66)	0.00 (0.00)	1.42 (1.77)	80.39 (100)	79.74	13.29
1999-2000	41.50 (48.70)	29.81 (34.98)	2.52 (2.96)	9.58 (11.24)	0.00 (0.00)	1.80 (2.11)	85.21 (100)	85.34	14.22
2000-2001	43.15 (48.58)	30.98 (34.88)	2.62 (2.95)	10.05 (11.32)	0.00 (0.00)	2.01 (2.27)	88.81 (100)	87.46	14.58
2001-2002	45.50 (48.73)	32.59 (34.90)	2.71 (2.90)	10.40 (11.14)	0.00 (O.00)	2.17 (2.32)	93.37 (100)	92.41	15.40
2002-2003	48.50 (49.67)	33.50 (34.31)	2.94 (3.01)	10.90 (11.16)	0.00 (0.00)	1.81 (1.85)	97.65 (100)	97.03	16.17
2003-2004	51.10 (49.49)	35.75 (34.63)	3.10 (3.00)	11.70 (11.33)	0.00 (0.00)	1.60 (1.55)	103.25 (100)	100.19	16.69
2004-2005	54.50 (50.83)	36.25 (33.81)	3.28 (3.06)	11.74 (10.95)	0.00 (0.00)	1.45 (1.35)	107.22 (100)	107.24	17.87
2005-2006	54.44 (49.48)	38.35 (34.86)	3.43 (3.12)	11.94 (10.85)	0.00 (0.00)	1.86 (1.69)	110.02 (100)	110.63	18.44

Note: (1) Figures in parenthesis give percentage of the total inputs purchased
(2) Necessary stock-adjustments are made.

Source: Survey Data

A perusal into the composition of inputs purchased/consumed by three regions in Kerala showed the following notable features.

(i) Of the total input cost, clay constituted about 40-50 per cent in all the regions. (ii) The share of shell is absolutely zero in Alwaye region. (iii) Firewood is found to be comparatively cheap in Calicut region. (iv) The use of oil as a fuel has got less consideration in all the regions.

3.3.3 Cost of Production

Cost of production is a highly useful tool to assess the present position of enterprises' management. The return on the investment of enterprises depends upon their cost structure. Per unit cost of production of output is an important criterion of measuring efficiency. The lower the cost per unit of output, the higher would be the efficiency of the enterprises (Gupta, 1984).[1]

The total cost of production per unit stood at Rs.168.96 lakh in 1996-97 in Calicut region which rose to Rs.205.24 lakh in 2005-06; (Table 3.36) the percentage increase being 21.47. The total cost of production per unit came to Rs.24.21 lakh in 1996-97 in Trichur region which increased to Rs.34.27 lakh in 2005-06; the percentage increase being 41.55 (Table 3.37). The total cost of production per unit of Alwaye region in 1996-97 stood at Rs.31.60 lakh which rose to Rs.33.06 lakh in 2005-06 (Table 3.38); the percentage increase being 4.62. The notable features of the above analysis are: a) Rise in input cost is low in Trichur region (37.76 per cent) and high in Alwaye (46.69 per cent) region b) Labour cost is high in Calicut region and low in Trichur region.

TABLE 3.36

COST OF PRODUCTION OF THE SAMPLE UNITS IN CALICUT REGION DURING 1996-97 TO 2005-06

(Figures in Rs. lakh)

Year	Inputs consumed	Wages and Salaries	Other establishment costs	Total cost (2+3+4)	Total cost per unit
1	2	3	4	5	6
1996-1997	442.20 (43.62)	544.98 (53.76)	26.58 (2.62)	1013.76 (100.00)	168.96
1997-1998	390.42 (70.84)	123.20 (22.35)	37.51 (6.81)	551.13 (100.00)	91.85
1998-1999	344.40 (34.67)	606.79 (61.09)	42.05 (4.23)	993.24 (100.00)	165.54
1999-2000	469.99 (40.48)	650.92 (56.60)	40.23 (3.46)	1161.14 (100.00)	193.52
2000-2001	275.15 (34.66)	483.37 (60.88)	35.44 (4.46)	793.96 (100.00)	132.33
2001-2002	412.18 (37.90)	641.99 (59.04)	33.30 (3.06)	1087.47 (100.00)	181.25
2002-2003	607.82 (51.62)	535.94 (45.52)	33.64 (2.86)	1177.40 (100.00)	196.23
2003-2004	582.35 (58.94)	374.91 (37.94)	30.82 (3.12)	988.08 (100.00)	164.68
2004-2005	615.30 (51.60)	538.11 (45.12)	39.14 (3.28)	1192.55 (100.00)	198.76
2005-2006	635.72 (51.62)	569.06 (46.21)	26.68 (2.17)	1231.46 (100.00)	205.24

Note: Figures in parenthesis give percentage share of each component of the total cost

Source: Survey Data

TABLE 3.37

COST OF PRODUCTION OF THE SAMPLE UNITS IN TRICHUR REGION DURING 1996-97 TO 2005-06

(Figures in Rs . lakh)

Year	Inputs consumed	Wages and Salaries	Other establishment costs	Total cost (2+3+4)	Total cost per unit
1	2	3	4	5	6
1996-1997	408.16 (56.19)	244.80 (33.70)	73.44 (10.11)	726.40 (100.00)	24.21
1997-1998	425.73 (54.20)	276.73 (33.23)	83.01 (10.57)	785.47 (100.00)	26.18
1998-1999	430.64 (55.99)	258.38 (33.59)	80.09 (10.41)	769.11 (100.00)	25.64
1999-2000	456.10 (55.80)	273.66 (33.48)	87.57 (10.71)	817.33 (100.00)	27.24
2000-2001	483.02 (52.37)	338.10 (36.66)	101.14 (10.97)	922.26 (100.00)	30.74
2001-2002	504.86 (54.20)	328.15 (35.23)	98.44 (10.57)	931.45 (100.00)	31.05
2002-2003	513.15 (55.99)	307.89 (33.59)	95.44 (10.41)	916.48 (100.00)	30.55
2003-2004	538.46 (55.18)	333.84 (34.21)	103.49 (10.61)	975.79 (100.00)	32.53
2004-2005	562.87 (54.98)	354.60 (34.63)	106.38 (10.39)	1023.85 (100.00)	34.13
2005-2006	562.62 (54.73)	350.50 (34.10)	114.83 (11.17)	1027.95 (100.00)	34.27

Note: Figures in parenthesis give percentage share of each component of the total cost
Source: Survey Data

Table 3.38

Cost Of Production Of The Sample Units In Alwaye Region During 1996-97 to 2005-06

(Figures Rs. in lakh)

Year	Inputs consumed	Wages and Salaries	Other establishment costs	Total cost (2+3+4)	Total cost per unit
1	2	3	4	5	6
1996-1997	75.42 (39.77)	89.36 (47.13)	24.84 (13.10)	189.62 (100.00)	31.60
1997-1998	77.10 (39.57)	89.36 (45.86)	28.38 (14.57)	194.84 (100.00)	32.47
1998-1999	79.74 (39.31)	96.49 (47.57)	26.62 (13.12)	202.85 (100.00)	33.81
1999-2000	85.34 (41.56)	96.02 (46.76)	24.00 (11.68)	205.36 (100.00)	34.23
2000-2001	87.46 (44.89)	83.52 (42.86)	23.86 (12.25)	194.84 (100.00)	32.47
2001-2002	92.41 (45.35)	83.52 (40.99)	27.84 (13.66)	203.77 (100.00)	33.96
2002-2003	97.03 (48.70)	81.76 (41.04)	20.44 (10.26)	199.23 (100.00)	33.21
2003-2004	100.19 (51.45)	73.63 (37.82)	20.89 (10.73)	194.71 (100.00)	32.36
2004-2005	107.24 (54.47)	70.14 (35.63)	19.48 (9.90)	196.86 (100.00)	32.81
2005-2006	110.63 (55.78)	69.44 (35.01)	18.27 (9.21)	198.34 (100.00)	33.06

Note: Figures in parenthesis give percentage share of each component of the total cost

Source: Survey Data

Cost structure clearly reveals that among the three regions, labour cost is the highest in Calicut region on account of better remuneration and other perks given to the workers. However, Calicut region is capable of producing better quality products at relatively moderate price because of the economies of scale enjoyed by the factories in that region.

3.3.4 Products

An idea regarding the production profile of sample units in Calicut, Trichur and Alwaye regions can be had from the Tables 3.39 to 3.41. Total value of production in Calicut region was Rs.1051.94 lakh in 1996-97, which rose to Rs.1303.72 lakh in 2005-06; percentage increase being 23.93. The share of roofing tiles in total value of production came to 60.65 per cent, ridges 20.23 per cent, flooring tiles 11.36 per cent, hourdis 2.14 per cent, bricks 2.33 per cent, ceiling tiles 1.36 per cent and others 1.93 per cent in 1996-97. The share of each item in total value of production remained more or less the same at the end of the reference period but with a slight increase in the share of roofing tiles and ceiling tiles and a slight fall in the share of ridges, flooring tiles, hourdis, bricks and others.

TABLE 3.39

COMPOSITION OF PRODUCTS PRODUCED BY THE SAMPLE UNITS IN CALICUT REGION DURING 1996-97 TO 2005-06

(Figures in Rs. lakh)

Year	Roof tiles	Ridges	Floor tiles	Hourdis	Bricks	Ceiling tiles	Jallies	Others	Total production	Total out put	Output per unit
1	2	3	4	5	6	7	8	9	10	11	12
1996-1997	637.99 (60.65)	212.83 (20.23)	119.43 (11.36)	22.50 (2.14)	24.52 (2.33)	14.32 (1.36)	0.00 (0.00)	20.35 (1.93)	1051.94 (100)	1041.84	173.64
1997-1998	500.33 (63.13)	140.17 (17.68)	66.10 (8.34)	27.23 (3.44)	24.60 (3.10)	14.59 (1.84)	0.00 (0.00)	19.58 (2.47)	792.60 (100)	786.10	131.02
1998-1999	549.99 (54.40)	248.72 (24.60)	140.85 (13.93)	18.04 (1.78)	20.98 (2.08)	13.58 (1.34)	0.00 (0.00)	18.90 (1.87)	1011.06 (100)	1015.16	169.19
1999-2000	682.73 (56.04)	300.47 (24.66)	166.52 (13.67)	7.53 (0.63)	20.51 (1.68)	23.91 (1.96)	0.00 (0.00)	16.60 (1.36))	1218.27 (100)	1223.57	203.93
2000-2001	793.02 (66.66)	213.75 (17.96)	116.29 (9.77)	12.42 (1.04)	21.27 (1.79)	14.62 (1.23)	0.00 (0.00)	18.45 (1.55)	1189.82 (100)	1198.42	199.74
2001-2002	785.36 (65.96)	217.02 (18.23)	116.49 (9.78)	12.60 (1.06)	25.64 (2.15)	16.01 (1.34)	0.00 (0.00)	17.65 ((1.48)	1190.77 (100)	1178.67	196.45
2002-2003	843.49 (65.23)	241.80 (18.70)	123.90 (9.58)	12.26 (0.95)	27.58 (2.13)	27.75 (2.15)	0.00 (0.00)	16.35 (1.26)	1293.13 (100)	1276.73	212.79
2003-2004	864.18 (66.36)	228.98 (17.58)	122.04 (9.37)	11.58 (0.89)	29.90 (2.30)	28.11 (2.16)	0.00 (0.00)	17.40 (1.34)	1302.19 (100)	1310.59	218.43
2004-2005	862.86 (66.31)	226.83 (17.43)	122.96 (9.45)	11.68 (0.90)	30.09 (2.31)	28.29 (2.17)	0.00 (0.00)	18.50 (1.43)	1301.2 (100)	1313.81	218.87
2005-2006	855.86 (65.65)	225.28 (17.28)	141.49 (10.85)	11.24 (0.86)	27.20 (2.09)	26.55 (2.04)	0.00 (0.00)	16.10 (1.23)	1303.72 (100)	1292.62	215.44

Note: (1) Figures in parenthesis give percentage of the total production (2) Necessary stock adjustments are made.

Source: Survey Data.

In Trichur region, the total value of production stood at Rs.775.93 lakh in 1996-97 which rose to Rs.1177.96 lakh in 2005-2006, recording a percentage increase of about 51.80. The share of roofing tiles in total value of production stood at 77.97 per cent, ridges 2.43 per cent, flooring tiles 3.79 per cent, hourdis 4.18 per cent, bricks 5.83 per cent, ceiling tiles 1.88 per cent and others 3.92 per cent in 1996-97. The share of each item in total value of production remained more or less the same at the end of 2005-06 with slight variations.

Table 3.40

Composition Of Products Produced By The Sample Units In Trichur Region During 1996-97 – 2005-06

(Figures in Rs. lakh)

Year	Roof tiles	Ridges	Floor tiles	Hourdis	Bricks	Ceiling Tiles	Jallies	Others	Total production	Total out put	Output per unit
1	2	3	4	5	6	7	8	9	10	11	12
1996-1997	605.01 (77.97)	18.83 (2.43)	29.43 (3.79)	32.50 (4.18)	45.20 (5.83)	14.56 (1.88)	0.00 (0.00)	30.40 (3.92)	775.93 (100)	775.20	25.84
1997-1998	655.00 (77.48)	30.17 (3.56)	24.10 (2.85)	41.23 (4.88)	46.00 (5.44)	17.65 (2.09)	0.00 (0.00)	31.25 (3.70)	845.40 (100)	843.92	28.13
1998-1999	698.60 (81.46)	27.72 (3.23)	23.72 (2.77)	27.04 (3.15)	30.89 (3.60)	19.58 (2.28)	0.00 (0.00)	30.10 (3.51)	857.65 (100)	853.45	28.45
1999-2000	671.72 (74.52)	30.47 (3.38)	24.52 (2.72)	14.53 (1.61)	100.50 (11.15)	33.92 (3.76)	0.00 (0.00)	25.80 (2.86)	901.46 (100)	910.06	30.34
2000-2001	692.01 (74.44)	30.02 (3.22)	25.29 (2.72)	17.26 (1.86)	112.72 (12.13)	21.62 (2.33)	0.00 (0.00)	30.60 (3.30)	929.52 (100)	939.12	31.30
2001-2002	785.65 (79.92)	25.80 (2.62)	24.49 (2.49)	5.20 (0.53)	86.40 (8.79)	24.01 (2.44)	0.00 (0.00)	31.50 (3.20)	983.05 (100)	995.77	33.19
2002-2003	719.49 (74.80)	61.98 (6.44)	35.90 (3.73)	5.52 (0.57)	75.80 (7.88)	30.75 (3.20)	0.00 (0.00)	32.40 (3.38)	961.84 (100)	1022.29	34.08
2003-2004	746.18 (66.55)	42.98 (3.83)	33.04 (2.95)	4.74 (0.42)	221.00 (19.71)	38.17 (3.40)	0.00 (0.00)	35.10 (3.13)	1121.21 (100)	1146.01	38.20
2004-2005	743.86 (62.38)	39.83 (3.34)	33.06 (2.77)	5.04 (0.42)	300.09 (25.17)	34.30 (2.88)	0.00 (0.00)	36.25 (3.04)	1192.43 (100)	1212.64	40.42
2005-2006	737.43 (62.60)	37.28 (3.16)	61.49 (5.23)	4.96 (0.42)	272.00 (23.09)	32.55 (2.76)	0.00 (0.00)	32.25 (2.74)	1177.96 (100)	1203.46	40.12

Note: (1) Figures in parentheses give percentage of the total production (2) Necessary stock-adjustments are made.
Source: Survey Data

In Alwaye region, the total value of production which stood at Rs. 197.49 lakh in 1996-97 rose to Rs. 293.67 lakh in 2005-06, recording a percentage increase of about 48.70. In 1996-97, the share of roofing tiles was 67.80 per cent, whereas that of ridges, flooring tiles, hourdis, bricks, ceiling tiles, jallies and others were respectively 5.63 per cent, 6.83 per cent, 0 per cent, 0 per cent, 6.63 per cent, 7.34 per cent and 5.77 per cent. In 2005-06, the share of roofing tiles increased to 75.35 per cent, flooring tiles increased to 7.76 per cent, and that of ridges, ceiling tiles, jallies and others decreased respectively to 3.89 per cent, 4.77 per cent, 4.09 per cent and 4.14 per cent.

Table 3.41

Composition Of Products Produced By The Sample Units In Alwaye Region During 1996-97 to 2005-06

(Figures in Rs. lakh)

Year	Roof tiles	Ridges	Floor tiles	Hourdis	Bricks	Ceiling Tiles	Jallies	Others	Total production	Total out put	Output per unit
1	2	3	4	5	6	7	8	9	10	11	12
1996-1997	133.88 (67.80)	11.11 (5.63)	13.50 (6.83)	0.00 (0.00)	0.00 (0.00)	13.10 (6.63)	14.50 (7.34)	11.40 (5.77)	197.49 (100)	211.22	35.20
1997-1998	136.13 (67.92)	10.43 (5.20)	13.68 (6.82)	0.00 (0.00)	0.00 (0.00)	13.20 (6.59)	14.80 (7.38)	12.20 (6.09)	200.44 (100)	213.37	35.56
1998-1999	142.66 (68.61)	11.23 (5.40)	13.45 (6.47)	0.00 (0.00)	0.00 (0.00)	13.30 (6.40)	15.40 (7.41)	11.89 (5.71)	207.93 (100)	224.43	37.41
1999-2000	146.38 (67.91)	11.28 (5.23)	15.30 (7.10)	0.00 (0.00)	0.00 (0.00)	13.50 (6.26)	16.00 (7.42)	13.10 (6.08)	215.56 (100)	230.81	38.47
2000-2001	145.71 (67.46)	11.33 (5.25)	15.96 (7.39)	0.00 (0.00)	0.00 (0.00)	13.80 (6.39)	16.60 (7.68)	12.60 (5.83)	216.00 (100)	220.82	36.80
2001-2002	152.36 (68.21)	11.38 (5.09)	16.69 (7.47)	0.00 (0.00)	0.00 (0.00)	14.00 (6.27)	17.20 (7.70)	11.75 (5.26)	223.38 (100)	240.30	40.05
2002-2003	164.80 (71.64)	11.38 (4.95)	17.46 (7.59)	0.00 (0.00)	0.00 (0.00)	14.00 (6.09)	10.80 (4.69)	11.60 (5.04)	230.04 (100)	270.69	45.12
2003-2004	184.35 (72.42)	11.51 (4.52)	21.78 (8.56)	0.00 (0.00)	0.00 (0.00)	14.02 (5.51)	11.00 (4.32)	11.90 (4.67)	254.56 (100)	305.08	50.85
2004-2005	201.32 (73.88)	11.43 (4.19)	21.90 (8.04)	0.00 (0.00)	0.00 (0.00)	14.02 (5.15)	11.80 (4.33)	12.01 (4.41)	272.48 (100)	299.52	49.92
2005-2006	221.27 (75.35)	11.43 (3.89)	22.80 (7.76)	0.00 (0.00)	0.00 (0.00)	14.02 (4.77)	12.00 (4.09)	12.15 (4.14)	293.67 (100)	274.87	45.81

Note: (1) Figures in parentheses give percentage of the total production (2) Necessary Stock-adjustments are made.
Source: Survey Data

An examination of production profile reveals that in Calicut and Alwaye regions, the share of roofing tiles increased over the reference period, and the share of roofing tiles decreased in Trichur region along with an increase in the share of bricks. It gives a clear indication of absence of product diversification in tile factories.

3.3.5 Gross Profit

Tables 3.42 to 3.44 provide a comparative picture of the profit earned by sample units of three regions during the reference period. In Calicut region, gross profit earned by the sample units exhibited a cyclical trend. In 1996-97, profit earned by the sample units amounted to Rs.28.08 lakh which increased to Rs. 234.97 lakh in 1997-98. Later it fell down to Rs.21.95 lakh in 1998-99, and which rose to Rs.404.46 lakh in 2000-2001. At the end of the reference period, sample units in Calicut region earned a profit of Rs. 61.16 lakh. On the other hand, gross profit steadily increased in Trichur and Alwaye regions exempting a few years. Gross profit per unit is found to be greater in Calicut region and less in the other two regions. This disparity may be due to economies of scale enjoyed by sample units, availability of firewood and other essential inputs at relatively lower prices or better market for the products of Calicut region.

TABLE 3.42

GROSS PROFIT (OUTPUT COST) AND VALUE-ADDED BY THE SAMPLE UNITS IN CALICUT REGION DURING 1996-97 TO 2005-06

(Figures in Rs. lakh)

Year	Input	Output	Total cost	Gross profit (3)-(4)	Gross profit/ unit	Value- added (3)-(2)	Value added/ unit
1	2	3	4	5	6	7	8
1996-1997	442.20	1041.84	1013.76	28.08	4.68	599.64	99.94
1997-1998	390.42	786.10	551.13	234.97	39.16	395.69	65.95
1998-1999	344.40	1015.19	993.24	21.95	3.66	670.79	111.80
1999-2000	469.99	1223.57	1161.14	62.43	10.41	753.58	125.60
2000-2001	275.15	1198.42	793.96	404.46	67.41	923.27	153.88
2001-2002	412.18	1178.67	1087.47	91.20	15.20	766.49	127.75
2002-2003	607.82	1276.73	1177.40	99.33	16.56	668.91	111.49
2003-2004	582.35	1310.59	988.08	322.51	53.75	728.24	121.37
2004-2005	615.30	1313.81	1192.55	121.26	20.21	698.51	116.42
2005-2006	635.72	1292.62	1231.46	61.16	10.19	656.90	109.48

Source: Compiled from Survey Data

3.3.6 Value-added

Tables 3.42 to 3.44 coln. 7 give a comparative analysis of value-added by sample units in three regions. This analysis will help us understand the contribution of tile industry in each region. Value-added figures have shown a rising trend in most of the years in Calicut region. Value-added amounted to Rs. 599.64 lakh in 1996-97 which rose to Rs.656.90 lakh in 2005-06. A direct relationship between profit and value-added was randomly observed in Calicut region. In Trichur region value-added has shown a continuously rising trend. In 1996-97, value-added figure of Trichur region was Rs. 367.04 lakh which increased to Rs. 640.84 lakh in 2005-06. In Alwaye region value-added figures have shown a slightly fluctuating trend in certain years. In 1996-97, value-added figure of Alwaye region was Rs. 135.80 lakh which rose to Rs. 164.24 lakh in 2005-06. Average value-added figure of Calicut region is found to be greater than that of the other two regions.

Table 3.43

Gross Profit (Output Cost) And Value-Added By The Sample Units In Trichur Region During 1996-97 to 2005-06

(Figures in Rs. lakh)

Year	Input	Output	Total cost	Gross profit (3)-(4)	Gross profit/ unit	Value-added (3)-(2)	Value-added/ unit
1	2	3	4	5	6	7	8
1996-1997	408.16	775.20	726.40	48.80	1.63	367.04	12.23
1997-1998	425.73	843.92	785.47	58.45	1.95	418.19	13.94
1998-1999	430.64	853.45	769.11	84.34	2.81	422.81	14.09
1999-2000	456.10	910.06	817.33	92.73	3.09	453.96	15.13
2000-2001	483.02	939.12	922.26	16.86	0.56	456.10	15.20
2001-2002	504.86	995.77	931.45	64.32	2.14	490.91	16.36
2002-2003	513.15	1022.29	916.48	105.81	3.53	509.14	16.97
2003-2004	538.46	1146.01	975.79	170,22	5.67	607.55	20.25
2004-2005	562.87	1212.64	1023.85	188.79	6.29	649.77	21.66
2005-2006	562.62	1203.46	1027.95	175.51	5.85	640.84	21.36

Source: Compiled from Survey Data

Table 3.44

Gross Profit (Output Cost) And Value-Added By The Sample Units In Alwaye Region During 1996-97 to 2005-06

(Figures in Rs. lakh)

Year	Input	Output	Total cost	Gross profit (3)-(4)	Gross profit/ unit	Value-added (3)-(2)	Value-added / unit
1	2	3	4	5	6	7	8
1996-1997	75.42	211.22	189.62	21.60	3.60	135.80	22.63
1997-1998	77.10	213.37	194.84	18.53	3.09	136.27	22.71
1998-1999	79.74	224.43	202.85	21.58	3.60	144.69	24.12
1999-2000	85.34	230.81	205.36	25.45	4.24	145.47	24.25
2000-2001	87.46	220.82	194.84	25.98	4.33	133.36	22.23
2001-2002	92.41	240.30	203.77	36.53	6.09	147.89	24.65
2002-2003	97.03	270.69	199.23	71.46	11.91	173.66	28.94
2003-2004	100.19	305.08	194.71	110.37	18.39	204.89	34.14
2004-2005	107.24	299.52	196.86	102.66	17.11	192.28	32.05
2005-2006	110.63	274.87	198.34	76.53	12.76	164.24	27.37

Source: Compiled from Survey Data

3.3.7 Employment and Remuneration

An attempt is made in this section to examine the extent of labour absorption in tile industry in the different regions (Tables 3.48 to 3.50). In Calicut region, the number of persons employed per factory was 301 in 1996-97 and 210 in 2005-06. It is clear from the data that the number of persons employed has declined over the reference period. In Trichur region, the number of persons employed per factory was 60 in 1996-97 and 40 in 2005-06. In Alwaye region, the average number of persons employed in sample units was 75 in 1996-97 and 44 in 2005-06. It is clear from the above analysis that the number of persons employed in sample tile units had declined irrespective of the regions. The following conclusions emerge from this analysis. (i) Tile units failed to attract fresh workers to this field. (ii) The main reason for the diminution in the number of workers in tile units is its unremunerative wage structure.

3.3.8 Structural Ratios

Various structural ratios of the sample units of three regions for the reference period are discussed here. The most important ratios are fixed capital-invested capital, fixed capital-productive capital, fixed capital-output, invested capital-output, and so forth. The results of these ratios are presented in Tables 3.45 to 3.47 respectively for Calicut, Trichur and Alwaye regions. The major inferences are:-

i) Fixed capital-invested capital ratio and fixed capital-productive capital ratio give a clue regarding the magnitude of capital consumption. The higher these ratios, the greater the intake of capital in the industry. These two ratios are found to be greater in Trichur and Alwaye regions. This was due to some attempt on the part of certain companies to effect modernisation. These ratios are found to be comparatively lower in Calicut region, for companies in this region had already effected modernisation.

ii) The extent of stock piling in the form of materials, semi-finished goods and finished goods can be understood, if we examine the invested capital to output ratio. This ratio ranged between 0.72 to 1.07 in Calicut region; 1.10 to 1.76 in Alwaye region and 2.34 to 2.52 in Trichur region. Fluctuation associated with this ratio hints at cyclical nature of the industry.

iii) Input-output ratio showed a slightly rising trend in three regions over the period which establishes the increase in the cost of inputs. Among the three regions, input-output ratio is comparatively lower in Calicut and Trichur regions.

iv) An idea regarding industry's contribution can be had, if we analyse the value-added-output ratio. The higher the value-added-output ratio, the greater will be the contribution of industry. This ratio showed a minor fluctuation in Calicut, Trichur and Alwaye regions. This ratio is found to be comparatively lower in Alwaye region and relatively higher in Trichur region.

v) Other important ratios to be dealt with are input per worker, output per worker, value-added per worker and so on. These ratios continuously increased over the years in value terms.

Table 3.45

Important Structural Ratios Of The Sample Units In Calicut Region During 1996-97 to 2005-06

(Figures in Rs. lakh)

Year	FC/IC	FC/PC	Input/ output	VA/ Output	FC/ output	IC/ output	VA/IC	Output / Worker	Input Worker	VA/ worker	VA/ Input	Output / input	Output / IC	Input /IC
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1996-1997	0.48	0.48	0.42	0.58	0.37	0.76	0.75	0.58	0.24	0.33	1.36	2.36	1.31	0.56
1997-1998	0.47	0.46	0.50	0.50	0.50	1.07	0.47	0.44	0.22	0.22	1.01	2.01	0.93	0.46
1998-1999	0.50	0.55	0.34	0.66	0.41	0.82	0.81	0.58	0.20	0.38	1.95	2.95	1.22	0.41
1999-2000	0.44	0.47	0.38	0.62	0.35	0.79	0.78	0.69	0.27	0.43	1.60	2.60	1.27	0.49
2000-2001	0.44	0.54	0.23	0.77	0.35	0.79	0.97	0.70	0.16	0.54	3.36	4.36	1.26	0.29
2001-2002	0.41	0.46	0.35	0.65	0.35	0.85	0.76	0.81	0.28	0.52	1.86	2.86	1.17	0.41
2002-2003	0.42	0.45	0.48	0.52	0.32	0.74	0.70	0.90	0.43	0.47	1.10	2.10	1.34	0.64
2003-2004	0.44	0.50	0.44	0.56	0.32	0.72	0.77	0.93	0.41	0.52	1.25	2.25	1.39	0.62
2004-2005	0.42	0.48	0.47	0.53	0.31	0.74	0.72	1.01	0.47	0.54	1.14	2.14	1.36	0.64
2005-2006	0.42	0.49	0.49	0.51	0.31	0.72	0.70	1.02	0.50	0.52	1.03	2.03	1.38	0.68

Source: Compiled from Survey Data

TABLE 3.46

IMPORTANT STRUCTURAL RATIOS OF THE SAMPLE UNITS IN TRICHUR REGION DURING 1996-97 – 2005-06

(Figures in Rs. lakh)

Year	FC/IC	FC/PC	Input/ output	VA/ Output	FC/ output	IC/ output	VA/IC	Output / Worker	Input Worker	VA/ worker	VA/ Input	Output / input	Output / IC	Input /IC
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1996-1997	0.83	0.86	0.53	0.47	2.07	2.50	0.19	0.43	0.23	0.20	0.90	1.90	0.40	0.21
1997-1998	0.82	0.86	0.50	0.50	1.92	2.34	0.21	0.47	0.24	0.23	0.98	1.98	0.43	0.22
1998-1999	0.82	0.85	0.50	0.50	1.96	2.37	0.21	0.51	0.26	0.25	0.98	1.98	0.42	0.21
1999-2000	0.82	0.85	0.50	0.50	1.92	2.35	0.21	0.58	0.29	0.29	1.00	2.00	0.43	0.21
2000-2001	0.82	0.85	0.51	0.49	2.00	2.43	0.20	0.64	0.33	0.31	0.94	1.94	0.41	0.21
2001-2002	0.82	0.84	0.51	0.49	1.99	2.42	0.20	0.73	0.37	0.36	0.97	1.97	0.41	0.21
2002-2003	0.83	0.85	0.50	0.50	2.06	2.47	0.20	0.77	0.38	0.38	0.99	1.99	0.41	0.20
2003-2004	0.83	0.85	0.47	0.53	1.95	2.34	0.23	0.90	0.42	0.48	1.13	2.13	0.43	0.20
2004-2005	0.84	0.85	0.46	0.54	1.97	2.35	0.23	0.99	0.46	0.53	1.15	2.15	0.43	0.20
2005-2006	0.85	0.86	0.47	0.53	2.14	2.52	0.21	1.01	0.47	0.54	1.14	2.14	0.40	0.19

Source: Compiled from Survey Data

TABLE 3.47

IMPORTANT STRUCTURAL RATIOS OF THE SAMPLE UNITS IN ALWAYE REGION DURING 1996-97 TO 2005-06

(Figures in Rs. lakh)

Year	FC/IC	FC/PC	Input/ output	VA/ Output	FC/ output	IC/ output	VA/IC	Output / Worker	Input Worker	VA/ worker	VA/ Input	Output / input	Output / IC	Input /IC
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1996-1997	0.85	0.96	0.36	0.64	0.94	1.10	0.58	0.47	0.17	0.30	1.80	2.80	0.91	0.32
1997-1998	0.84	0.94	0.36	0.64	1.00	1.19	0.54	0.47	0.17	0.30	1.77	2.77	0.84	0.30
1998-1999	0.84	0.93	0.36	0.64	1.07	1.27	0.51	0.50	0.18	0.32	1.81	2.81	0.79	0.28
1999-2000	0.84	0.92	0.37	0.63	1.14	1.36	0.46	0.57	0.21	0.36	1.70	2.70	0.74	0.27
2000-2001	0.84	0.90	0.40	0.60	1.38	1.64	0.37	0.60	0.24	0.36	1.52	2.52	0.61	0.24
2001-2002	0.83	0.90	0.38	0.62	1.33	1.60	0.38	0.67	0.26	0.41	1.60	2.60	0.62	0.24
2002-2003	0.83	0.89	0.36	0.64	1.30	1.56	0.41	0.82	0.29	0.53	1.79	2.79	0.64	0.23
2003-2004	0.81	0.86	0.33	0.67	1.19	1.47	0.46	1.02	0.33	0.68	2.06	3.06	0.68	0.22
2004-2005	0.79	0.84	0.36	0.64	1.27	1.60	0.40	1.10	0.39	0.71	1.79	2.79	0.62	0.22
2005-2006	0.80	0.85	0.40	0.60	1.41	1.76	0.34	1.03	0.41	0.62	1.48	2.48	0.57	0.23

Source: Compiled from Survey Data

Table 3.48

Selected Aggregates Of The Sample Units In Calicut Region During 1996-97 to 2005-06

(Figures in Rs. lakh)

Year	FC	IC	PC	Input	Output	VA	Workers	Selected aggregates per unit						
								FC	IC	PC	Input	Output	VA	Worker
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1996-1997	385.54	796.30	802.96	442.20	1041.84	599.64	1805	64.26	132.72	133.83	73.70	173.64	99.94	301
1997-1998	394.22	841.09	853.34	390.41	786.10	395.69	1805	65.70	140.18	142.22	65.07	131.02	65.95	301
1998-1999	417.82	830.58	754.64	344.40	1015.19	670.79	1765	69.64	138.43	125.77	57.40	169.20	111.80	294
1999-2000	424.90	962.91	907.44	469.99	1223.57	753.58	1765	70.82	160.49	151.24	78.33	203.93	125.60	294.
2000-2001	420.64	950.88	783.21	275.15	1198.42	923.27	1715	70.11	158.48	130.54	45.86	199.74	153.88	286
2001-2002	415.99	1005.50	909.60	412.18	1178.67	766.49	1460	69.33	167.58	151.60	68.70	196.45	127.75	243
2002-2003	403.07	950.24	905.35	607.82	1276.73	668.91	1424	67.18	158.37	150.89	101.30	212.79	111.49	237
2003-2004	418.95	945.39	846.22	582.35	1310.59	728.24	1407	69.83	157.57	141.04	97.06	218.43	121.37	234
2004-2005	410.50	967.57	857.42	615.30	1313.81	698.51	1296	68.42	161.26	142.90	102.55	218.97	116.42	216
2005-2006	396.32	935.09	814.56	635.72	1292.6	656.90	1263	66.0	155.85	135.76	105.95	215.44	109.48	210

					2			5						

Source: Compiled from Survey Data

TABLE 3.49

SELECTED AGGREGATES OF THE SAMPLE UNITS IN TRICHUR REGION DURING 1996-97 TO 2005-06

(Figures in Rs. lakh)

Year	FC	IC	PC	Input	Output	VA	Workers	Selected Aggregates per unit						
								FC	IC	PC	Input	Output	VA	Worker
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1996-1997	1606.58	1936.03	1857.75	408.16	775.20	367.04	1799	53.55	64.53	61.93	13.61	25.84	12.23	60
1997-1998	1619.95	1973.83	1890.55	425.73	843..92	418.19	1787	54.00	65.79	63.02	14.19	28.13	13.94	60
1998-1999	1671.26	2026.75	1958.14	430.64	853.45	422.81	1682	55.71	67.56	65.27	14.35	28.45	14.09	56
1999-2000	1750.38	2134.50	2062.39	456.10	910.06	453.96	1566	58,35	71.15	68.75	15.20	30.34	15.13	52
2000-2001	1877.89	2286.58	2218.93	483.02	939.12	456.10	1471	62.60	76.22	73.96	16.10	31.30	15.20	49
2001-2002	1976.98	2408.36	2345.31	504.86	995.77	490.91	1358	65.90	80.28	78.18	16.83	33.19	16.36	45
2002-2003	2101.36	2523.84	2467.07	513.15	1022.29	509.14	1335	70.05	84.13	82.24	17.11	34.08	16.97	44
2003-2004	2235.17	2683.87	2633.43	538.46	1146.01	607.55	1275	74.51	89.46	87.78	17.95	38.20	20.25	42
2004-2005	2390.96	2847.87	2809.16	562.87	1212.64	649.77	1224	79.70	94.93	92.64	18.76	40.42	21.66	41
2005-2006	2578.61	3030.89	2997.63	562.62	1203.46	640.84	1194	85.95	101.03	99.92	18.75	40.12	21.36	40

Source: Compiled from Survey Data

Table 3.50

Selected Aggregates Of The Sample Units In Alwaye Region During 1996-97 to 2005-06

(Figures in Rs. lakh)

Year	FC	IC	PC	Input	Output	VA	Worker	Selected aggregates per unit						
								FC	IC	PC	Input	Output	VA	Worker
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1996-1997	198.26	233.06	205.75	75.42	211.22	135.80	453	33.04	38.84	34.29	12.57	35.20	22.63	75
1997-1998	213.74	253.19	226.41	77.10	213.37	136.27	453	35.62	42.20	37.74	12.85	35.56	22.71	75
1998-1999	240.13	285.60	257.51	79.74	224.43	144.69	453	40.02	47.60	42.92	13.29	37.41	24.12	75
1999-2000	263.48	313.69	287.43	85.34	230.81	145.47	404	43.91	52.28	47.91	14.22	38.47	24.25	67
2000-2001	305.03	363.23	337.51	87.46	220.82	133.36	366	50.84	60.54	56.25	14.58	36.80	22.23	61
2001-2002	319.45	384.57	356.58	92.41	240.30	147.89	360	53.24	64.10	59.43	15.40	40.05	24.65	50
2002-2003	350.57	422.27	395.56	97.03	270.69	173.66	330	58.43	70.38	65.93	16.17	45.12	28.94	55
2003-2004	363.56	449.08	423.55	100.19	305.08	204.89	300	60.59	74.85	70.59	16.69	50.85	34.14	50
2004-2005	380.09	479.82	453.35	107.24	299.52	192.28	272	63.35	79.97	75.56	17.87	49.92	32.05	45
2005-2006	388.32	484.90	457.95	110.63	274.87	164.24	267	64.72	80.82	76.33	18.44	45.81	27.37	44

Source: Compiled from Survey Data

3.4 Inter-regional Variation

In the above section, we examined the economics of tile manufacturing units in different regions separately. It is a priori felt that there are regional differences in the economics. To substantiate this ANOVA was tried. But the results indicated only a marginal variation between the regions. Further, the critical values were not significant also. Alternative statistical tests also established the same. Thus, it may be inferred that there are no significant differences between the regions. But considering from the practical point of view, it is felt that Calicut region would have reflected uniqueness. The hiding of this reality may be due to the relatively high size of figures for all variables in the Calicut region; thus the ratios remaining at almost similar to other regions.

Conclusion

In this chapter, we have examined the profile of sample units and economics of tile industry at the aggregate and disaggregate (regional) level. It is apparent from the above discussion that there are differences with regard to the nature of technology, forms of organisation, nature of acquisition, level of education of entrepreneurs and so on among the sample units of three regions.

Examination of economics of tile industry at the aggregate level brings out certain interesting features. Data relating to capital structure indicated that land is the main component of fixed capital at the aggregate level. Analysis of the composition of working capital revealed that the sample units raised enough working capital by way of loans and advances. It is found from the analysis that clay and firewood shared nearly 82 per cent of the total inputs purchased. The study proved that roofing tile occupied the first place among the various clay products manufactured by the tile industry.

Economics of tile industry at the disaggregate level gives more or less the same result.

A clear picture regarding the performance of tile industry is not obtained without attempting physical performance. A brief description regarding the theoretical as well as empirical aspects of productivity is given in the next chapter.

Notes and References

1. Gupta, K.R., (1984), *Economics and Management of Public Enterprises*, Vol.1, Atlantic Publishers, New Delhi, p. 155.

CHAPTER IV

PRODUCTIVITY TRENDS OF THE TILE INDUSTRY IN KERALA

INTRODUCTION

The objective of the present chapter is to describe and analyse productivity trends in the tile industry in Kerala during 1995-96 to 2005-06. Studies on total factor productivity acquire great significance in the context of growth in developing economies. These economies are characterised by acute scarcity of resources, and must use the available resources as best as they can. Also, generation of surplus which plays a pivotal role in their growth depends crucially on the efficiency with which resources are used. Evidently, the present study on productivity trends in tile manufacturing units in Kerala would be of much interest, as it will bring out how effectively resources are utilised.

Section A of this chapter discusses the conceptual and theoretical framework of productivity. Section B provides results of empirical study.

SECTION A

4.1 Productivity Analysis - Theoretical Framework

The resources available to any nation for economic development are limited. Thus its economic and social development depend on its efficient utilisation of available resources. Most developed nations have attained their present level of advancement by full utilisation of productive resources such as man-power, materials and capital. On the other hand, nations remain underdeveloped because they lack the determination and capacity to use the existing resources efficiently. Thus, economy in the use of resources is of vital importance for developing countries. In modern terminology, the concept of economy in the use of resources, is called 'productivity'.

Increase in productive efficiency is the key to economic progress. The increase in output is made of two elements. One is the increase in output due to increase in inputs or resources expended and the other is the rise in productive efficiency. Productivity growth is recognised as a key feature of economic dynamism today. The role of productivity in accelerating the pace of economic growth is recognised in both the theoretical and empirical literature on growth.

Productivity is usually defined as the ratio of the output of products or services to the input of resources in the form of man-power, machinery and materials. In broadest terms, "productivity" is the change in results obtained for the resources expanded (Davis, 1955).[1] Productivity is the fundamental measure of a technology's contribution (Brynjolfsson, 1993).[2] It is a measure of how efficiently and effectively a variety of resources is used as inputs to produce output needed by society (Mohanty and Deshmukh, 1988).[3] According to John. W. Kendrick (1983)[4], "Productivity is the relationship between output of goods and services and inputs of basic resources – labour, capital goods and material resources". Productivity, in economics, is a measure of productive efficiency calculated as the ratio of what is produced to what is required to produce it.

4.1.1 Importance

Productivity is one of the important parameters of measuring the efficiency in the utilisation of factor inputs. It is considered as the single main source of per capita output growth, a central component of economic welfare. Explanations of the enhancement of output growth have unravelled miracles and mysteries. Two routes have been used to explain the higher output growth: (a) in terms of factor augmentation, and (b) in terms of factor productivities. As the first route exhausts in terms of saturation of the scarce factors of production, the second route provides promising interpretation; often unexplainable in terms of short run factors, acquiring the label of "the measure of ignorance."

Contributions of productivity increase to economic growth are well brought out in growth accounting exercises. More importantly, it has been recognised that economic growth without productivity growth becomes unsustainable and does little for raising the standard of living. Unravelling the growth process of industrialized economies since the 18th century shows that the growth was fuelled mainly by improvement in labour productivity. In terms of human welfare too, productivity growth plays a vital role in the long run. It contributes to the general standard of living in a society.

4.2 Measurement of Productivity

There are many ways to quantify total factor productivity growth. As the commonly used measures vary in their approaches to measurement according to definitions of the concept they adopt, we define productivity growth as is used in these studies before outlining these measures. In general, productivity growth can be defined as:

(a) the difference between value of output and inputs in constant prices.

(b) the ratio between the value of output and inputs, and

(c) the ratio of the actual output to the potential output. The first two approaches are called the classical approach and the third, the frontier approach.

An early version of classical approach can be seen in Davis (1955).[5] He defines a measure of productivity as

$$\mathbf{P = Y - l - k - m} \qquad \text{.................... (1)}$$

where ,

Y represents output. **l** = labour, **k** = capital and **m** = materials in base year prices.

For the sake of comparison, P is divided either by the value-added, final output or by the value of inputs, resulting in a ratio. These ratios of output to particular input are called *Partial productivity measures*, in which output is compared with one input at a time. In the literature, most commonly used partial productivity indices are labour and capital productivity indices which are defined as output per unit of labour input and output per unit of capital input, respectively. Partial productivity indices do not measure overall productivity changes but provide useful information on the measure of saving achieved in particular cost elements over time. As noted by Kendrick (1961)[6] these measures fail to consider overall productivity changes as factor substitution which changes the composition of inputs.

Thus to measure changes in overall productivity, output must be related to the aggregate of corresponding inputs. This is generally done by constructing an index of weighted average of inputs using either relative prices or factor shares as the weight. Such an index, essentially an output-input ratio, is known as total factor productivity index (Domar, 1961).[7]

Total factor productivity (TFP) can be expressed as

$$\mathbf{TFP = Y/\Sigma i\ (Wi\ Xi)} \qquad \text{........................ (2)}$$

Where Y indicates the level of production,

Xi the quantity of factor input 'i' and
Wi some appropriate weights.

Thus for two inputs capital (K) and labour (L) TFP can be expressed as

TFP = Y / (WiL + WkK) .... (3)

The issue here is to arrive at appropriate weights. This can either be exogenously given or arrived at statistically.

Total productivity presents a more suitable way to measure the productivity of a firm. It is the relationship between outputs and sacrificed input items to create those output (Hilmola, 2005).[8] It is a broader concept encompassing the effect not only of technical progress but also of better utilisation of capacities, learning by doing and improved skills of labour. (Goldar, 1986).[9] Thus total factor productivity growth is a composite measure of technological change and changes in the efficiency with which known technology is applied to production (Ahluwalia, 1991).[10] Therefore, total factor productivity growth is the combined result of technical progress and the technical efficiency change with which the factors are used to produce output (Fan, 1991).[11]

The literature spells out four different approaches to measure total factor productivity of an industrial sector and economy as a whole.
i) Growth accounting approach, ii) Econometric estimation of production and cost functions, iii) Production frontier approach, and iv) Non-parametric approach.

Growth accounting method arrives at total factor productivity growth as the difference between the growth in output and the growth in aggregate inputs. Growth accounting method is also referred to as the index number approach. Index of total factor productivity is constructed using the residual thus obtained.

The index number approach can be employed only if weights for the aggregate of the inputs are known. Two indices most often used in empirical research are *Kendrick's arithmetic measure and Solow's geometric index* [Kendrick, (1961)[12], Solow, (1957)[13]]. These indices relate modern economic production theory to the weighting process. Kendrick's approach is based on a linear homogeneous production function for two inputs – labour and capital. Let wo and ro respectively denote the factor rewards of labour and capital in the base year of the study, then the Kendrick index of total factor productivity in year 't' may be written as:

$$At = \frac{Yt}{\omega oL + rokt} \qquad \text{.................. (4)}$$

On the other hand, the geometric index of the total factor productivity growth rate is defined as

$$\mathbf{TFPG = dy/y - [\alpha(dxi/xi) + (1\text{-}\alpha)\ (dyk/xk)]} \qquad \text{.......... (5)}$$

Where, ***Y*** denotes output, ***L*** labour input, ***k*** capital input and α the input expenditure share of labour. The measure is based on the *Cobb-Douglas production function* with constant returns to scale. Solow demonstrated that the residual growth would become a measure of technical progress, provided the share of the value of inputs in the total revenue may be used as weights for the aggregation.

In the case of multiple output TFP can also be measured as the ratio of an index number describing aggregate output levels and an index of aggregate input levels. Tornqvist index is an important variant of the Divisia index.

4.2.1 Parametric and Non-parametric Approaches

In the parametric approach, an explicit function form of production, cost or profit function is specified and estimated econometrically. This estimated model is then utilised to compute the rate of productivity change and its components. Two different methodologies are used for this: one is to estimate flexible functional form without giving much importance to the requisite economic properties of the cost/production function and the equilibrium condition arising from optimization. The second method is to impose the properties and the equilibrium conditions and estimate the total factor productivity growth or test whether the production function is well behaved. The frontier approach too makes use of parametric and non-parametric methods. The frontier approach implies that efficient firms are those operating on the cost or production frontiers, while the inefficient ones operate above the cost or below the production frontier (Farrel, 1957).[14] The distance from the frontier is the measure of inefficiency and in deterministic frontier models, technical efficiency is defined on the factor by which the level of production for the firm is less than its frontier output.

Non-parametric analysis makes use of only minimal regulatory assumptions about technology and data development analysis is performed. Econometric approach can further be classified into primal and dual. While the primal approach requires data on input and output quantities, the dual approach makes use of input-output price information. Total factor productivity growth is computed as the difference between the change in total cost and the weighted change in the input prices.

It emerges from the above survey that the various methods of computing total factor productivity growth involves various assumptions having important bearing on the results. The results are sensitive to both the methods employed and data used. Interpretation of the results should thus be in the light of the methodology adopted and underlying assumptions.

SECTION B

4.3 Empirical Estimates of Productivity

4.3.1 Labour Productivity in the Tile Industry in Kerala

The tile industry is one of the traditional industries in Kerala. This industry is labour-intensive in nature. Labour is the most important dynamic force in each and every process of tile manufacture. The productivity of workers primarily depends on the technology (type of kiln) employed by the tile factories. The type of kiln represents the level of technology. There are three types of kiln used by the tile factories in Kerala, viz, down-draught kiln, semi-continuous kiln and continuous kiln.

In order to carry out the study of measuring labour productivity, a sample of 42 tile factories, representing 6 factories from the Calicut region, 30 factories from the Trichur region and 6 units from the Alwaye region were selected on random basis. The sample includes all the three types of kiln. The sample consists of 19 down-draught kiln units representing traditional technology of production, 13 semi-continuous kiln units representing intermittent technology, and 10 continuous kiln units representing modern technology of production. The analysis is done by employing tools like Average, Analysis of Variance and Critical Difference Analysis.

4.3.2 Labour Productivity

Labour productivity is considered as the most important productivity measure of tile industry due to the following reasons.

(i) It is a rural industry, labour intensive in nature, providing employment to rural people.

(ii) There is technological stagnation in the industry.

(iii) The direct labour cost accounts for 40-45 per cent of the direct cost of manufacture, and

(iv) There is disparity in direct wages with regard to level of technology used by the sample tile factories.

Productivity of labour is measured with the help of the following variables.

(a) Output per worker, and (b) Output per rupee of wages.

The result of each variable is presented below.

4.3.3 Out put Per worker

Output per worker denotes the number of tiles that a worker produces in a year. The frequency distribution showing the annual output per worker is shown in Table 4.1

TABLE 4.1

FREQUENCY DISTRIBUTION OF ANNUAL OUTPUT PER WORKER

Annual output per worker (No. of Tiles)	No. of units	Percentage
10,000 - 20,000	17	40.47
20,000 - 30,000	9	21.43
30,000 - 40,000	6	14.29
40,000 - 50,000	8	19.05
50,000 - 60,000	1	2.38
60,000 - 70,000	1	2.38
70,000 and Above	--	--
Total	42	100

Source: Survey Data.

The Table indicates that 17 units representing 40.47 per cent of the sample had the output per worker between 10,000 and 20,000 tiles per annum. Annual output per worker is between 20,000 and 30,000 tiles for 9 units representing 21.43 per cent of the sample units. Six units representing 14.29 per cent of the sample units produce output per worker between 30,000 and 40,000 tiles per annum. It is very clear from the Table that sample units producing annual output per worker above 70,000 tiles are absent. The data given in the Table also indicate that the labour productivity is very low in most of the sample units.

To examine whether the annual output per worker differs in different types of kiln used, the technology-wise annual output per worker is calculated and is presented below.

TABLE 4.2

TECHNOLOGY-WISE ANNUAL OUTPUT PER WORKER

Technology	Mean Annual Output per worker (No. of Tiles)
Continuous kiln	35620
Semi - continuous kiln	18718
Down-draught kiln	24368
Over all average	26235

Source: Survey Data.

The mean annual output per worker is more than the overall average in units of continuous kiln and is less than the over all average in semi-continuous and down-draught kilns. To measure the significance in the difference in the output per worker across the type of kilns used, Analysis of Variance (ANOVA) is used and the F ratio is found to be 6.903, which is significant at 5 per cent level ($P = 0.038$). Thus the annual output per worker across the three types of kiln is statistically significant.

Analysis of Variance

Source	Sum of squares	D.F	Mean Square	F	P
Between samples	1747449772	2	873724886		
				6.903	**0.038**
Within samples	4936059102	39	12656518		
Total	6683508874	41			

4.3.4 Output Per rupee of Wages

Output per rupee of wages shows the number of tiles that are produced on payment of one rupee as direct wages to the workers engaged in tile manufacture. The frequency distribution of output per rupee of wages is calculated and tabulated below.

TABLE 4.3

FREQUENCY DISTRIBUTION OF OUTPUT PER-RUPEE OF WAGES

Output per rupee of wages of worker (No. of tiles)	No. of units	Percentage
Less than 1	22	52.39
1 - 3	11	26.19
2 - 3	4	9.52
3 - 4	2	4.76
4 - 8	1	2.38
8 - 10	2	4.76
Total	42	100.00

Source: Survey Data.

Table 4.3 shows that on payment of one rupee, 22 units, representing 52.39 per cent of the sample, manufacture less than 1 tile. But 11 units, representing 26.19 per cent of the sample, are capable of producing 1 to 2 tiles on payment of one rupee. But 4 units could manufacture 2 to 3 tiles, and 2 units could manufacture 3 to 4 tiles on payment of one rupee. There was only one unit which could make 4 to 8 tiles per rupee of wages. There was not even a single unit which could produce 10 tiles and above per rupee of wages.

The technology-wise output per rupee of wages is furnished in Table 4.4.

TABLE 4.4

TECHNOLOGY-WISE MEAN OUTPUT PER RUPEE OF WAGES

Technology	Mean output per rupee of wages (No. of Tiles)
Continuous kiln	2.47
Semi-continuous kiln	0.99
Down-draught kiln	1.54
Overall average	1.66

Source: Survey Data.

According to the Table, the mean output per rupee of wages is the highest in continuous kiln and that of semi-continuous kiln units is the lowest. Output per rupee of wages is less than the overall average in semi-continuous and down-draught kilns. Output per rupee of wages is the highest in continuous kiln, despite comparatively higher salaries given to the workers in these regions because of higher production and economies of scale associated with continuous kilns.

The significance of the above difference according to technology can be tested with the help of ANOVA as follows:

Analysis of Variance

Source	Sum of squares	D.F	Mean Square	F significance	P Value
Between groups	13.633	2	5.05		
				1.38	**0.265**
Within groups	193.265	39	4.96		
Total	206.898	41			

The result of ANOVA shows that the difference in output per rupee of wages in different types of kiln is not significant at 5 per cent level of significance (P = 0.265). To test significance of the difference between different pairs of technology, Critical Difference Analysis (CDA) is carried out and the result is shown below.

Critical Difference Analysis of
Mean Output per Rupee of Wages Across Technology

Technology	Difference between Means	't' value	P Value
Continuous kiln and down-draught kiln	2.47 - 1.54 = 0.93	0.85*	0.408
Continuous kiln an Semi-continuous kiln	2.47 - 0.99 = 1.48	1.55*	0.152
Down-draught kiln and Semi-continuous kiln	1.54 - 0.99 = 0.55	0.90*	0.337

Note: * The values denotes significance at 5 per cent level.

As per the Critical Difference Analysis (CDA) the difference in mean output per rupee of wages between semi-continuous kiln and other two types, and continuous kiln and down-draught kiln is not statistically significant at 5 per cent level.

An attempt has also been made to assess the inter-regional differences in the physical performance of tile industry by computing labour productivity in terms of output-labour ratio and value-added-labour ratio. In this context number of persons employed is taken as a measure of labour input. We take the numbers of persons employed and multiply by the number of days worked in that year to get the labour input scores for our study. Tables 4.5 and 4.6 given below measure inter-regional differences in labour productivity in terms of gross output per worker and value-added per worker.

TABLE 4.5

LABOUR PRODUCTIVITY (GROSS OUTPUT/WORKER APPROACH)

(Figures in Rs. lakhs)

Year	Calicut	Trichur	Alwaye
1996-97	0.0019 (100.00)	0.0014 (100.00)	0.0015 (100.00)
1997-98	0.0014 (73.68)	0.0015 (107.14)	0.0015 (100.00)
1998-99	0.0019 (100.00)	0.0016 (114.28)	0.0016 (106.66)
1999-00	0.0023 (121.05)	0.0019 (135.71)	0.0019 (126.66)
2000-01	0.0023 (121.05)	0.0021 (150.00)	0.0020 (133.33)
2001-02	0.0026 (136.84)	0.0024 (171.42)	0.0022 (146.66)
2002-03	0.0029 (152.63)	0.0025 (178.50)	0.0027 (180.00)
2003-04	0.0031 (163.15)	0.0029 (207.14)	0.0033 (220.00)
2004-05	0.0033 (173.68)	0.0033 (235.71)	0.0036 (240.00)
2005-06	0.0034 (178.94)	0.0335 (239.28)	0.0034 (226.00)

Note: Figures in parentheses indicate indices of labour productivity.
Source: Compiled from Survey Data.

Labour productivity explains the quantity of output derived out of each labour input. Table 4.5 shows that the output per unit of labour in Calicut region was Rs. 0.0019 lakh in 1996-97 and by the year 2005-06, it has risen to Rs. 0.0034 lakh, while the same in Trichur region has recorded as 0.0014 lakh in 1996-97 and Rs. 0.0335 lakh in 2005-06. More or less the same pattern has been shown by Alwaye region also. It may be mentioned that, by employing one more unit of labour, enhancement in output seems more or less the same in Trichur, Calicut and Alwaye regions during 2005-06. It may be noted that indices of productivity per worker (output per worker approach) have gone up less than two times in Calicut region but more than two times in Trichur and Alwaye regions.

Analysis of labour productivity in terms of value-added-worker ratio is given in Table 4.6.

TABLE 4.6

LABOUR PRODUCTIVITY (VALUE-ADDED/WORKER APPROACH)

(Figures in Rs. lakh)

Year	Calicut	Trichur	Alwaye
1996-97	0.0011 (100.00)	0.0006 (100.00)	0.0009 (100.00)
1997-98	0.0007 (67.63)	0.0007 (116.66)	0.0001 (111.40)
1998-99	0.0012 (109.09)	0.0008 (133.33)	0.0010 (111.10)
1999-00	0.0014 (127.27)	0.0009 (150.00)	0.0012 (133.33)
2000-01	0.0017 (121.42)	0.0010 (166.66)	0.0012 (133.33)
2001-02	0.0017 (121.42)	0.0012 (200.00)	0.0013 (144.44)
2002-03	0.0015 (136.36)	0.0012 (200.00)	0.0017 (188.88)
2003-04	0.0017 (154.54)	0.0015 (250.00)	0.0022 (244.44)
2004-05	0.0017 (154.54)	0.0017 (283.33)	0.0023 (255.55)
2005-06	0.0017 (154.54)	0.0017 (283.33)	0.0020 (222.22)

Note: Figures in parentheses indicate indices of labour productivity.
Source: Compiled from Survey Data.

Table 4.6 indicates labour productivity in terms of value-added-worker ratio. Labour productivity recorded an improvement during the period under study in all the regions. But labour productivity is found to be relatively high in Alwaye region compared to the other two regions. It may be noted that indices of productivity per worker (value-added per worker) have gone up less than two times in Calicut but more than two times in Trichur and Alwaye regions. The improvement in labour productivity may be attributed to increase in prices of output rather than increase in the efficiency of workers.

4.4 Total Factor Productivity (TFP)

Dissatisfaction with the analytical defects of the partial productivity measures had led economists to evolve the Total Factor Productivity (TFP) measure. Since both labour and capital jointly contribute to output, it is necessary to derive a total factor productivity index that will include both labour and capital inputs. The TFP indices aim at relating the output to the combined use of all the resources. The total factor productivity or technical change captures growth in value-added not accounted for by the growth in inputs such as labour and capital.

Total factor productivity may be defined as the ratio of output to a weighted combination of inputs. The methodology for measurement of total factor productivity may be classified into two categories, viz; (i) a non-parametric index number approach, and (ii) a parametric production function approach.

4.4.1 Variables defined

Gross Output: It is the aggregate market value of products manufactured for sale. The measure of output in the present study is gross value-added. Gross value-added is the difference between total value of output minus total value of inputs. Gross value-added is measured in monetary value terms at current prices, though gross value-added at constant price is more preferable.

Labour Input: Labour is a service input in production process. Regarding the measurement of labour input, there are three alternatives available viz., man- hours worked, number of workers and number of employees. In the present study, however, we have taken the wages and salaries of labourers as the measure of labour input.

Capital Input: Capital input manifests itself in two forms: fixed and working. Measurement of capital stock is a difficult problem in the case of an age-old traditional industry like tile. So the study favours the use of value of working capital at current prices as a measure of capital input.

The present study is intended to observe the pattern of tile manufacturing units' productivity during 1996-97 to 2005-06. In order to compute TFP growth, three measures are used. They are (a) Direct Method, (b) Kendrick Index Method, and (c) Cobb-Douglas Production Method. The analysis of productivity is based on primary data collected through visits to the various plants.

4.4.2 Direct Method

Direct method of total factor productivity is the geometric average of the partial factor productivities. Partial factor productivity is obtained by dividing value-added by the respective factors of production. If we define partial factor productivity of capital by PFP_K, partial productivity of labour by PFP_L, and total factor productivity by TFP, then,

$$PFP_{Kt} = {}^{Vt}\!/_{Kt}$$

and $$PFP_{Lt} = {}^{Vt}\!/_{Lt}$$

where, **V(t)** = Value-added for the year t,

K(t) = Capital employed for the year t, and

L(t) = Labour employment for the year t.

Thus, the TFP for the year t through the Direct Method will be calculated as:

$$TFP_t = \sqrt{(PFP_{kt}) \cdot (PFP_{Lt})}$$

4.4.3 Kendrick Index

The Kendrick index is the ratio of the actual output to change in output, which would have resulted from the use of increased inputs in the absence of technological changes. The index measures average productivity of an arithmetic combination of labour and capital. This index implicitly assumes constant returns to scale, neutral technical progress, and an infinite elasticity of substitution between labour and capital. It is defined as:

$$TFP(k) = \frac{Vt}{woL_t + roK_t}$$

Where, **V** stands for indices of real value added, **L** for indices of labour, **K** for indices of capital, and $\mathbf{w_0}$ and $\mathbf{r_0}$ for the share of labour and capital respectively in value-added in the base year.

4.4.4 Production Function Approach

The production function expresses the technological relationship between various inputs and output. The main purpose of applying production function is to estimate marginal productivity and elasticity of inputs, returns to scale and elasticity of substitution between the inputs. Among the available literature of production functions, the choice in this study is in favour of Cobb-Douglas Production Function. Since tile industry is a traditional industry, quality of data is poor and value of coefficient is inaccurate. Hence, the methodology was confined to the conventional Cobb-Douglas production function.

Cobb-Douglas production function can be written as:

$$Q = AK^{\beta_1} L^{\beta_2} e^{u}$$

Where

Q = Measure of output (value-added)

A = Efficiency parameter

K and **L** are working capital and wages and salaries.

$\boldsymbol{\beta_1}$ and $\boldsymbol{\beta_2}$ are constants to be determined empirically.

The Cobb-Douglas production function restricts the elasticity of substitution between capital and labour to unity which may or may not be empirically valid.

4.4.5 Empirical Results

In this section, productivity trends in the tile manufacturing units of Kerala for the period 1996-97 to 2005-06 are examined. As mentioned earlier, in this study three methods - Direct method, Kendrick index method and Cobb-Douglas production function method--are used. For empirical estimation, we have used data collected from 42 sample tile units of Kerala. The results of the study are presented in Table, 4.7 and 4.8.

TABLE 4.7

TOTAL FACTOR PRODUCTIVITY INDEX FOR TILE MANUFACTURING UNITS IN KERALA (1997-2006)

Year	Direct Method	Kendrick Index Method
1996-97	100.00	100.00
1997-98	110.26	99.95
1998-99	111.01	111.87
1999-00	103.50	103.18
2000-01	129.62	129.08
2001-02	100.97	110.10
2002-03	102.83	100.29
2003-04	129.53	123.86
2004-05	113.35	110.74
2005-06	107.98	106.26
CAGR	**-0.843**	**-0.930**

Note: The growth rate are calculated by fitting exponential functions of the form $Y = ab^x$

Source: Compiled from Survey Data

Estimate of total factor productivity of tile manufacturing units shows a fluctuating trend in all the two measures of total factor productivity. It is seen that these two measures give different results. From a base of 100 in1996-97, productivity index, by using Direct method, first rises and reaches a peak of 129.62 in 2000-01. But in the year 2001-02, it goes down to 100.97 and then rises to 129.53 in 2003-04. Then it starts falling and comes down to 107.98 in 2005-06. The Kendrick index is also marked by frequent fluctuations. From a base of 100 in 1996-97, it first falls to 99.55 in 1997-98 and then it rises and reaches a peak of 129.08 in 2000-01. But in the year 2002-03, it goes down to 100.29. Then it starts rising and reaches a peak of 123.86 in 2003-04 and then comes down to 106.26 in 2005.06.The A semi-log trend fitted to the total factor productivity indices based on Direct method yielded a compound annual growth rate of **-0.843** per cent, while, the productivity indices based on Kendrick index yielded a compound annual growth rate of **-0.930** per cent.

The results of Cobb-Douglas production function estimated for sample units are given in Table 4.8.

TABLE 4.8

TOTAL FACTOR PRODUCTIVITY - COBB-DOUGLAS PRODUCTION FUNCTION

	Co-efficient	**Standard Error**	**t. statistic**	**P - Value**
1. Intercept	0.6676	0.7974	0.8772	0.4301
2. Capital	0.53185	0.25857	2.055**	0.0789
3. Labour	0.3998	0.1604	2.4915*	0.0455
R^2	0.665			
$\bar{R}^2$	0.569			
F Statistic	6.960			
P Value	0.0216			

* Significant at 5 per cent level
** Significant at 10 per cent level
Source: Compiled from Survey Data.

From Table 4.8, it is seen on the basis of test statistic that co-efficient of labour is significant at 5 per cent, whereas the co-efficient of capital is significant at 10 per cent. The F-value shows overall significance at 5 per cent. R^2 shows that 67 per cent of the variation in output is explained by capital and labour.

The parameters β_1 and β_2 are the partial elasticity of output with respect to capital and labour respectively. The elasticity of output of capital is 0.531 and that of labour is 0.3998. We can compute the rate of return on investment by simply adding output elasticity.

Rate of return = $\beta_1 + \beta_2 = 0.930$

As the rate of return is less than unity, the industry is subject to decreasing returns to scale.

4.4.6 Total Factor Productivity: Region-wise Analysis

To examine movements in total factor productivity in the tile factories at the regional level over the time period of 1996-97 to 2005-06, two measures of total factor productivity, i.e., Direct Method and Kendrick Method indices are calculated and presented in Table 4.9 and are also shown in Figure 4.1.

TABLE 4.9

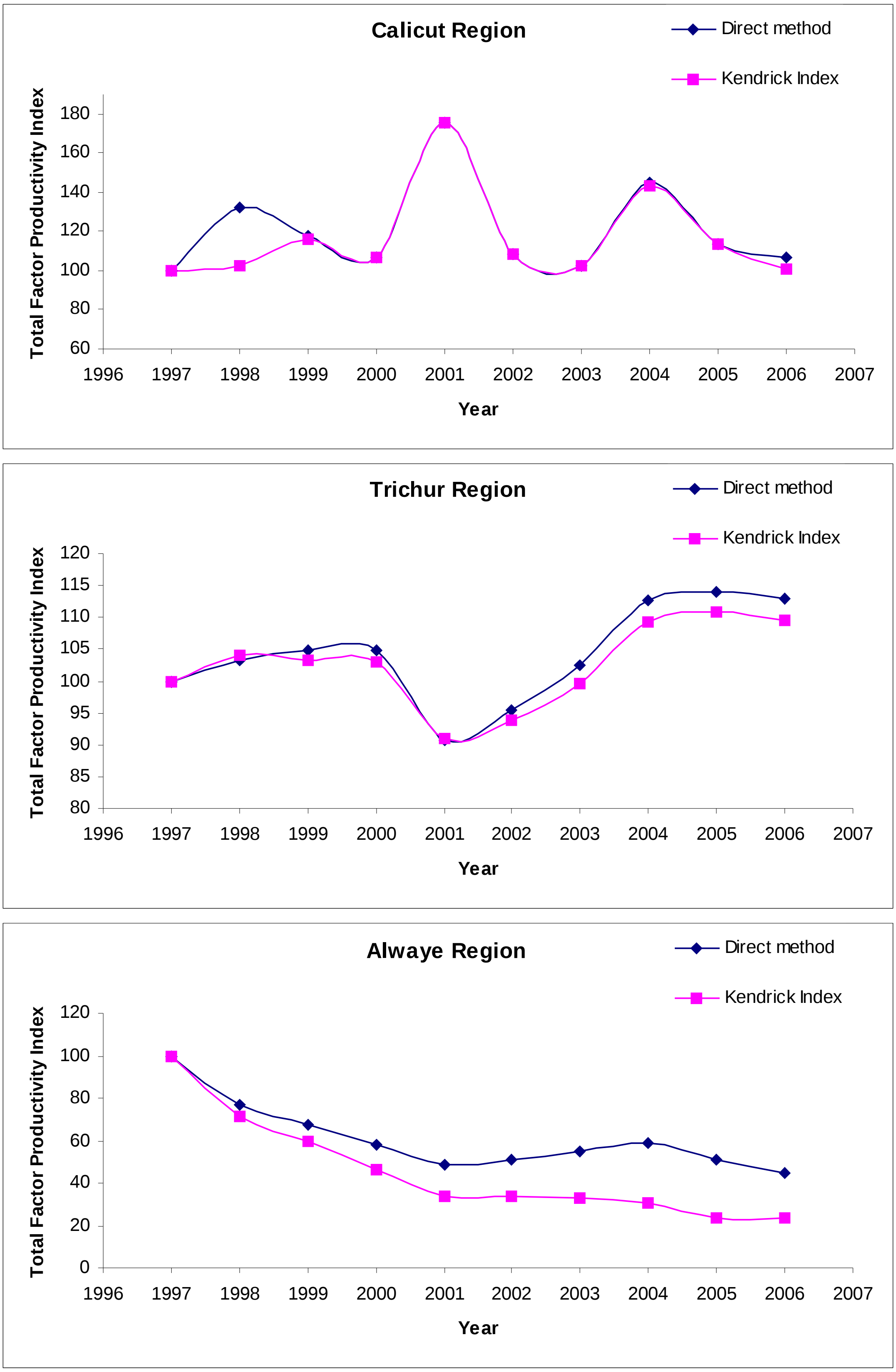
TOTAL FACTOR PRODUCTIVITY INDEX - REGION-WISE ANALYSIS

Year	Calicut		Trichur		Alwaye	
	Direct Method	Kendrick Index	Direct Method	Kendrick Index	Direct Method	Kendrick Index
1996 - 97	100.00	100.00	100.00	100.00	100.00	100.00
1997 - 98	132.35	102.23	103.28	104.15	77.23	71.73
1998 - 99	118.01	115.76	104.93	103.39	67.33	59.24
1999 - 00	106.96	106.88	104.96	102.88	57.85	46.54
2000 - 01	175.42	175.34	90.72	91.00	48.83	33.84
2001 - 02	108.30	108.32	95.41	93.79	50.63	33.36
2002 - 03	102.55	102.45	102.52	99.63	54.58	33.09
2003 - 04	144.73	143.04	112.59	109.29	58.76	30.26
2004 - 05	113.29	113.39	114.01	110.97	51.14	23.62
2005 - 06	107.09	100.99	112.98	109.64	45.01	23.17
CAGR	**0.034**	**-0.768**	**-1.294**	**-0.903**	**6.386**	**14.23**

Note: The growth rates are calculated by fitting exponential function of the form $Y = ab^x$.

Source: Compiled from Survey Data

FIGURE 4.1 - TOTAL FACTOR PRODUCTIVITY INDICES



In the case of Calicut region, the Direct method of TFP index registered compound annual growth rate of 0.034 per cent. But, considering the year-wise movement, it shows an increasing trend with minor year-to-year fluctuations. TFP index according to this method is very low in 1996-97 and very high in 2000-01. According to Kendrick Index of TFP, in Calicut region, the compound annual growth rate is -0.768 per cent. TFP according to this method, shows an increasing trend with year-to-year fluctuations, which reached the maximum level in 2000-01 (175.34) and then declined to 106.99 in 2005-06. This decline in productivity may be attributed to certain internal problems affecting the units.

TFP indices of Trichur region have also shown a mixed picture. TFP index of this region based on Direct method has shown an increasing trend till 1999-00 (104.96) and then a declining trend till 2001-02 (95.41). TFP index was the highest in 2004-05 (114.01) but it declined to 112.98 in 2005-06. TFP index based on Kendrick index method recorded an annual compound growth rate of -0.903 per cent, whereas year-wise indices have shown a mild fluctuation. TFP indices increased in the first three years and then started to decline after 2000-01. However, TFP index reached the highest level in 2004-05 (110.97) and then slightly declined to 109.64 in 2005-06. Various reasons are attributed to this sort of fluctuations in productivity like shortage of labour, raw-material and electricity, fluctuations in demand and so forth.

Alwaye region has exhibited a very dismal picture with regard to TFP. Both Direct method and Kendrick method indices have shown a declining trend during the period of reference. TFP index based on Direct method was 45.01 in 2005-06 and during the same period, TFP index based on Kendrick method was 23.17.

Inter-regional analysis of TFP using Direct method and Kendrick Method proves that TFP indices of Calicut and Trichur regions are relatively better compared to Alwaye region. But a semi-log trend fitted to the total factor productivity indices for the period between 1996-97 to 2005-06 a compound annual growth rates of 0.034 and -0.768 per cent respectively due to Direct method and Kendrick method in Calicut region; -1.294 and -0.903 per cent respectively due to Direct method and Kendrick method in Trichur region and 6.386 and 14.23 per cent respectively due to Direct method and Kendrick method in Alwaye region. Compound annual growth rate is found to be higher in Alwaye region.

Conclusion

In this chapter, a theoretical survey of the measurement of productivity has been presented. The major findings of this chapter can be summarised along following lines.

The literature spells out four distinct approaches to measure total factor productivity growth. In the empirical part of the study, more importance is given to the measurement of partial productivity. Labour being the most important factor in tile manufacturing units, attempt is made to measure labour productivity by applying output-per worker and output per rupee of wages. Labour productivity is found to be lower in most of the units in Kerala. However, there are inter-regional variations in labour productivity. Among the three regions labour productivity is relatively higher in Alwaye region and lower in Calicut and Trichur regions. Labour productivity is measured in the context of technology absorption level of the manufacturing units. It is found that labour productivity is relatively high in technology intensive tile units. But total factor productivity studies based on different methods give different results.

Inter-regional analysis of TFP using Direct method and Kendrick method proved that TFP indices of Calicut and Trichur regions are relatively better compared to Alwaye region. But the compound growth rate is higher in Alwaye region. The physical performance of the tile industry depends upon the level of capacity utilisation by the manufacturing units. Hence, the next chapter delineates the theoretical and conceptual issues relating to capacity and its utilisation. It also studies the extent of capacity utilisation and causes of idle capacity in the tile industry in Kerala.

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CHAPTER V

CAPACITY UTILISATION IN THE TILE INDUSTRY

INTRODUCTION

There are very few words capable of covering more meaning than capacity. The deceptively simple term 'capacity' has been much discussed, too frequently misunderstood and conjures up different images to different people both in the industry and outside the industry.

Capacity can be defined, as the rate of output at which there is no incentive to alter the size of the plant, if that rate of output is expected to be permanent. Productive capacity is the maximum output which the current stock of plant and machinery is capable of producing during a period of time.

The following are the different concepts of capacity currently used.

(i) **Licensed capacity** Licensed capacity is the capacity for which a firm has obtained a license from the issuing authorities.

(ii) **Designed capacity** Designed capacity of the plant is a technical factor and therefore may not be equal to licensed capacity.

(iii) **Installed capacity** Installed capacity is the maximum possible output, which can be produced by the plant once it is properly installed according to the specifications. This installed capacity may or may not be equal to licensed or designed capacities.

(iv) **Rated capacity** Rated capacity refers to the maximum production which a given plant is capable of producing under conditions prevailing in a country. It is the ideal capacity under given conditions.

(v) **Attainable capacity** The ideal condition prevailing in a plant may be undermined by certain unforeseen and uncontrollable factors affecting the rated or potential capacity. So the capacity of the plant will have to be re-rated. The maximum possible output under the changed circumstances is called the "attainable capacity".

(vi) **Available capacity** Even attainable capacity may not be available for a certain period of time due to factors such as non-availability of power, spares and so forth. These factors are of a temporary nature. Available capacity is the maximum output that can be produced in a particular period within a given set of conditions. (Meena Gupta and Thavaraj, 1975).[1]

Section A of the chapter discusses the conceptual and theoretical issues and outlines different methods that have been employed for estimating capacity utilisation. Section B provides results of empirical study. In Section C, an attempt is made to set forth the various factors which generally contribute to under utilisation of industrial capacity.

SECTION A

5.1 Conceptual and Theoretical Issues

Economic analysis is replete with the use of the term "capacity", yet comparatively little attention is devoted to a precise theoretical statement of the concept. There is a wide range of ambiguity with respect to the meaning of 'capacity' and the definition of capacity utilisation.

5.1.1 Meaning of Capacity

Though there is no unanimous definition of capacity, it is broadly defined as the ability of a firm or industry to obtain maximum possible output from a given set of inputs and technology. In economic statistics, capacity utilisation is a measure of the intensity with which a national economy (or sector, or firm) makes use of its resources. In production process, sometimes the actual capacity utilisation may be more or less than the installed capacity. Shortfall in capacity utilisation due to lack of demand for products can be termed excess capacity.

Depending upon the relative importance attached to the fixed capital stock, there are three different concepts of capacity. These concepts are: (i) Engineering concept, (ii) Operational or Managerial concept, and (iii) Economic concept. While the engineering approach belongs to the 'narrow sense' definition of capacity utilisation, the economic approach belongs to the wider-sense definition. The narrow sense definition is concerned with the degree of utilisation of capital only, whereas the wider sense definition of capacity is concerned with the degree of utilisation of all resources including capital. Let us discuss these approaches in detail.

(i) The Engineering Concept

One common approach to capacity is in terms of "engineering capacity". The engineering approach is in terms of the capacity potential of the equipment of the firm. This approach defines capacity as the maximum output that may be produced given the plant and equipment. Thus the capacity utilisation is defined as the ratio of actual output (Y) to this maximum output (Y_0). In this category there are two concepts: (a) Concept of installed capacity, and (b) Concept of rated capacity. By installed capacity engineers mean the potential output, which can be realised from items of equipment under optimum conditions while rated capacity denotes the potential output which can be realised under actual plant conditions.

(ii) The Operational Concept

The operational concept of capacity considers the influence of managerial capabilities, establishment pattern, plant lay-out broadly defined as "actual plant conditions". Therefore, operational or managerial concept of capacity is defined as that level of output at which the management would become dissatisfied with existing stock of its fixed plant and equipment (Hickman, 1964).[7] This is the level of output which corresponds to the point of minimum average cost.

(iii) The Economic Concept

"The economist's definition [...] identifies capacity output with the output rate prevailing when the short run average total cost per unit is at a minimum. The economist's definition, therefore, is concerned with that output from a given set of productive facilities that coincide with minimum average cost, and under competitive conditions, with the maximum profit for the enterprise" (Klein, 1937).[3]

5.2 Alternative Measures of Capacity Utilisation

This section discusses several methods that have been developed in the literature to measure capacity utilisation. It provides insight into the performance of manufacturing enterprise and also aids in identifying factors which influence industrial growth.

Capacity utilisation is a concept that is difficult to define and even more difficult to measure. Any measure of capacity utilisation hinges on the definition of capacity output or potential output. There are two broad measures used in estimating capacity utilisation: the statistical approach and the survey approach. The measures using the former approach deal with the capacity utilisation at a macro level using aggregate data at the industry or the economy level. A brief analysis of some of the important measures is given in the ensuing paragraphs.

5.2.1 Statistical Approach

1. The Wharton Index Method

This measure uses a method associated with Klein (1960)[4] and with Wharton Econometric Forecasting Associates, Inc. (WEFA). It attempts to measure the degree of utilisation of all inputs.

The first step in this method consists of determining the past peaks. Klein describes the procedure as follows; peak values are picked out by inspection by determining points where values exceed the immediately preceding and adjacent values with special treatment of exceptional cases. When output is unchanged at a peak value for two successive quarters, the second quarter is selected as peak. When output is unchanged at a peak value for three successive quarters, the middle quarter is designated as peak. When output regains a peak following a decline of no more than one quarter in duration, the second of the two high values is selected as peak (Klein, 1960).[5]

Once the peaks are determined, the next step in the procedure is to draw trend lines through the peaks by means of straight-line interpolation. The lines are assumed to represent 'potential output'. The ratio of actual to potential output gives the degree of capacity utilisation.

(ii) Modified Trend Through Peaks

This method was developed by Dhrymes (1976)[6] in order to make improvement over WEFA assumptions. He constructs the non-peak potential output series by using information on developments in employment in addition to information on the capital stock. Dhrymes applies his method separately to the manufacturing, mining and 'other' sectors.

The method is as follows. First, one constructs an employment series that is adjusted for cyclical variations in output. Next, the peak levels in output are identified. (as is done for WEFA). Then, a Cobb-Douglas production function is fitted to these points by using a factor shares approach. The production function is

$$\mathbf{Y_t = Ae^{rt}\ K_t^{(1-\alpha)} L_t^{\alpha} e^{ut} \quad t \in D} \qquad \text{.... (1)}$$

Thus peak values in Y_t assumed to represent capacity output, are joined by a curve that takes into account developments in both labour and the capital stock within the context of the estimated historical relation between these and output.

(iii) Output-Capital Ratio

This measure relies on the existence of a stable proportional relation between the stock of capital and potential output. This method is used by Panic (1978).[7]

Let us look at the method used by Panic. First, he constructs an actual output/capital ratio series (Y_t/K_t), t = 1.........T where Y_t and K_t are output and the capital stock, respectively at time t. Next, he constructs a "capacity" output/capital series by fitting a linear trend to the actual output/capital series, as follows:

$$\frac{Y_t}{K_t} = \mathbf{a_o + a_1 t + \hat{u}_t} \qquad \mathbf{t = 1, ...T} \qquad \text{.... (1)}$$

Where, $\mathbf{a_o}$, $\mathbf{a_1}$ and $\mathbf{\hat{u}_t}$ are fitted by least squares. The capacity output/capital ratio is taken to be the points on a line with time derivatives a_1, raised just enough so that it touches only one of the observed Y_t/K_t series. The adjusted trend Y/K ratio - call it $(Y_t/K_t)^c$ – is the assumed capacity output/capital ratio. The method assumes that actual and capacity output/capital ratios differ because of deviations of output from its potential. That is, it is assumed that:

$$\left(\frac{Y_t}{K_t}\right) = \left(\frac{Y_t^c}{k_t}\right) = \frac{100}{cu_t} \cdot \frac{Y_t}{K_t} \qquad \text{... (2)}$$

Where $cu_t = \left(\frac{Y_t}{Y_t^c}\right) x\,100$ is defined as the capacity utilisation rate. The final step in calculating capacity utilisation is to take the ratio of the observed to capacity output/capital stock ratio and multiply by 100.

$$cu_t \quad = \quad \frac{\left(\frac{Y_t}{K_t}\right)}{\left(\frac{Y_t^c}{K_t}\right)} \times 100$$

iv) Minimum Capital-Output Ratio

Another variant of output/capital ratio is the minimum capital-output ratio, developed by National Conference Board of the U.S. These estimates have grown from the pioneering work of Daniel Cremer. This method works as follows. First, the capital-output ratios in real terms are computed for a given industry. A benchmark year is then chosen on the basis of the observed lowest capital-output ratio. In choosing the benchmark year, other independent evidence is also taken into consideration. The lowest observed capital-output ratio is considered as capacity output. The estimate of capacity is obtained by dividing the real fixed capital by minimum capital-output ratio. Finally, the capacity utilisation index is computed by dividing real output by estimate of capacity. We note that the capacity utilisation index is the maximum for the benchmark year in which the observed capital-output ratio is minimum. This represents the full capacity utilisation and helps to estimate the extent to which the remaining years output departs from the full capacity utilisation rate.

Thus $U = \dfrac{O}{\hat{c}} . 100$

$$\hat{c} = \frac{C}{(C/o)min}$$

Where,

U = Capacity utilisation, O = Real output (gross value-added) $\hat{c}$ = Estimate of capacity and c = Real fixed capital-output ratio.

(v) Cost Function Approach

Another approach to the problem of capacity utilisation is by the estimation of cost function. There are two different measures of capacity utilisation based on cost function. According to one variant, capacity output corresponds to the minimum point on the firm's long run average cost (Cassel, 1937).[8] The second variant defines the capacity output at a point where short run average cost curve is tangent to the long run average cost curve Hickman, 1964).[9]

(vi) Production Function Approach

In the production function technique, the capacity output is defined as the weighted sum of the contribution of several inputs working at the full employment level. This is the most satisfactory measure of capacity utilisation because it would take into account changes in all the major factor inputs.

(vii) Time Utilisation Measure

The time utilisation measure identifies the proportion of time a plant has been operating during the year. Winston's time measure U_t is defined as the number of hours the capital plant is utilised in a year as a percentage of

8760 hours, the total number of hours available in a year (Gorden Winston, 1974).[10]

$$U_t = \frac{\text{Number of hours capital plant is utilised}}{\text{8760 hours}} \text{x}100$$

U_t therefore, associates like the electricity measure, 24 hours a day and 365 days a year with full capacity.

(viii) Electricity Measure of Capacity

A new approach for measuring long run capital utilisation was developed which is based on used electricity data. The actual consumption of electric energy as a proportion of the average rated capacity of installed electric motors of the same period is considered as a measure of utilisation of capital (Helen Hughes, 1976).[11] This method was developed by Foss. Thus the measure U_s is given by

$$[E_{it}^{m}/(C^{m}_{it} \text{ x } 8760/0.90)] \text{ x } 100$$

Where E^{m}_{it} is the actual consumption of electricity by electric motors in plant i in year t in kilowatt-hours, C^{m}_{it} the rated capacity of electric motors in plant i in a year t in kilowatts, 8760 the total number of hours in a year, and 0.90 the efficiency of electric motors on the assumption that 10 per cent of power input into an electric motor is dissipated in the form of heat.

(ix) Engineering Measures of Capacity

The most common measure of capacity utilisation is in terms of engineering capacity. According to the engineering concept, capacity is the maximum potential output attainable from given capital equipment in a given period of time, and utilisation of capacity means the actual outflow of output in relation to the technically possible level of output. Therefore, it is the ratio between actual output and maximum possible output. If Y_h is the hourly output from a given equipment at 100 per cent efficiency, T is the total hours in the year (i.e. 24 x 365 = 8760) that total annual maximum output $\hat{Y} = Y_h.T$. If Y_A is the actual output during the year, then capital utilisation (K_u) can be defined as,

$$K_u = \frac{Y_A}{\hat{Y}} = \frac{Y_A}{Y_h.T} \qquad \text{.... (1)}$$

The methods given above are appropriate for micro level studies.

5.2.2 Survey Approach

Another way of compiling estimates of capacity utilisation is to survey business. The survey approach deals more with capacity utilisation at the micro level and it involves carrying out surveys and interviews, asking individual firms questions concerning capacity and its utilisation. As Philips (1963)[12] notes, "The obvious advantage of the [...] survey method is that direct questions relating to capacity are responded to by persons likely to know the answers". This approach also has the advantage that it makes possible the compilation of kinds of information that would be practically impossible using data-based methods.

There are two kinds of surveys; they are informally referred to as Type # 1 and Type # 2.

SECTION B

5.3 Empirical Estimates of Capacity Utilisation

The analysis of capacity utilisation in the present study is based on the installed capacity, which is the plant concept of capacity. Installed capacity refers to the maximum possible output which can be produced by the plant once it is properly installed according to specifications. It is calculated by dividing the actual output produced in a year by the installed capacity of the plant in the corresponding year.

Before proceeding with the analysis of capacity utilisation in tile industry, it would be proper to mention that 100 per cent utilisation of capacity is almost impossible to achieve due to various operating interruptions. This is particularly true in the case of age-old traditional industries like tile industry. Therefore, a capacity utilisation of 75 per cent is taken as the norm in the small-scale and traditional industries taken together (Govt. of India). In the case of the tile industry, in this study 70 per cent is regarded as normal. The actual level of capacity utilisation in the units under study has, thus, to be evaluated and analysed against this norm.

5.3.1 Region-wise Analysis

The tile industry is an important traditional industry. Some of the factors affecting capacity utilisation like shortage of power, scarcity of raw-materials, and so on would have a similar effect on all the regions. But some other factors may affect various regions differently. It is, therefore, important to analyse capacity utilisation region-wise.

The units under study fall under three regions, viz., Calicut, Trichur and Alwaye. The average utilisation of capacity in these regions during the period 1996-97 to 2005-06 is given in Table 5.1.

The data indicate wide region-wise differences in average capacity utilisation. For instance, in 1996-97, Calicut region had the lowest capacity utilisation of 57.83 per cent. Against this, the Trichur and Alwaye regions had the highest utilisation of 71.13 per cent and 60.73 per cent respectively in that year. There was no definite pattern of relationship between the regions and capacity utilisation.

Between the ten year periods, 1996-97 to 2005-06, almost all the regions improved their capacity utilisation except Trichur region. In Trichur region capacity utilisation had declined from 71.13 per cent to 64.23 per cent during the period under study. Taking up all regions, it can be seen from the Table 5.1 that capacity utilisation remained unchanged as 63 per cent during 1996-97 to 2005-06. Figure 5.1 depicts the average capacity utilisation of three regions and Kerala.

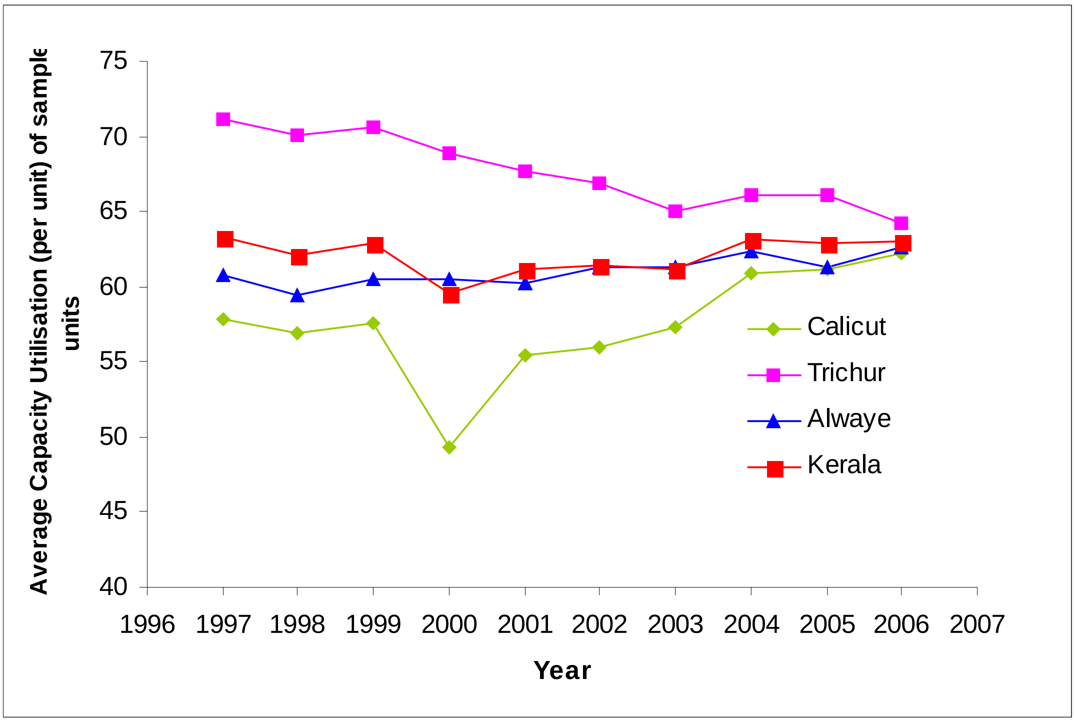
TABLE 5.1

AVERAGE CAPACITY UTILISATION - REGION-WISE ANALYSIS

Region	No. of Units	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Calicut	6	57.83 (-)	56.84 (-0.99)	57.57 (+0.73)	49.36 (-8.21)	55.44 (+6.08)	55.96 (+0.52)	57.25 (+1.29)	60.91 (+3.66)	61.17 (+0.21)	62.20 (+1.03)
Trichur	30	71.13 (-)	70.06 (-1.07)	70.59 (+0.53)	68.94 (-1.65)	67.71 (-1.23)	66.91 (-0.80)	64.98 (-1.93)	66.04 (+1.06)	66.05 (+0.01)	64.23 (-1.82)
Alwaye	6	60.73 (-)	59.40 (-1.33)	60.53 (+1.13)	60.53 (Nil)	60.26 (-0.27)	61.26 (+1.00)	61.26 (Nil)	62.60 (+1.34)	61.33 (-1.27)	62.66 (+1.33)
All Regions	42	63.23	62.10	62.89	59.61	61.13	61.38	61.16	63.18	62.85	63.03

Note: Figures in parenthesis indicate increase (+) or decrease (-) in C.U. over the immediately preceding year.
Source: Survey Data.

Figure 5.1:- Average Capacity Utilisation (per Unit) of Sample Units in Calicut, Trichur, Alwaye Regions and Kerala.



5.3.2 Frequency Distribution

The region-wise utilisation of average capacity has been discussed so far. The frequency distribution of sample units by average capacity utilisation (Table 5.2) puts in a sharper focus on the position of the units.

The data in Table 5.2 show that in 1996-97, the largest number of units, viz. 69.05 per cent were operating at 60 per cent and above of their capacity. This trend continued in the following years also with a slight decline. For instance, in 2005-06, 30.95 per cent units were operating at 60 per cent or more of their capacity. It would be interesting to note that the number of units operating below 20 per cent of their capacity had increased after 1996-97. As against this, the number of units in the relatively higher utilisation group, say., 50-60 per cent increased from 4 to 10 units during the period under study. One of the main conclusions that is derived from the assessment of the data is that the number of units operating at 60 per cent or more of their capacity has declined during the period of reference.

TABLE 5.2

FREQUENCY DISTRIBUTION OF CAPACITY UTILISATION OF SAMPLE UNITS IN KERALA

Percentage Capacity utilisation	**1996-97**	**1997-98**	**1998-99**	**1999-'00**	**2000-01**	**2001-02**	**2002-03**	**2003-04**	**2004-05**	**2005-06**
Below 20	1 (2.38)	1 (2.38)	1 (2.38)	2 (4.76)	3 (7.14)	3 (7.14)	4 (9.52)	5 (11.90)	3 (7.14)	6 (14.29)
20 - 30	2 (4.76)	2 (4.76)	3 (7.14)	4 (9.52)	3 (7.14)	5 (11.90)	6 (14.29)	6 (14.29)	5 (11.90)	4 (9.52)
30 - 40	3 (7.14)	4 (9.52)	4 (9.52)	4 (9.52)	5 (11.90)	3 (7.14)	4 (9.52)	5 (11.90)	5 (11.90)	4 (9.52)
40 - 50	3 (7.14)	3 (7.14)	5 (11.90)	6 (14.29)	7 (16.67)	7 (16.67)	6 (14.29)	6 (14.29)	7 (16.67)	5 (11.90)
50 – 60	4 (9.52)	5 (11.90)	5 (11.90)	6 (14.29)	6 (14.29)	6 (14.29)	8 (19.05)	6 (14.29)	9 (21.43)	10 (23.81)
60 and Above	29 (69.05)	27 (64.29)	24 (54.76)	20 (47.62)	18 (42.86)	18 (42.86)	14 (33.33)	14 (33.33)	13 (30.95)	13 (30.95)
Total	42 (100)	42 (100)	42 (100)	42 (100)	42 (100)	42 (100)	42 (100)	42 (100)	42 (100)	42 (100)

Note: Figures in parenthesis represent percentage of the total.
Source: Survey Data.

5.3.3 High, Medium and Low Utilisation

The above analysis can be carried a little further so as to find out region-wise position. On the basis of the extent of average capacity utilisation, we may classify units into the following three groups.

(i) ***High Utilisation Group***: In this category, units having a capacity utilisation level of 60 per cent or more have been covered.

(ii) ***Medium Utilisation Group***: Units having a capacity utilisation of 30 per cent or more but less than 60 per cent are included in this category.

(iii) ***Low Utilisation Group***: Units with capacity utilisation below 30 per cent have been taken in this group.

The distribution of units as per the above classification is given in Table 5.3.

The data given in the Table confirm that the number of units with high utilisation had declined and many units moved into the medium utilisation group by 2005-06. But the number of units with low utilisation increased from 3 (7.15 per cent) to 10 (23.81 per cent) during the period under study.

Table 5.3

Distribution of Units According to High, Medium and Low Utilisation in Kerala

Year / Category	1996-97	1997-98	1998-99	1999-'00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
High	29 (69.05)	27 (64.29)	23 (54.76)	20 (47.62)	18 (42.86)	18 (42.86)	14 (33.33)	14 (33.33)	13 (30.95)	13 (30.95)
Medium	10 (23.81)	12 (28.57)	14 (33.33)	16 (38.10)	18 (42.86)	16 (38.10)	18 (42.86)	17 (40.48)	21 (50.00)	19 (49.24)
Low	3 (7.14)	3 (7.14)	5 (11.90)	6 (14.28)	6 (14.28)	8 (19.04)	10 (23.81)	11 (26.19)	8 (19.05)	10 (23.81)
Total	42 (100)	42 (100)	42 (100)	42 (100)	42 (100)	42 (100)	42 (100)	42 (100)	42 (100)	42 (100)

Note: Figures in parenthesis indicate percentage of the total.
Source: Survey Data

The data in Table 5.4 give the region-wise distribution of units by the three categories - high, medium and low utilisation category. The Table brings to light some important trends in capacity utilisation in certain regions during 2003-04, 2004-05 and 2005-06. It indicates that most of the units in the Trichur region belong to the medium utilisation category whereas in Calicut region 66.6 per cent of the units fall in the high utilisation category. In Trichur and Alwaye regions, this proportion comes to about 23 and 50 per cent respectively in 2003-04 and 26.67 and 16.67 per cent respectively in 2004-05.

In the following section an attempt is made to examine the relationship between size and capacity utilisation, profit and capacity utilisation and market demand and capacity utilisation by conveniently choosing three years i.e., 2003-04, 2004-05 and 2005-06.

TABLE 5. 4

DISTRIBUTION OF UNITS BY HIGH, MEDIUM AND LOW UTILISATION - REGION-WISE ANALYSIS

Region	2003-04			2004-05			2005-06			Total Units
	Low	Medium	High	Low	Medium	High	Low	Medium	High	
Calicut	1 (16.67)	1 (16.67)	4 (66.66)	1 (16.67)	1 (16.67)	4 (66.66)	1 (16.67)	1 (16.67)	4 (66.66)	6 (100.00)
Trichur	9 (30.00)	14 (46.67)	7 (23.33)	6 (20.00)	16 (53.33)	8 (26.67)	8 (26.67)	14 (46.66)	8 (26.67)	30 (100.00)
Alwaye	1 (16.67)	2 (33.33)	3 (50.00)	1 (16.67)	4 (66.66)	1 (16.67)	1 (16.67)	4 (66.66)	1 (16.67)	6 (100.00)
Total	11 (26.19)	17 (40.48)	14 (33.33)	8 (19.05)	21 (50.00)	13 (30.95)	10 (23.81)	19 (45.24)	13 (30.95)	42 (100.00)

Note: Figures in parenthesis indicate percentage of the total.
Source: Calculated from Survey Data

5.4 Size and Capacity Utilisation

Capacity utilisation is partly a function of size. Bigger units with more resources at their disposal are in a better position to stand the market pressures and make such adjustments in their operations as may be necessitated by the economic conditions. They have more technological, financial and managerial resources at their command. In times of shortage of raw-materials, the bigger units can afford to buy raw-materials much in advance of their use. Their production is not hampered or interrupted by non-availability of raw-materials. In case of persistent power shortages, they may install their own generating sets. If there is a change in the pattern of demand, such units are better placed to adjust the design of the product or make technological changes as may be necessary. Similarly, the larger units need not necessarily reduce the scale of operations if there is a temporary setback in sales. The smaller units cannot do all this. It is generally out of their reach to cope with rapid changes in design or technology of the product. But, the smaller units have the benefit of quick decision and flexibility where resources permit. It is important, therefore, to look into the relationship, if any, between size and capacity utilisation. Out of several indicators of size of a unit, the two most popular are the **size of the work- force** and the **capital investment**. In this section, an attempt has been made to examine the relationship between *employment and capacity utilisation* on the one hand, and *capital investment and capacity utilisation* on the other.

5.4.1 Employment and Capacity Utilisation

On the basis of size of work force, units can be categorised into large, medium and small-scale categories. For the purpose of analysis, the units under study have been classified into three categories. The basis of this classification is the average number of workers employed in sample units.

(a) Units with employment of more than 100 workers were classified as large.

(b) Units with an employment of more than 25 but up to 100 workers were classified as medium.

(c) Units having a workforce of up to 25 workers were placed in the small-scale category.

The distribution of units on the basis of employment and capacity utilisation for the three years period, i.e. from 2003-04 to 2005-06 is given in Tables 5.5 to 5.7.

TABLE 5.5

DISTRIBUTION OF UNITS BASED ON EMPLOYMENT AND CAPACITY UTILISATION, 2003-04 - KERALA

Nature of Industry	Capacity Utilisation			Total
	High	Medium	Low	
Large	8 (72.73)	2 (18.18)	1 (9.09)	11 (100)
Medium	4 (22.22)	10 (55.56)	4 (22.22)	18 (100)
Small	2 (15.38)	5 (38.46)	6 (46.16)	13 (100)
Total	14 (33.33)	17 (40.48)	11 (26.19)	42 (100.00)

Note: Figures in parenthesis indicate percentage of the total
Source: Compiled from Survey Data

During 2003-04, out of 11 large size units, 8 units (72.73 per cent) had high capacity utilisation, 2 units (18.18 per cent) had medium capacity utilisation, while the remaining 1 unit (9.09 per cent) was in the low utilisation group (Table 5.5). In the same year, 18 units were in the medium-scale category. Out of them, 4 units (22.22 per cent) were in the high utilisation category, 10 units (22.22 per cent) were in the medium utilisation group, and 4 units (22.22 per cent) had low utilisation. Similarly, out of 13 small-scale units, 2 units (15.38 per cent) had high utilisation, 5 units (38.46 per cent) had medium-scale utilisation and 6 units (46.16 per cent) were in the low utilisation category.

TABLE 5.6

DISTRIBUTION OF UNITS BASED ON EMPLOYMENT AND CAPACITY UTILISATION, 2004-05 - KERALA

Nature of Industry	Capacity Utilisation			Total
	High	Medium	Low	
Large	7 (58.33)	4 (33.33)	1 (8.34)	12 (100)
Medium	3 (16.67)	12 (66.66)	3 (16.67)	18 (100)
Small	3 (25.00)	5 (41.67)	4 (33.33)	12 (100)
Total	13 (30.95)	21 (50.00)	8 (19.05)	42 (100.00)

Note: Figures in parenthesis indicate percentage of the total
Source: Compiled from Survey Data

The distribution of units according to employment and capacity utilisation during 2004-05 is given in Table 5.6. Out of 12 large-scale units, 7 units (58.33 per cent) had high utilisation, 4 units (33.33 per cent) had medium utilisation, and 1 unit (8.34 per cent) had poor utilisation. In the case of medium and small-sized units, the percentage of units having medium utilisation was 66.66 and 41.67 respectively as compared to 33.33 in the large-scale units. Similarly, it can be seen that the percentage of units having low utilisation was higher in the small-scale category as compared with those in the medium and large-scale categories. Statistically, 8.34 per cent units in the large-scale category, 16.67 per cent units in the medium-scale category and 33.33 per cent units in the small-scale category had low utilisation.

TABLE 5.7

DISTRIBUTION OF UNITS BASED ON EMPLOYMENT AND CAPACITY UTILISATION, 2005-06 - KERALA

Nature of Industry	Capacity Utilisation			Total
	High	Medium	Low	
Large	4 (44.44)	4 (44.44)	1 (11.12)	9 (100)
Medium	5 (27.78)	10 (55.56)	3 (16.66)	18 (100)
Small	4 (26.67)	5 (33.33)	6 (40.00)	15 (100)
Total	13 (30.95)	19 (45.24)	10 (23.81)	42 (100.00)

Note: Figures in parenthesis indicate percentage of the total
Source: Survey Data

An assessment of the data on employment and capacity utilisation for the year 2005-06 as given in Table 5.7 indicates that there is no clear relationship between the two. Out of 9 large-scale units, only 4 units (44.44 per cent) had high capacity utilisation, while 4 units (44.44 per cent) and 1 unit (11.12 per cent) were in the medium and low utilisation categories respectively. As against this, the distribution of 18 medium-scale units in the high, medium and low utilisation categories was 5 (27.78 per cent) 10 (55.56 per cent) and 3 (16.66 per cent) respectively. Similarly, out of 15 small-scale units, 4 units (26.67 percent) had high level utilisation, 5 units (33.33 per cent) were in the medium utilisation category, while 6 units (40.00 per cent) had low utilisation. The data, therefore, do not prove that higher utilisation is associated with size--arge or small.

5.4.2 Capital Investment and Capacity Utilisation

Investment is another important measure of size. In order to find out the relationship between size and capacity utilisation, the units were divided on the basis of capital investment. The units under study were mostly of small size but for a proper analysis, the following classification was made on the basis of average amount of total capital employed in sample units:

a) Units with a capital investment of more than Rs.50 lakh were classified as large-scale units.

b) Units with a capital investment of more than Rs.10 lakh but upto Rs.50 lakh were classified as medium-scale units.

c) Units with an investment of Rs.10 lakh or less were considered as small-scale units.

The distribution of units by capital investment and capacity utilisation for 2003-04, 2004-05 and 2005-06 is given in Tables 5.8, 5.9 and 5.10 respectively.

TABLE 5.8

DISTRIBUTION OF UNITS BASED ON INVESTMENT AND CAPACITY UTILISATION, 2003-04 - KERALA

Nature of Industry	Capacity Utilisation			Total
	High	Medium	Low	
Large	4 (50.00)	3 (37.50)	1 (12.50)	8 (100)
Medium	8 (42.11)	7 (36.84)	4 (21.05)	19 (100)
Small	2 (13.33)	7 (46.67)	6 (40.00)	15 (100)
Total	14 (33.33)	17 (40.48)	11 (26.19)	42 (100.00)

Note: Figures in parenthesis indicate percentage of the total
Source: Survey Data

Out of 8 large-scale units in 2003-04, 4 units (50.00 per cent) had high utilisation, 3 units (37.50 per cent) had medium utilisation and one unit had low utilisation (Table 5.8). In the case of 19 medium-scale units, the distribution in high, medium and low utilisation groups was 8 (42.11 per cent), 7 (36.84 per cent) and 4 (21.05 per cent) respectively. Out of 15 small-scale units, 2 units (13.33 per cent) had high utilisation, 7 (46.67 per cent) had medium utilisation, and 6 units (40.00 per cent) had low utilisation.

TABLE 5.9

DISTRIBUTION OF UNITS BASED ON INVESTMENT AND CAPACITY UTILISATION, 2004-05 - KERALA

Nature of Industry	Capacity Utilisation			Total
	High	Medium	Low	
Large	4 (36.36)	4 (36.36)	3 (27.28)	11 (100)
Medium	6 (28.57)	12 (57.14)	3 (14.29)	21 (100)
Small	3 (30.00)	5 (50.00)	2 (20.00)	10 (100)
Total	13 (30.95)	21 (30.95)	8 (19.05)	42 (100.00)

Note: Figures in parenthesis indicate percentage of the total
Source: Survey Data

During 2004-05, the number of large-scale units increased to 11, of which 4 units (36.36 per cent) had high utilisation and the distribution into medium and low utilisation categories was 4 (36.36 per cent) and 3 (27.28 per cent) respectively (Table 5.9). Out of the 21 medium-scale units during that year, 6 units (28.57 per cent) had high utilisation, 12 (57.14 per cent) had medium utilisation, and 3 (14.29 per cent) had low utilisation. Similarly, out of 10 small-scale units, 3 (30.00 per cent) had high utilisation, 5 (50.00 per cent) had medium utilisation and 2 (20.00 per cent) had low utilisation. The analysis clearly indicates that a larger per cent of small, medium and large-scale units had medium utilisation.

TABLE 5.10

DISTRIBUTION OF UNITS BASED ON INVESTMENT AND CAPACITY UTILISATION, 2005-06 - KERALA

Nature of Industry	Capacity Utilisation			Total
	High	Medium	Low	
Large	4 (36.36)	3 (27.28)	4 (36.36)	11 (100)
Medium	6 (30.00)	11 (55.00)	3 (15.00)	20 (100)
Small	3 (27.27)	5 (45.46)	3 (23.27)	11 (100)
Total	13 (30.95)	19 (42.24)	10 (23.81)	42 (100.00)

Note: Figures in parenthesis indicate percentage of the total
Source: Survey Data

Table 5.10 depicts the distribution of sample units by investment and capacity utilisation for the year 2005-06. The relationship between the two is clearly reflected in the data. Out of 11 large units, 4 units (36.36 per cent) had high utilisation, 3 units (27.28 per cent) had medium utilisation and 4 (36.36 per cent) had low utilisation. Out of 20 medium-scale units, 6 (30.00 per cent) had high utilisation, 11 (55.00 per cent) had medium utilisation and 3 (15.00 per cent) had low utilisation. In the case of 11 small-scale units, 3 units (27.27 per cent) were in the high utilisation group, 5 (45.46 per cent) were in the medium utilisation group, while the remaining 3 (27.27 per cent) were in the low utilisation category.

The above analysis shows that there is an increasing tendency towards medium level utilisation in the case of medium and small-scale units. It shows that there is no clear positive relationship between capacity utilisation and capital investment.

5.5 Capacity Utilisation and Profitability

Generally, capacity utilisation should be positively related to the profitability of the units. Underutilisation of capacity results in higher costs of production, as overhead costs get distributed over a smaller volume of production. Barring situations where due to monopolistic and/or scarcity conditions, the prices may be manipulated, excess capacity will have an adverse effect on the profitability of a firm. Similarly, high profits and prospects may motivate a firm to achieve a higher rate of utilisation of installed capacity. It may thus be of interest to examine the relationship, if any, between the profits earned by the units and the utilisation of capacity by them. In other words, it is necessary to ascertain whether high utilisation had, in practice, contributed to higher profitability. For purpose of this analysis, the units have been categorized arbitrarily on the basis of profitability as follows:

i) ***Low Profitability Group* -** Units with a profit margin of less than 6 per cent on the capital employed have been included in the low profitability category.

ii) ***Medium Profitability Group* -** Units with a profit margin of more than 6 per cent but upto 12 per cent on the capital employed have been taken in this category.

iii) ***High Profitability Group* -** Units earning a profit of more than 12 per cent on the capital employed are included in this category.

The distribution of units by profitability and capacity utilisation for the period between 2004 to 2006 has been worked out and is given in Tables 5.11, 5.12 and 5.13.

TABLE 5.11

DISTRIBUTION OF UNITS BASED ON PROFITS* AND CAPACITY UTILISATION, 2003-04 – KERALA

Nature of Industry	Capacity Utilisation			Total
	High	Medium	Low	
High	10 (40.00)	14 (56.00)	1 (4.00)	25 (100)
Medium	3 (33.33)	2 (22.22)	4 (44.45)	9 (100)
Low	1 (12.50)	1 (12.50)	6 (75.00)	8 (100)
Total	14 (33.33)	17 (40.48)	11 (26.19)	42 (100)

Note: Figures in parenthesis indicate percentage of the total
* Profits denote net profits as per cent of sales
Source: Survey Data

There is evidence in the data to suggest that high profitability was related to better utilisation. During 2003-04, high profit units had the highest proportion (56.00 per cent) in the medium utilisation category; while 40.00 per cent units had high utilisation. Out of 9 medium profit earning units 3 units (33.33 per cent) belonged to high utilisation category and 2 (22.22 per cent) had medium utilisation. Similarly, out of 8 low profit earning units, 1 (12.50 per cent) had medium utilisation and 6 units (75.00 per cent) were in the low utilisation category.

TABLE 5.12

DISTRIBUTION OF UNITS BASED ON PROFITS* AND CAPACITY UTILISATION, 2004-05 – KERALA

Nature of Industry	Capacity Utilisation			Total
	High	Medium	Low	
High	10 (35.71)	17 (60.71)	1 (3.58)	28 (100)
Medium	2 (25.00)	3 (37.50)	3 (37.50)	8 (100)
Low	1 (16.67)	1 (16.67)	4 (66.66)	6 (100)
Total	13 (30.95)	21 (50.00)	8 (19.05)	42 (100)

Note: Figures in parenthesis indicate percentage of the total
* Profits denote net profits as per cent of sales
Source: Survey Data

Similarly, during 2004-05, out of 28 high profit earning units, 10 units (35.71 per cent) had high utilisation, while 60.71 per cent of the units belonged to medium utilisation category. During this period 6 units belonged to low profit earning group, of which 1 unit each (16.67 percent) had high utilisation and medium utilisation whereas 4 units (66.66 per cent) were in the low utilisation category. During this period 8 units belonged to medium profit earning group, of which 25 per cent units had high utilisation, 37.50 per cent units belonged to medium utilisation and 3 units were in the low utilisation category.

TABLE 5.13

DISTRIBUTION OF UNITS BASED ON
PROFITS* AND CAPACITY UTILISATION, 2005-06 – KERALA

Nature of Industry	Capacity Utilisation			Total
	High	Medium	Low	
High	10 (37.03)	15 (55.56)	2 (7.41)	27 (100)
Medium	2 (22.22)	3 (33.33)	4 (44.45)	9 (100)
Low	1 (16.67)	1 (16.67)	4 (66.66)	6 (100)
Total	13 (30.95)	19 (45.24)	10 (23.81)	42 (100)

Note: Figures in parenthesis indicate percentage of the total
* Profits denote net profits as per cent of sales
Source: Survey Data

During 2005-06, 27 units had high profit, of which 10 units (37.03 per cent) were in the high utilisation category, whereas 15 units (55.56 per cent) belonged to medium utilisation category and 2 units (7.41 per cent) had only low utilisation. Out of 9 medium profit earning units, the proportion of high utilisation category was 22.22 per cent. During this period, there were 6 low profit earning units, of which one each belonged to high and medium level utilisation categories. All this shows that there is a positive link between the profitability of the firms and their utilisation rate.

5.6 Market Demand and Capacity Utilisation

An explanation of the problem of utilisation of industrial capacity will have to take account of demand for the product. Characteristics of product demand that affect capacity utilisation fall into two categories depending upon whether the resulting idleness is unanticipated or planned. Unanticipated capacity under-utilisation arises, if there is a decline in demand because of changes in taste, income and so forth, forcing a cut in production. Therefore, *ceteris paribus*, growth in market demand should be an incentive for increased supply of output resulting in better utilisation. In this context, we examine the link between market demand for the product and the level of capacity utilisation in tile manufacturing units. In this study, sales proceed is taken as a proxy of the level of market demand. For the sake of convenience, sample units are classified on the basis of level of demand/sales proceed into three categories.

i. **High demand units**, having annual sales proceed of Rs. 100 lakh and above.

ii. **Normal demand units**, having annual sales proceed between Rs. 25 lakh and Rs. 100 lakh.

iii. **Low demand units**, having annual sales proceed less than Rs. 25 lakh.

The distribution of sample units based on market demand and capacity utilisation for the three years, i.e., 2003-04, 2004-05 and 2005-06, is given in Tables 5.14 to 5.16.

TABLE 5.14

DISTRIBUTION OF UNITS BASED ON MARKET DEMAND AND CAPACITY UTILISATION, 2003-04 - KERALA

Nature of Industry	Capacity Utilisation			Total
	High	Medium	Low	
High	8 (80.00)	1 (10.00)	1 (10.00)	10 (100.00)
Normal	4 (21.05)	11 (57.90)	4 (21.05)	19 (100.00)
Low	2 (15.38)	5 (38.46)	6 (46.16)	13 (100.00)
Total	14 (33.33)	17 (40.48)	11 (26.19)	42 (100.00)

Note: Figures in parenthesis indicate percentage of the total
Source: Compiled from the Survey Data

During 2003-04, out of 10 high demand units 80.00 per cent had high level utilisation, 10 per cent each was in the medium and low level utilisation categories. In the same year, out of 19 normal demand units. 21.05 per cent were in the high utilisation category, 57.90 per cent and 21.05 per cent respectively were in the medium and low level utilisation categories. Similarly, out of 13 low demand units, 15.38 per cent units had high level utilisation, while the remaining units were in the medium (38.46 per cent) and low level (46.16 per cent) utilisation categories. The above analysis shows that there is a positive association between the two.

Table 5.15

Distribution of Units Based on Market Demand and Capacity Utilisation, 2004-05 - Kerala

Nature of Industry	Capacity Utilisation			Total
	High	Medium	Low	
High	7 (77.78)	1 (11.11)	1 (11.11)	9 (100.00)
Normal	4 (16.67)	17 (70.83)	3 (12.50)	24 (100.00)
Low	2 (22.22)	3 (33.33)	4 (44.45)	9 (100.00)
Total	13 (30.95)	21 (50.00)	8 (19.05)	42 (100.00)

Note: Figures in parenthesis indicate percentage of the total
Source: Compiled from the Survey Data

An assessment of the data on market demand and capacity utilisation for the year 2004-05, as given in Table 5.15 indicates that out of 9 high demand units, 77.78 per cent units enjoyed high level utilisation, while the share of medium level utilisation units was 11.11 per cent and that of the low level utilisation category units was also 11.11 per cent. During the same period, out of 24 normal demand units, 16.67 per cent had high level utilisation and 70.83 per cent had medium level utilisation and the share of low level utilisation category was 12.50 per cent. Similarly, out of 9 low demand units, the percentage shares of high, medium and low level utilisation category units were 22.22, 33.33 and 44.45 respectively. This analysis clearly indicates that larger percentage of high demand units had high level utilisation.

TABLE 5.16

DISTRIBUTION OF UNITS BASED ON MARKET DEMAND AND CAPACITY UTILISATION, 2005-06 - KERALA

Nature of Industry	Capacity Utilisation			Total
	High	Medium	Low	
High	7 (70.00)	2 (20.00)	1 (10.00)	10 (100.00)
Normal	4 (23.53)	11 (64.71)	2 (11.76)	17 (100.00)
Low	2 (13.33)	6 (40.00)	7 (46.67)	15 (100.00)
Total	13 (30.95)	19 (45.24)	10 (23.81)	42 (100.00)

Note: Figures in parenthesis indicate percentage of the total
Source: Compiled from the Survey Data

The distribution of units based on market demand and capacity utilisation for the period 2005-06 is given in Table 5.16. There appears to be some association between magnitude of market demand and the level of capacity utilisation. During the period, out of 10 high demand units, 70 per cent were in the high utilisation category. The shares of medium and low level utilisation categories were 20 per cent and 10 per cent respectively. Similarly 23.53 per cent units in the high utilisation category, 64.71 per cent units in the medium utilisation category and 11.76 per cent units in the low utilisation category had normal demand. As against this, the distribution of

15 low demand units among the high, medium and low utilisation categories was 13.33 per cent 40.00 per cent and 46.67 respectively. The above data prove that high capacity utilisation is associated with high market demand.

SECTION C

5.7 Reasons for Underutilisation of Capacity

The problem of underutilisation of capacity has received considerable attention from policy makers. Underutilisation of capacity is a luxury which developing countries can ill-afford.

It has been pointed out that the factors that determine capacity utilisation can broadly be divided into exogenous and endogenous (Vijay. K. Seth, 1999)[13]. Samuel Paul has also addressed himself to this aspect of the problem while studying inter-industrial differences in capacity utilisation (Samuel Paul, 1974).[14] He divides all the factors that can explain underutilisation into three groups.

(a) Industrial characteristics , (b) Policy influences, and (c) Outliers. Singh Hardip (1975)[15] has broadly categorised the factors which cause underutilisation as follows.

(i) Factors which affect industry as a whole, and (ii) Factors whose impact is normally restricted to a particular industry.

With the foregoing background consideration in view, we may now examine as to what are the major factors which cause underutilisation of installed capacity among the tile factories in Kerala.

Our analysis of underutilisation of capacity is based on: (i) Information supplied by the firms, and (ii) Views expressed by the owners and managers in the opinion survey.

There are many factors which come in the way of effective utilisation of installed capacity. The present study brought out the following reasons responsible for the underutilisation.

5.7.1 Shortage of Raw-materials. Raw-material is a crucial factor in production. The present study reveals that the most telling effect on capacity utilisation in the tile industry in Kerala was caused by the shortage of raw-materials, especially clay. Almost all the units surveyed were handicapped by the non-availability of raw-materials.

The region-wise analysis (Table 5.17) indicates that 41 units out of 42 units suffered the most because of shortage of raw-materials. 100 per cent of the units in Calicut region, 96 per cent of the units in Trichur region and 100 per cent of the units in Alwaye region reported underutilisation of capacity due to raw-material shortage during 2003-04 to 2005-06.

TABLE 5.17

DISTRIBUTION OF UNITS HAVING RAW-MATERIAL SHORTAGE BY NATURE OF REGION

Region	Total units	2003-04		2004-05		2005-06	
		No. of units reporting shortage	Per cent of total	No. of units reporting shortage	Per cent of total	No. of units reporting shortage	Per cent of total
Calicut	6	6	100.00	6	100.00	6	100.00
Trichur	30	29	96.67	28	93.33	29	96.67
Alwaye	6	6	100.00	6	100.00	6	100.00
Total (Kerala)	42	41	97.61	40	95.23	41	97.61

Source: Survey Data.

Raw-Material Shortage and Extent of Capacity Utilisation

Table 5.18 gives the distribution of units reporting raw-material shortage according to the extent of capacity utilisation. On the basis of utilisation, the units were grouped into three categories: units having high utilisation, units having medium utilisation and units having low utilisation.

It is obvious that the units having no difficulty in obtaining raw-materials would have relatively higher capacity utilisation. Similarly, units having poor availability of raw-materials would have lower capacity utilisation. The study indicated that in 2003-04, 40 per cent, 86 per cent and 96 per cent of the units in high, medium and low capacity utilisation groups respectively reported shortage of raw-materials. The proportion of the units in the three groups reporting shortage of raw-materials in 2004-05 was 38 per cent, 84 per cent and 94 per cent respectively. The study indicates more or less the same trend in 2005-06.

TABLE 5.18

SHORTAGE OF RAW-MATERIALS BASED ON UTILISATION (IN PER CENT)

Nature of Utilisation	2003-04	2004-05	2005-06
High	40.00	38.00	39.00
Medium	86.00	84.00	85.00
Low	96.00	94.00	95.00

Source: Survey Data.

5.7.2 Shortage of Power. Inadequate supply of power has been another most important factor causing underutilisation of capacity in tile units in Kerala.

Almost all the units under survey reported extreme power cuts leading to loss of production. Table 5.19 gives the distribution of sample units reporting power problem region-wise. An assessment of the data in the Table shows that on the whole 31 per cent to 35 per cent of the tile units under study during 2003-06 had suffered on account of inadequate supply of power. The problem was more acute in 2003-04.

TABLE 5.19

DISTRIBUTION OF UNITS REPORTING POWER PROBLEM BY REGION-WISE

Region	Total No. of units	2003-04		2004-05		2005-06	
		No. of units reporting shortage	Per cent of total	No. of units reporting shortage	Per cent of total	No. of units reporting shortage	Per cent of total
Calicut	6	4	66.67	4	66.67	3	50.00
Trichur	30	27	90.00	26	86.67	25	83.33
Alwaye	6	4	66.67	3	50.00	3	50.00
Total (Kerala)	42	35	83.33	33	78.57	31	73.81

Source: Survey Data.

Table 5.20 given below shows the distribution of sample units having power problem according to size.

TABLE 5.20

DISTRIBUTION OF UNITS HAVING POWER PROBLEM BY SIZE

(in per cent)

Size	2003-04	2004-05	2005-06
Large	72.00	85.00	87.00
Medium	87.00	92.00	94.00
Small	81.00	99.00	87.00

Source: Survey Data.

The data clearly indicate that the gravity of the problem was more in the case of small and medium-scale units as compared to large-scale units. For instance, 72 per cent of large-scale units in 2003-04 reported power problem as against 87 per cent and 81 per cent in the medium and small-scale categories respectively. In 2004-05, the proportion of units having power problem in large, medium and small-scale categories was 85, 92 and 99 per cent respectively. In 2005-06, the relevant figures were 87, 94 and 87 per cent respectively.

It has been observed that there was a somewhat lower incidence of power shortage in the large-scale category. This was so because several large-scale units had installed their own generators and could meet a part of their power requirement through them.

5.7.3 Lack of Finance

Shortage of finance also held up production and prevented the fuller utilisation of capacity. Out of 42 sample units, 8 units had stated lack of finance as a serious bottleneck in their working and fuller utilisation of capacity.

Table 5.21 gives the distribution of sample units having financial problem region-wise. The problem of finance is closely connected with size and it is clearly revealed in the data given in the Table 5.21.

TABLE 5.21

DISTRIBUTION OF UNITS WHICH EXPERIENCED SHORTAGE OF FINANCE BASED ON SIZE

(in per cent)

Size	2003-04	2004-05	2005-06
Large	10	10	9
Medium	40	38	30
Small	60	58	51

Source: Survey Data.

The problem of finance appears to be serious in the small-scale sector. (50-60 per cent). In the case of medium-scale units, 40 per cent units in 2003-04, 38 per cent units in 2004-05 and 30 per cent units in 2005-06 indicated underutilisation of capacity due to shortage of finance. Against this, only 10 per cent of the large-scale units in 2003-04, 10 per cent in 2004-05 and 9 per cent in 2005-06 indicated it as a cause of underutilisation. This is understandable as these units have an easy access to credit from banks.

The relationship between availability of finance and utilisation of capacity can be deduced from the data in Table 5.22 which depicts the distribution of units by capacity utilisation and inadequacy of finance.

TABLE 5.22

DISTRIBUTION OF UNITS BY CAPACITY UTILISATION VIS-À-VIS SHORTAGE OF FINANCE

(in per cent)

Nature of Utilisation	2003-04	2004-05	2005-06
High	40	30	21
Medium	65	50	51
Low	68	70	76

Source: Survey Data.

In the case of units having low capacity utilisation (less than 30 per cent of capacity), 68 per cent, 70 per cent and 76 per cent of the units in 2003-04, 2004-05 and 2005-06 respectively indicated the problem of shortage of finance. On the other hand, in high utilisation category (60 per cent and above of capacity), the percentage of units indicating this problem was 40 per cent in 2003-04, 30 per cent in 2004-05 and 21 per cent in 2005-06.

5.7.4 Lack of Demand

Out of 42 sample units, only 5 units had mentioned inadequate demand among the main causes of underutilisation. Out of 5 units which mentioned the lack of demand as a reason for underutilisation in 2005-06, I unit belongs to Calicut region, 3 units belong to Trichur region and I unit belongs to Alwaye region.

The distribution of sample units which experienced shortage of demand by size is given in Table 5.23.

TABLE 5.23

DISTRIBUTION OF UNITS WHICH EXPERIENCED SHORTAGE OF DEMAND BY SIZE

(in percentage)

Size	2003-04	2004-05	2005-06
Large	2	2	1
Medium	4	5	4
Small	5	6	4

Source: Survey Data.

Size-wise, 2 per cent of the units in the large-scale, 4 per cent of the units in medium-scale and 5 per cent of the units in the small-scale categories experienced shortage of demand in 2003-04. In 2005-06, 1 per cent, 4 per cent, and 4 per cent of the large, medium and small-scale categories respectively indicated shortage of demand as a cause of underutilisation.

5.7.5 Labour Problem

A part of underutilisation may be attributed to labour trouble. There are two aspects of this problem: one was the shortage of required labour supply, and the other related to such matters as go slow, absenteeism, disputes and work stoppages. Absenteeism was high in tile factories. In the case of units under survey, 25 units had significantly drawn attention to labour problems as a major hindrance to fuller utilisation and better capacity. However, labour militancy does not pose a serious threat to utilisation of industrial capacity in recent years.

5.7.6 Lack of Product Planning and Inappropriate Technology

Though the primary causes of underutilisation appear to be raw-material shortage (clay and firewood) and allied issues, yet lack of proper product planning seems to have aggravated it further. Although small technological changes have been taking place in tile units, many units are still producing the goods they had started with.

To sum up, the primary cause of underutilisation of capacity was inadequate supply of essential inputs, namely, clay and firewood, power and finance. This was aggravated by neglect of proper planning and labour problems. Capacity utilisation has its impact not only on productivity of labour and capital but also on costs and profits. Once a firm has installed some capacity, lower utilisation of the capacity does not bring about a proportionate reduction in costs. The case of fixed cost is obvious. Even variable costs like wages do not go down proportionately with production. Same is the case with administrative and other overhead expenses. Costs that go down are material, power and fuel costs. Even here proportionate reduction is not possible as certain consumable stores and spares become fixed costs once production is undertaken. Since above fixed costs account for a significant proportion of the total cost, higher utilisation would bring about considerable reduction in the costs per unit of output. It is also important to note that profits increase not only because of reduction in costs but also because they are earned on output which was not produced when capacity was underutilised.

Conclusion

This chapter has surveyed some of the issues with regard to the definition and measurement of capacity and utilisation of installed capacity. The two definitions put forward are the engineering and the economic definitions. According to the former, capacity is defined in terms of a ceiling on production and the latter gives enough space for the role of non capital inputs and their prices in deciding potential output. Alternative measures of capacity utilisation have also been discussed in this chapter.

In measuring capacity utilisation in the study, the installed capacity approach is relied upon. Examining all the regions, it has been found that in Kerala, average capacity utilisation remained unchanged at 63 per cent during 1996-97 to 2007-06. Region wise analysis of capacity utilisation exhibited inter-regional variations. Among the three regions, the average capacity utilisation is found to be relatively high in Trichur and Alwaye regions and low in Calicut region. Attempt has also been made to link capacity utilisation with size and profitability. It is apparent from the study that there is no positive association between capacity utilisation and size and that there is positive association between capacity utilisation and profit and also between market demand and capacity utilisation. We have also examined the main causes of under-utilisation of capacity among the tile manufacturing units in Kerala. The analysis highlighted the significant influence of shortage of critical inputs like clay and firewood on capacity utilisation.

Analysis of physical performance or capacity utilisation alone will not give a true picture of the health of an industrial unit. Therefore, an analysis of financial performance is attempted in the next chapter.

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CHAPTER VI
ANALYSIS OF FINANCIAL PERFORMANCE

INTRODUCTION

Analysis of financial statements (profit and loss account and balance sheet) of an organization is one of the measures of studying its financial performance. The importance of financial analysis stems from the fact that every activity of the firm has financial repercussions. Therefore, the analysis of financial performance is the best way to study the effectiveness and efficiency of firm's activities. There are several tools for financial analysis. Among this, ratio analysis, single as well as multivariate, is a widely used measure to study the financial performance. Ratio analysis is extremely helpful in providing valuable insights into a firm's financial health. "Ratio analysis is a very powerful analytical tool useful for measuring the performance of an organization. Ratio analysis helps management to analyse and make further projections" (Ravi. M. Kishore, 2003).[1] In this chapter the financial performance of the tile industry is studied using single as well as multivariate analysis of accounting ratios. The analysis falls into four categories. They are: Analysis of liquidity, Analysis of profitability, Analysis of resource utilisation and Analysis of financial health.

6.1 Analysis of Liquidity

The long term and short term financial stability of a firm depends upon its ability to meet its liabilities on time. The inability to honour obligations will lead to bankruptcy of an organization. The level of liquidity determines a firm's ability to honour its obligations in time. Liquidity of the tile industry is studied from two angles. They are short-term and long-term angles of liquidity.

Short-term liquidity ratios measure the ability of the firm to meet its short-term obligations on time. The inability to honour short-term obligations may lead to under-utilisation of business opportunities and bankruptcy of the organization. The long-term liquidity, on the other hand, determines the financial risk profile of an organisation. The lower the long term liquidity, the higher may be the risk exposure and cost of borrowing in future. The key ratios used for studying short-term liquidity in the present study are Current ratio and Quick ratio. The long-term liquidity is analysed with the help of Debt-Equity ratio.

6.1.1 Current Ratio

Current ratio measures the liquidity of the company in the short-term. This ratio is expressed as follows

$$\text{Current Ratio} = \frac{\text{Current assets \& Loans and Advances}}{\text{Current Liabilities and Provision}}$$

Current assets are the assets which can be converted into cash within a year. Current liabilities and provisions are those liabilities that are repayable within a year. A current ratio of 2:1 is generally accepted as comfortable short-term liquidity position. However, banks and financial institutions generally accept a lower ratio of 1.33: 1 as comfortable for providing working capital finance to the firm.

The inter-regional study of short-term liquidity using current ratio is presented in Table 6.1.

TABLE 6.1

CURRENT RATIO

Year	Calicut	Alwaye	Trichur	Kerala
1996-97	2.44	1.28	1.88	1.87
1997-98	3.18	1.25	2.06	2.10
1998-99	2.53	1.38	2.21	2.14
1999-00	3.23	1.61	2.43	2.43
2000-01	2.09	1.83	2.64	2.45
2001-02	2.63	1.97	2.83	2.68
2002-03	2.27	2.28	2.94	2.75
2003-04	2.08	2.84	3.26	3.03
2004-05	2.24	3.12	3.44	3.22
2005-06	2.16	3.00	3.67	3.36
AVERAGE	2.485	2.056	2.736	2.60

Source: Compiled from Financial Statements

It is evident from the Table that the average current ratios of the tile industry in all the three regions under study are above the normal level of 2:1. However, excess liquidity is seen in the Trichur region with a current ratio of 2.73:1 as against 2.48 in Calicut and 2.05 in Alwaye regions. The inter-regional analysis of the current ratio reveals that the liquidity level of the tile industry in Alwaye region has more fluctuation when compared to their counterparts in other region. However, Calicut region has maintained a relatively stable level of short-term liquidity as indicated by lower fluctuation level of the ratio. The higher current ratio of the tile industry may be attributable to the piling up of inventory or receivables or cash balance. This aspect is investigated by studying the quick ratio in the following analysis.

6.1.2 Quick Ratio

The quick ratio is used as a measure of the firm's ability to meet current obligations . This ratio serves as a supplement to the current ratio in analyzing short-term liquidity. The ideal ratio is considered as 1:1. Since bank loans are secured by inventories, the other current assets should be sufficient to meet current liabilities. The ratio is stated as follows.

$$\text{Quick Ratio} = \frac{\text{Current assets and Loans and advances less inventories}}{\text{Current liabilities Less bank credit}}$$

The quick ratio of the tile industry is presented in the Table 6.2.

TABLE 6.2

QUICK RATIO

Year	Calicut	Alwaye	Trichur	Kerala
1996-97	0.74	0.14	0.23	0.29
1997-98	0.85	0.13	0.24	0.31
1998-99	0.64	0.15	0.25	0.29
1999-00	0.73	0.18	0.28	0.33
2000-01	0.54	0.18	0.28	0.30
2001-02	0.65	0.20	0.31	0.34
2002-03	0.61	0.19	0.33	0.35
2003-04	0.60	0.23	0.38	0.39
2004-05	0.59	0.23	0.37	0.38
2005-06	0.54	0.22	0.53	0.49
AVERAGE	0.649	0.185	0.32	0.35

Source: Compiled from Financial Statements

The study of the short term liquidity of the tile industry using quick ratio paints a different picture about the liquidity levels of the industry. Firms are not able to maintain sufficient liquidity levels as indicated by the lower quick ratio of the industry in all the three regions. The average quick-ratio at the Kerala level is also below the normal level. This reveals that the favourable liquidity levels shown by the current ratio is attributable to the higher levels of inventory build ups in the tile industry. Thus it is evident from the analysis that firms are finding it difficult to meet current obligations on time. An inter-regional study reveals that Alwaye region is more affected by the liquidity problem than their counterparts in other regions.

6.1.3 Debt - Equity Ratio

The capital of the firm is derived from two sources-equity and debt. Equity represents capital provided by owners and debt represents capital provided by outsiders by way of loans. The increase of debt in the capital structure increases the risk profile of the suppliers of debt .This also increases the risk profile of the owners because it reduces the earnings available to the owners in times of financial difficulties. This is attributable to the fact that the debt capital is secured by periodic interest payments even when the company does not earn anything from its operations. The ratio is computed as follows:

$$\text{Debt - Enquity Ratio} = \frac{\text{Debt}}{\text{Owner's Capital}}$$

TABLE 6.3

DEBT - EQUITY RATIO

Year	Calicut	Alwaye	Trichur	Kerala
1996-97	0.07	0.33	0.54	0.44
1997-98	0.07	0.33	0.55	0.45
1998-99	0.09	0.31	0.54	0.44
1999-00	0.09	0.30	0.53	0.43
2000-01	0.12	0.26	0.52	0.43
2001-02	0.11	0.25	0.52	0.42
2002-03	0.08	0.25	0.52	0.42
2003-04	0.09	0.22	0.48	0.39
2004-05	0.09	0.20	0.48	0.38
2005-06	0.09	0.20	0.46	0.37
AVERAGE	0.09	0.265	0.514	0.42

Source: Compiled from Financial Statements

Data presented in the Table show that the debt components of the capital structure of the tile industry across different regions are generally low. However, inter-regional differences exist in the debt-equity ratio. Trichur region has shown the highest level of debt component in the capital structure which is above the state average of 0.42. The Calicut region has exhibited a correspondingly lower debt component in its capital structure. The intra-regional analysis shows that the debt-equity ratio fluctuates widely in Alwaye region when compared with their counterparts in other regions. The lower debt-equity ratio at the all Kerala level exhibited by the tile industry discloses a comfortable long term liquidity of the industry. Generally, the lower the debt-equity ratio the better will be the long term borrowing capacity of the firm. Thus the lower debt-equity ratio exhibited by the industry across different regions is conducive for growth and diversification initiatives of the firms in future.

6.2 Analysis of Profitability

The analysis of profitability using accounting ratios will be helpful in assessing the adequacy of profit earned by the company and also to discover the trend of profitability. The profitability of a firm is the net result of a large number of policies and decisions. The key profitability ratios of the tile industry are explained below

6.2.1 Net Profit Ratio

This ratio is designed to focus attention on the net profit margin arising from the business operations. The ratio measures the efficiency of operations of the company. Net profit is arrived at from gross profit after deducting administration, selling and distribution expenses and financial charges. This ratio is expressed as follows:

$$\text{Net Profit Ratio} = \left(\frac{\text{Net Profit}}{\text{Sales}}\right) \times 100$$

The higher the ratio the better will be the profitability. The net profit ratio of the tile industry is presented in the Table No. 6.4.

TABLE 6.4

NET PROFIT RATIO

(in percentage)

Year	Calicut	Alwaye	Trichur	Kerala
1996-97	2.88	11.36	12.38	10.88
1997-98	6.10	8.44	8.38	8.06
1998-99	4.14	9.62	9.63	8.84
1999-00	4.41	5.51	9.90	8.49
2000-01	4.01	5.88	13.42	11.00
2001-02	3.05	7.60	14.82	12.11
2002-03	4.23	10.20	9.85	9.10
2003-04	4.58	8.06	11.94	10.33
2004-05	4.11	11.02	12.17	10.85
2005-06	3.95	11.46	14.96	12.89
AVERAGE	4.146	8.915	11.745	10.26

Source: Compiled from Financial Statements

The positive net profit ratio displayed by the sample units during the period of the study shows the profitability of the tile industry. The average net profit-ratio at the state level is 10.26 per cent. However, inter-regional differences exist in profitability. Alwaye and Trichur regions exhibit higher average levels of profitability when compared to Calicut region.

The net profit ratio shows relatively stable performance in the Calicut region. In the Alwaye region, the net profit ratio fluctuated between 5.51 per cent and 11.46 per cent. In the Trichur region, it fluctuated between 8.38 per cent and 14.96 per cent. The Calicut region exhibited a relatively lower level of profitability which is much lower than the state average. This analysis reveals that managerial actions in controlling overhead expenses are necessary to maintain a stable and comfortable level of net profit margin in the tile industry.

6.2.2 Return on Capital Employed (ROCE)

The main aim of any business is to earn a reasonable return on its capital. The ROCE has strategic implications because it guides several long term strategies involving business restructuring decisions. This ratio is determined by dividing net profit by capital employed to achieve the profit.

$$\text{Return of Capital Employed} = \frac{\text{Net Profit}}{\text{Capital Employed}}$$

Capital employed for the purpose of this ratio includes fund contributed by the owners which includes share capital and retained earning or reserves.

TABLE 6.5

RETURN ON CAPITAL EMPLOYED

Year	Calicut	Alwaye	Trichur	Kerala
1996-97	4.91	15.72	6.43	7.54
1997-98	6.75	10.40	4.60	5.74
1998-99	6.32	10.47	5.12	6.06
1999-00	6.70	5.36	5.23	5.46
2000-01	7.01	4.52	6.69	6.43
2001-02	4.45	5.92	7.34	6.72
2002-03	7.45	7.94	4.72	5.57
2003-04	8.35	6.44	5.93	6.35
2004-05	7.32	7.99	5.97	6.45
2005-06	7.52	7.51	6.74	6.96
AVERAGE	6.678	8.227	5.877	6.33

Source: Compiled from Financial Statements

A study of the ROCE depicted in the Table 6.5 reveals that tile industry has shown positive ROCE during the period of the analysis. The average ROCE at the state level is 6.33 per cent. This shows that the industry is generating returns to its owners. However, inter-regional differences exist with regard to the ROCE. Alwaye region displays the highest level of ROCE when compared to Calicut and Trichur regions. However, Alwaye region has shown highest level of fluctuation in ROCE. A comparison of ROCE with normal rate of interest on long-term deposits in a commercial bank during that period (ranges between 8 and 12 per cent) will reveal that the tile industry is not producing sufficient returns to compensate the opportunity cost of funds . This calls for structural alterations in the industry to enhance its ROCE

6.3 Analysis of Resource Utilisation

The effectiveness and efficiency of a firm is reflected in the level of resource utilisation. In general, higher level of resource utilisation increases the probability of higher earnings through improved capacity utilisation. Higher levels of performance are reflected in the utilisation of funds for generating sales revenue. Activity ratios measure how effectively the firm employs its resources. The ratio involves comparison between the level of sales and resource utilisation reflected by level of investment in short-term and long-term assets such as receivables, inventory, fixed assets and so forth. In general, activity ratios indicate the speed in which investment in different assets generate revenue to the business. A low ratio indicates blocking of funds in various asset categories leading to low revenue generating ability of the business. The key ratios used in the present analysis are Working Capital Turnover Ratio (WCTOR) and Fixed Asset Turnover Ratio (FATOR).

6.3.1 Working Capital Turnover Ratio (WCTOR)

In a manufacturing industry like tile industry, a sizable amount of funds are invested as working capital. The key feature of working capital is its ability to convert itself into cash quickly. The period is normally recognized as one year. “Working capital is defined as the excess of current assets over current liabilities" (Kishore, 2003).[2] The speed of conversion of working capital determines the firm's, ability to generate sales because the firm needs working capital to create additional sales. A slow rate of conversion of working capital will adversely affect the additional sales generating capacity, leading to lower levels of capacity utilisation by the firm. **WCTOR** is an indicator of the firm's ability to utilise working capital to generate additional sales. The ratio is expressed as

$$\text{Working Capital Turnover Ratio} = \frac{\text{Sales}}{\text{Working Capital}}$$

$$\text{Working Capital} = \text{Current Assets} - \text{Current Liabilities}$$

Data pertaining to WCTOR of the tile industry are presented in the Table 6.6.

TABLE 6.6

WORKING CAPITAL TURNOVER RATIO

Year	Calicut	Alwaye	Trichur	Kerala
1996-97	3.46	3.40	4.87	4.46
1997-98	2.02	3.00	4.89	4.21
1998-99	3.19	3.20	4.24	3.94
1999-00	2.65	3.30	3.89	3.63
2000-01	3.34	4.00	3.59	3.61
2001-02	2.53	5.20	3.46	3.58
2002-03	3.19	6.52	3.55	3.92
2003-04	4.20	7.00	3.57	4.15
2004-05	3.30	4.30	3.62	3.67
2005-06	3.50	4.15	3.50	3.59
AVERAGE	3.079	4.40	3.918	3.88

Source: Compiled from Financial Statements

The ratio is generally low except in Alwaye region which shows significantly higher ratio compared to their counterparts in Calicut and Trichur regions. However, an inter-regional analysis shows that the ratio has shown higher levels of fluctuation in Alwaye region. The average working capital turn-over ratio at the Kerala level is 3.88. A low ratio indicates low activity level due to blocking of working capital which may lead to:

1. High carrying cost of current assets, which dampens profitability.

2. Reduced capacity utilisation caused by the shortage of working capital. This aspect is probed by undertaking an inter-regional study of the correlation between WCTOR and the rate of capacity utilisation. The results of the analysis are presented in the Table 6.7.

TABLE 6.7.

WORKING CAPITAL TURNOVER & CAPACITY UTILISATION

YEAR	Calicut		Alwaye		Trichur		Kerala	
	Working capital turn over ratio	Capacity utilisation (%)	Working capital turn over ratio	Capacity utilisation (%)	Working capital turn over ratio	Capacity utilisation (%)	Working capital turn over ratio	Capacity utilisation (%)
1996-97	3.46	57.83	3.40	60.73	4.87	71.13	4.46	67.74
1997-98	2.02	56.84	3.00	59.40	4.89	70.06	4.21	66.65
1998-99	3.19	57.57	3.20	60.53	4.24	70.59	3.94	67.29
1999-00	2.65	49.36	3.30	60.53	3.89	68.94	3.63	64.94
2000-01	3.34	55.44	4.00	60.26	3.59	67.71	3.61	64.89
2001-02	2.53	55.96	5.20	61.26	3.46	66.91	3.58	64.54
2002-03	3.19	57.25	6.52	61.26	3.55	64.98	3.92	63.34
2003-04	4.20	60.91	7.00	62.60	3.57	66.04	4.15	64.82
2004-05	3.30	61.17	4.30	61.33	3.62	66.05	3.67	64.68
2005-06	3.50	62.20	4.15	62.66	3.50	64.23	3.59	63.72
AVERAGE	3.138	57.453	4.407	61.056	3.918	67.664	3.88	65.26
CORRELATION	0.56		0.66		0.85		0.67	

Source: Compiled from Financial Statements

The results presented in the Table 6.7 indicate a positive correlation between working capital turnover and the rate of capacity utilisation across all regions. The state level analysis also endorses the finding: At the inter-regional level the correlation is more significant in the Trichur region. The lowest level of correlation is reported in the Calicut region. It is clear from the analysis that any improvement in the working capital management is contributing positively towards the capacity utilisation of the firm.

A further insight into the lower working capital utilisation is undertaken by studying the utilisation level of key components of working capital such as inventory and receivables using Inventory-Turnover Ratio (ITOR) and Debtors-Turnover Ratio (DTOR) respectively in the following analysis.

6.3.2 Inventory Turnover Ratio (ITOR)

A considerable amount of a manufacturing firm's working capital is normally tied up in inventory. Inventory of the tile industry consists of raw-materials (clay and firewood) in the yard, work-in-progress in the factory and finished goods lying in the godown waiting for customers. The level of investment in these components is to be kept under control for smooth operation and profitability of the firm. ITOR is computed as follows:

$$\text{Inventory Turnover Ratio (ITOR)} = \frac{\text{Cost of Production}}{\text{Average Inventory}}$$

For better analysis this ratio is converted into days representing the number of days the working capital is tied up in inventory in the tile industry, using the following equation:

$$\text{No. of days of Inventory} = \frac{365}{\text{ITOR}}$$

The results of the analysis are presented in the Table 6.8.

TABLE 6.8

INVENTORY ACCUMULATION (IN DAYS)

Year	Calicut	Alwaye	Trichur	Kerala
1996-97	152.08	78.49	184.34	164.61
1997-98	233.97	73.89	184.34	175.65
1998-99	158.70	81.84	188.14	168.75
1999-00	175.48	89.24	192.11	175.04
2000-01	175.48	108.96	181.59	170.34
2001-02	203.91	116.61	189.12	180.87
2002-03	174.64	131.29	188.14	178.09
2003-04	164.41	133.70	188.14	176.97
2004-05	176.33	185.28	181.59	181.37
2005-06	162.95	177.79	180.69	177.74
AVERAGE	177.80	117.71	185.75	174.94

Source: Compiled from Financial Statements

Data presented in the Table 6.8 show that on an average working capital is blocked 178,118 and 186 days respectively in inventory in Calicut, Alwaye and Trichur regions. This indicates that a sizable amount of investment of working capital is blocked in inventories in the tile industry. At the inter-regional level fluctuations are found higher in Calicut and Alwaye regions. At the all Kerala level, on an average, working capital is blocked in inventory for 175 days.

Since inventory is represented by raw-materials, work-in-progress and finished goods, a further component-wise analysis will throw light on the contribution of different components to the slow movement of inventory of the industry. This is undertaken in the following Tables (Table 6.9 to Table 6.11)

i. Raw-Materials Conversion Period (RMCP)

Raw-Materials Conversion Period represents the number of days working capital is tied up in raw-materials stage of the inventory. The ratio is expressed as follows:

$$\text{Raw-materials Conversion Period}\left(\text{RMCP}\right) = \left(\frac{\text{Cost of Production}}{\text{Average Stock of Raw-materials}}\right) \times 365$$

The following Table 6.9 holds information pertaining to the RMCP of the tile industry

TABLE 6.9

RAW-MATERIALS ACCUMULATION (IN DAYS)

Year	Calicut	Alwaye	Trichur	Kerala
1996-97	60.13	61.55	91.71	82.89
1997-98	100.00	56.24	90.57	87.01
1998-99	58.03	62.93	92.41	83.29
1999-00	78.33	69.66	95.05	89.03
2000-01	44.57	84.49	89.68	82.49
2001-02	68.74	90.12	90.12	87.07
2002-03	58.78	102.53	93.83	90.07
2003-04	63.04	106.10	92.41	90.17
2004-05	83.52	145.42	91.02	97.72
2005-06	80.57	140.93	92.64	97.81
AVERAGE	69.57	92.00	91.94	88.76

Source: Compiled from Financial Statements

It is clear from the data presented in the Table 6.9 that, on an average, working capital is blocked 70, 92 and 92 days respectively in raw-material inventory in Calicut, Alwaye and Trichur regions. The corresponding figures at the all Kerala level in 89. This indicates that a sizable amount of investment in working capital is blocked in raw-materials in the tile industry. At the inter-regional level fluctuations are found higher in Calicut and Alwaye regions.

ii. Work-in-Progress Conversion Period (WIPCP)

Work-in-Progress Conversion Period represents the number of days working capital is tied up in work-in-progress (semi-finished goods) stage of the inventory. The ratio is expressed as follows .

$$\text{Work-in-Progress Conversion Period}\left(\text{WIPCP}\right)$$

$$= \left(\frac{\text{Cost of Production}}{\text{Average Work-in-Progress}}\right) \div 365$$

The Table 6.10 holds information pertaining to the WIPCP of the tile industry

TABLE 6.10

WORK-IN-PROGRESS CONVERSION (IN DAYS)

Year	Calicut	Alwaye	Trichur	Kerala
1996-97	18.25	12.90	63.92	50.11
1997-98	23.40	13.52	62.71	50.07
1998-99	23.25	14.37	64.83	51.68
1999-00	18.16	14.54	65.18	51.23
2000-01	18.07	18.25	57.66	46.37
2001-02	20.62	20.28	60.43	49.01
2002-03	20.74	21.10	63.92	51.63
2003-04	23.10	20.98	67.72	54.67
2004-05	23.10	29.92	63.81	53.15
2005-06	22.53	26.26	64.83	53.28
AVERAGE	21.12	19.21	63.50	51.12

Source: Compiled from Financial Statements

Table 6.10 shows that on an average, working capital is blocked 21,19 and 64 days respectively in work-in-progress inventory in Calicut, Alwaye and Trichur regions. The corresponding data for Kerala is 51 days. This indicates that the blocking of fund in this component of inventory is comparatively low is the tile industry except in Trichur region. The factors contributing to this may be efficiency achieved by the industry in production methods and production scheduling techniques. At the inter-regional level, fluctuations are not found higher across different regions

iii. Finished Goods Conversion Period (FGCP)

Finished Goods Conversion Period component of the inventory conversion period represents the number of days working capital is tied up in finished goods stage waiting for delivery to customers. The ratio is expressed as follows:

$$\text{Finished Goods Conversion Period}\left(\text{FGCP}\right) = \left(\frac{\text{Cost of production}}{\text{Average stock of Finished Goods}}\right) \times 365$$

The Table 6.11 holds information pertaining to the FGCP of the tile industry.

TABLE 6.11

FINISHED GOODS ACCUMULATION (IN DAYS)

Year	Calicut	Alwaye	Trichur	Kerala
1996-97	73.44	3.98	28.52	31.43
1997-98	110.94	4.20	30.67	38.36
1998-99	77.17	4.45	31.20	33.95
1999-00	78.83	5.03	31.74	34.65
2000-01	113.00	6.22	34.11	41.40
2001-02	114.78	6.25	38.46	44.76
2002-03	95.05	7.78	30.17	36.24
2003-04	78.66	6.94	27.44	31.83
2004-05	69.66	9.89	27.04	30.68
2005-06	60.03	10.46	23.40	26.78
AVERAGE	87.16	6.52	30.27	35.01

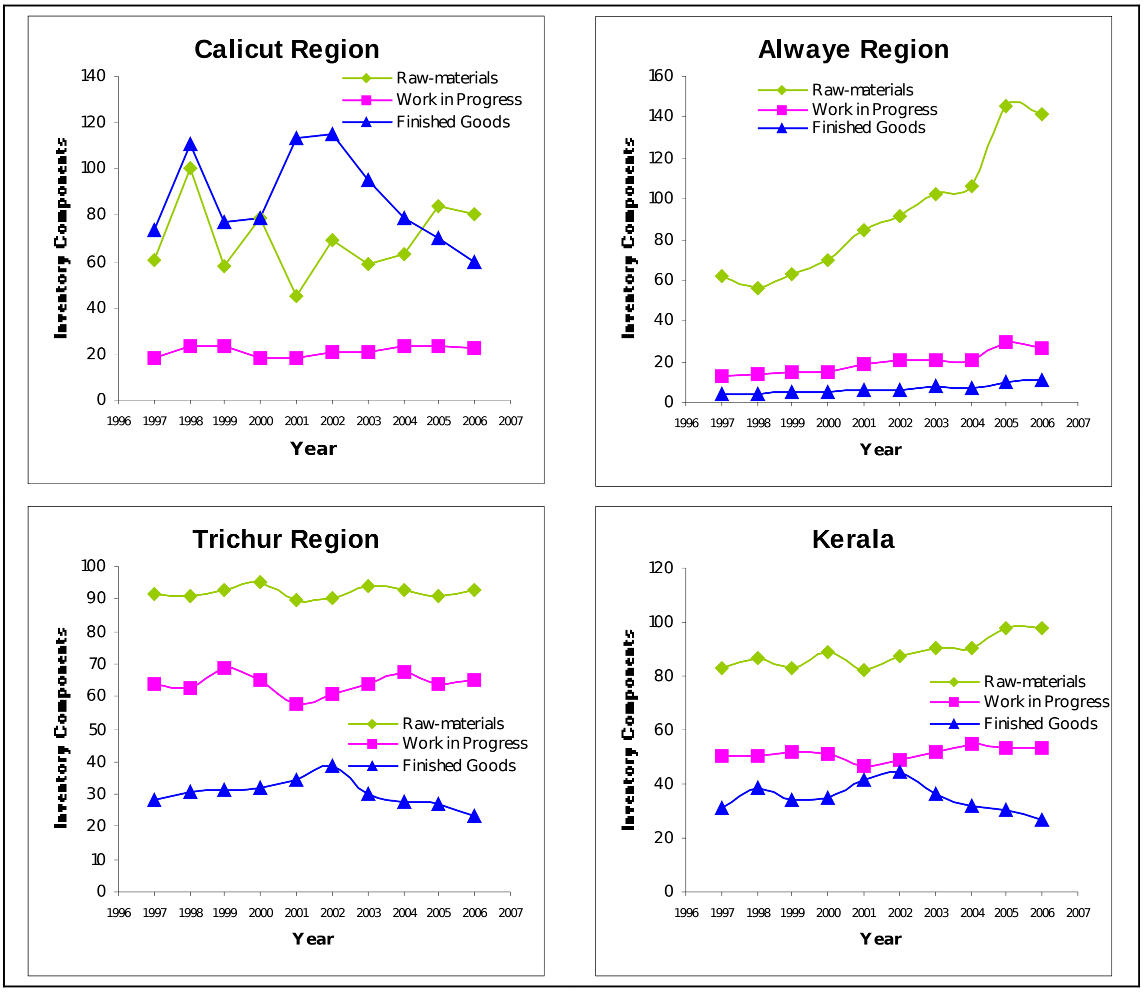
Source: Compiled from Financial Statements

Table 6.11 shows that on an average, working capital is blocked 87, 7 and 30 days respectively in finished goods stage, in Calicut, Alwaye and Trichur regions. This indicates that the blocking of funds in this component of inventory is comparatively less in Alwaye and Trichur regions when compared to their counterpart in Calicut region. At the all Kerala level the finished goods conversion period is 35 days. The factors contributing to this may be efficiency achieved by the Alwaye and Trichur regions in marketing management. At the inter-regional level, fluctuations are not found higher except in the case of Calicut region.

An inter-regional study of working capital blocking in different components of inventory is presented in Figure 6.1.

Figure 6.1

**Accumulation in Days in
Different Inventory Components -
Calicut, Alwaye, Trichur Regions and Kerala**



Source: Compiled from Financial Statements

It is clear from the Figures that raw-materials account for higher level of working capital blocking leading to dampening of activities in the tile industry. Inter-regional analysis shows that finished goods component of the industry is the highest in Calicut region which calls for improvements in marketing efforts. Work-in-progress component is found significant in Trichur region which calls for improvements in production methods.

6.3.3 Debtors Turnover Ratio (DTOR)

Another component of the working capital in the tile industry is the funds tied up in debtors (receivables) arising from sale of finished goods on credit. DTOR measures whether the amount of resources tied up in debtors is reasonable and whether the company is efficient in converting receivables into cash through efficient collection systems. The formula is:

$$\text{Debtors Turnover Ratio} = \frac{\text{Credit Sales}}{\text{Average Debtors}}$$

Instead of credit sales, total sales is taken for the present analysis for want of sufficient data pertaining to cash and credit sales from the sample units.

The results of the analysis are presented in the form of debtors conversion period which is derived from the DTOR to represent the number of days it takes to collect the amounts due from debtors. The formula is:

$$\text{Average Collection Period} = \frac{365}{\text{DTOR}}$$

The Table 6.12 depicts information pertaining to the collection period of debtors in the tile industry.

TABLE 6.12

AVERAGE COLLECTION PERIOD (IN DAYS)

Year	Calicut	Alwaye	Trichur	Kerala
1996-97	32	2	1	6
1997-98	53	3	1	9
1998-99	38	3	1	7
1999-00	36	3	1	6
2000-01	47	3	1	8
2001-02	48	3	1	8
2002-03	46	3	1	8
2003-04	46	3	1	8
2004-05	43	3	1	7
2005-06	40	3	1	7
AVERAGE	43	3	1	7

Source: Compiled from Financial Statements

The tile industry generally exhibits efficient collection as indicated by the lower collection period at the Kerala level. However, inter-regional differences exist in the collection efficiency. The average collection period is very low in Trichur (1 day) and Alwaye (3 days) regions. This shows marketing efficiency of the industry which is supported by the earlier analysis of average conversion period of finished goods of those regions. The collection efficiency is generally poor (43 days) in the Calicut region

6.3.4 Fixed Asset Turnover Ratio (FATOR)

Fixed Asset Turnover Ratio determines the utilisation of funds invested in fixed assets. This ratio is expressed as:

$$\text{Fixed Asset Turnover Ratio} = \frac{\text{Sales}}{\text{Average Fixed Assets}}$$

Relevant information pertaining to the FATOR of the tile industry is presented in the Table 6.13.

TABLE 6.13

FIXED ASSET TURNOVER RATIO

Year	Calicut	Alwaye	Trichur	Kerala
1996-97	2.70	1.07	0.48	0.88
1997-98	1.99	1.00	0.52	0.80
1998-99	2.43	0.93	0.51	0.84
1999-00	2.88	0.88	0.52	0.91
2000-01	2.85	0.72	0.50	0.87
2001-02	2.83	0.75	0.50	0.87
2002-03	3.17	0.77	0.49	0.91
2003-04	3.13	0.84	0.51	0.93
2004-05	3.20	0.79	0.51	0.93
2005-06	3.26	0.71	0.47	0.90
AVERAGE	2.84	0.85	0.50	0.89

Source: Compiled from Financial Statements

The FATOR measures efficiency in the utilisation of fixed assets. Data provided in the Table 6.13 shows that fixed asset utilisation efficiency is higher in the Calicut region than their counterparts in Alwaye and Trichur regions .

6.3.5 Cash Flow from Operations (CFFO)

The cash flow from operations measures the firm's ability to generate the resources required to meet its operation from internal sources. The cash generating ability is better studied by relating it with the current liabilities of the organization. This ratio is stated as follows:

$$\text{CFFO to current liabilities} = \frac{\text{CFFO}}{\text{Current Liabilities}}$$

Cash flow from operations represents company's earning adjusted to non cash items and changes in working capital. It is computed as follows

CFFO = Net Profit or Net Loss [+/-] Non-Cash items [+/-]

Net changes in working capital.

Non cash incomes and increase in net working capital are subtracted from the net profit and non cash expenses and decrease in net working capital are added to the net profit to arrive at the CFFO. Working capital represents excess of current assets over current liabilities.

The purpose of the ratio is to assess whether the tile industry operations are generating enough cash flows to cover its current liabilities. If the ratio is below 1 then the firm is not generating enough cash flows from its operations to meet its current liabilities. The Table 6.14 and supporting Figure 6.5 will provide insight into this aspect of the tile industry in Kerala.

TABLE 6.14

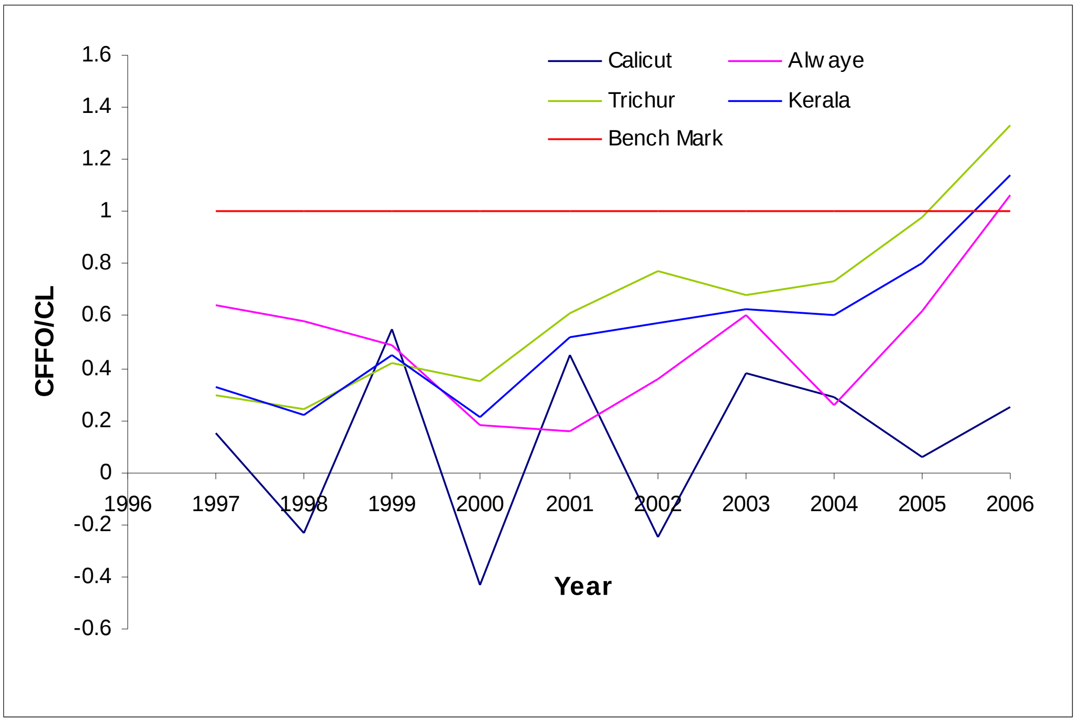
CFFO TO CURRENT LIABILITIES

Year	Calicut	Alwaye	Trichur	Kerala
1996-97	0.15	0.64	0.30	0.33
1997-98	-0.23	0.58	0.24	0.22
1998-99	0.55	0.49	0.42	0.45
1999-00	-0.43	0.18	0.35	0.21
2000-01	0.45	0.16	0.61	0.52
2001-02	-0.25	0.36	0.77	0.57
2002-03	0.38	0.6	0.68	0.63
2003-04	0.29	0.26	0.73	0.60
2004-05	0.06	0.62	0.98	0.80
2005-06	0.25	1.06	1.33	1.14
AVERAGE	0.116	0.55	0.548	0.55

Source: Compiled from Financial Statements

FIGURE 6.2

CFFO TO CURRENT LIABILITIES



Source: Compiled from Financial Statements

From the data provided in the Table 6.14 and the graphical representation of the ratio, it is clear that the cash flows from operations are generally inadequate to meet current liabilities across different regions. An inter-regional analysis shows that in Trichur and in Alwaye regions cash flows are greater than that of the Calicut region. The negative cash flow ratios of Calicut region indicate poor financial management. If the company cannot meet its current liabilities then it is not going to be easy for it to borrow additional funds at favourable terms.

6.4 Analysis of Financial Health

The foregoing analysis of liquidity, profitability and resource utilisation fall under univariate analysis using accounting ratios. One of the limitations of the univariate analysis is based on the fact that a single measure is not sufficient to diagnose the financial performance of a firm since performance is influenced by many factors. “In almost every case, the methodology was essentially univariate in nature and emphasis was placed on individual signals of impending problems. Ratio analysis presented in this fashion is susceptible to faulty interpretation and is potentially confusing (Altman, Caouctte and Narayan, 1998).[3]

Hence a multivariate analysis using several ratios determining performance is developed for better insights into a firm's operations. The most popular among them is the Multiple Discriminant Analysis (MDA) model suggested by Altman.

Multiple Discriminant Analysis is a statistical technique used to classify an observation into one of several a *priori* groupings dependent upon the observation’s individual characteristics. It is used primarily to classify and/or make predictions in problems where the dependent variable appears in qualitative form, for example, male or female, bankrupt or non bankrupt (Altman, Caouctte and Narayan, 1998).[4]

Altman has developed a multivariate model using MDA to predict financial distress of a firm. He has originally developed a model using 4 financial ratios to predict bankruptcy of a firm. The model was originally developed to study the financial distress of public companies whose shares are traded in the stock exchanges. Subsequently Altman has modified the model to incorporate private firms whose shares are not traded in stock exchanges.

Tile industry of Kerala falls under this category of firms. Hence the Altman’s model for private firm is used here for analyzing the financial health of the tile industry.

The model is built on 5 ratios with varying weights as shown below. The model will generate a "Z" score to study the level of financial health of a firm. However, the effectiveness of the model in the context of traditional industries like the tile needs further adaptations and modifications. Hence, the result of the analysis is to be evaluated in the light of this limitation. The model is expressed as follows:

$$\mathbf{Z = .717(X1) + .847(X2) + 3.107(X3) + .42(X4) + .998(X5)}$$

Where:

X1= Working capital/ Total assets

X2= Retained earnings/ Total assets

X3= Earnings before Interest and Taxes/ Total assets

X4= Networth /Total liabilities

X5= Sales/ Total assets

Z = Overall index

A "Z" score below 1.23 indicates high probability for bankruptcy or financial distress. A score above 2.9 indicates a low probability for bankruptcy. A score between 1.23 and 2.9 indicates grey areas where managerial action is needed to improve the financial health of the firm. "Z" scores of the tile industry are presented in the Table 6.15 and supporting Figure 6.6.

Table 6.15

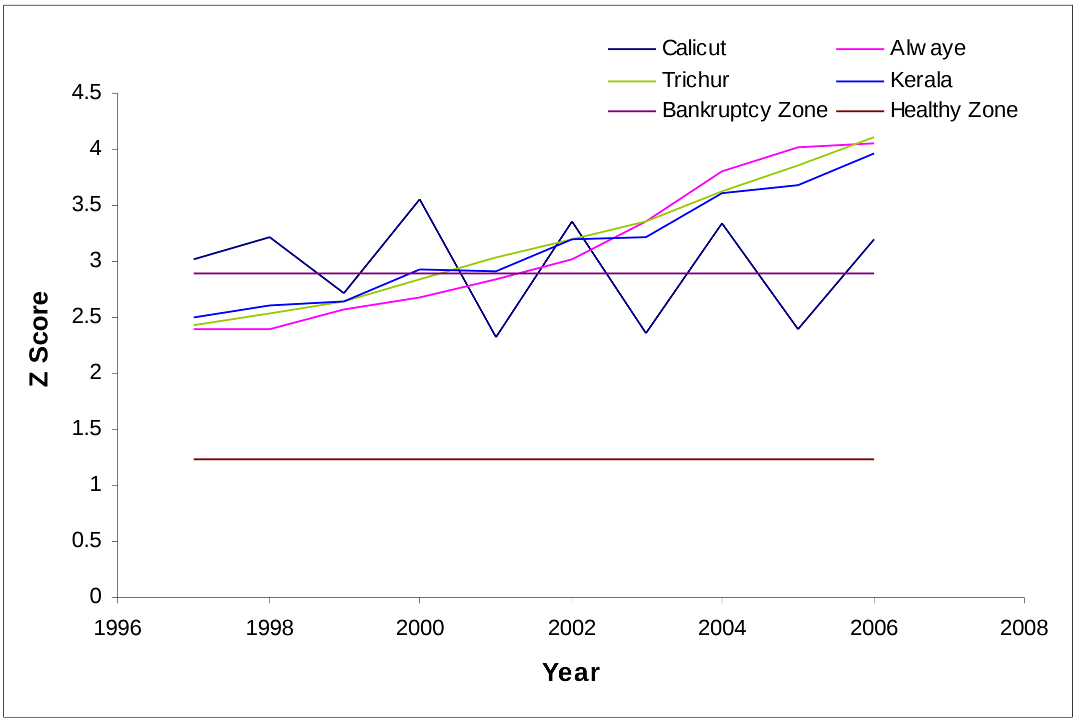
"Z" Scores

Year	Calicut	Alwaye	Trichur	Kerala
1996-97	3.02	2.40	2.42	2.50
1997-98	3.22	2.39	2.53	2.61
1998-99	2.72	2.57	2.65	2.65
1999-00	3.55	2.67	2.84	2.92
2000-01	2.33	2.84	3.04	2.91
2001-02	3.35	3.02	3.20	3.20
2002-03	2.35	3.36	3.36	3.22
2003-04	3.34	3.81	3.63	3.61
2004-05	2.40	4.02	3.85	3.67
2005-06	3.20	4.05	4.11	3.97
AVERAGE	2.948	3.113	3.163	3.13

Source: Compiled from Financial Statements

Figure 6.3

"Z" Scores with Bench Mark



It is clear from the Table 6.15 that the overall financial health of the tile industry is good as indicated by the average "Z" score, which is above the upper cut off limit across all regions. The "Z" score of Trichur region is the highest indicating overall financial health. The "Z" score is the lowest in Calicut region. However, an inter-regional study based on the Figure reveals that the industry was in the grey zone for several years. However, in the later years of the period of study, firms of the industry across the regions have moved into the healthy zone to report a "Z" score above 2.9.

Conclusion

The important findings of the financial performance analysis are summarized as follows.

The short term liquidity of the industry is generally good as indicated by the current-ratio. But an uncomfortable quick-ratio calls for improvements in inventory management of the tile industry. The profitability indicators showed weak signals as shown by lower return on capital employed. Net-profit ratio is low in tile industry. This study has shown lower working capital turnover ratio which is an indication of blocking of funds in working capital. The average debt-equity ratio of the industry is lower. This indicates that most of the firms enjoy reserve borrowing power. This study also pinpoints the need of improving productivity of the tile manufacturing units in Kerala.

Analysis of the overall financial health of the industry with the help of Multiple Discriminant Analysis indicated that the bankruptcy risk of the tile manufacturing units is generally low. It is apparent from the analysis of financial performance that the overall performance of tile manufacturing units in Kerala is not upto the mark. Therefore, an attempt is made in the next chapter to detect and diagnose the problems and constraints of this industry.

Notes and References

1. Ravi M. Kishore (2003), *Financial Management*, Taxmann's Allied Service Pvt Ltd, New Delhi, 2003, p. 14.

2. *Ibid*. p. 295.

3. Altman, E.I. John B. Caouctte and P. Narayan (1998), *Managing Credit Risk; Next Great Financial Challenge*: Wiley Frontiers in Finance Series, Canada, p. 119.

4. *Ibid*. p. 119.

CHAPTER VII

PROBLEMS AND CONSTRAINTS OF THE TILE INDUSTRY IN KERALA

INTRODUCTION

Kerala is enjoying the monopoly of tiles production in the country ever since this industry started to appear in the map of Kerala State. The age-old traditional industry of Kerala is now in the doldrums. This industry has been finding it difficult to survive in the present times due to various problems. Problems arose with the establishment of new tile factories in other States like Tamil Nadu, Karnataka, Andhra Pradesh, Gujarat, Rajasthan and Orissa. Problems of the existing tile units in Kerala intensified with the uncontrolled establishment of a large number of uneconomic small units. Changes in building technology and design of houses, shortage of critical inputs, limited financial resources and so on added fire. As a result of these causes, most of the tile units in Kerala are on the brink of closure. An attempt has been made in Section A of this chapter to identify the chief problems and challenges that the tile industry in Kerala faces today. Section B of this chapter contains certain solutions.

SECTION A

7.1 Chief Problems

7.1.1 Scarcity of Inputs

The major inputs of this industry are clay and firewood. The prime problem is the ever shrinking source of the chief raw-material - clay. This is followed by the scarcity and the soaring rate of cost of the second important raw-material - firewood. The problem of finding sufficient man power for heavy manual work fills the cup of woe for the industry.

(i) Clay - Clay is the most important raw-material involved in the manufacture of tiles. Therefore, the availability and extraction possibilities play a major role in successful running of this industry. The availability of clay has been diminishing day-by-day for a long time now and the industry, at least in some parts of the country, is finding it difficult to procure the right clay. There are various reasons for this situation. The clay is mined mainly from paddy fields and sometimes from the banks of backwater lakes. This source is being practically exhausted for various reasons. Digging to lower strata may not be feasible due to differences in quality and higher cost of clay. As a result the tile industry has to turn to inferior clay from sources other than paddy fields. Uncontrolled mining is another reason for non-availability of the right clay to the industry. Clay has to be brought from long distances, incurring huge transportation costs. Hence, this raw-material has become not only expensive but scarce also.

Due to these reasons the manufacturers have to collect the clay through the contractors, who will collect the clay from far off places and supply it at very high rates. The average cost of clay per box has gone up from Rs. 100/- in 1996-97 to Rs. 175/- in 2005-06 which reflects a 75 per cent increase in its price over a decade.

The various problems faced by the sample units in respect of clay include high price, scarcity, poor quality, delay in delivery, absence of quality test, shortage of finance and delay from contractors. The relative importance of each problem is analysed by using weighted ranking method and is presented in Table 7.1. In order to find out the intensity of the factors, the entrepreneurs were asked to indicate the order of intensity to them. The maximum number of reasons given by a single entrepreneur does not exceed seven. Accordingly, weighted scores were calculated for each of the seven problems by giving a weight of 7 points to the most prominent one, and six, five .... and one points respectively to the succeeding ones in that order. The weighted scores calculated for each of the seven problems were added up for all the respondents and the factors were ranked on the basis of the total weighted scores for each problem.

TABLE 7.1

RANKING OF PROBLEMS IN THE PROCUREMENT OF CLAY

Weight	7	6	5	4	3	2	1	0	Weighted Score	Weighted Rank
Rank	1	2	3	4	5	6	7	8		
Problems										
High price	15	20	2	1	-	-	1	3	240	I
Poor quality	10	8	15	1	1	1	-	6	202	III
Scarcity	13	11	14	-	-	-	-	4	227	II
Delay in delivery	2	2	4	10	3	3	3	15	104	IV
No quality test	1	-	4	3	14	-	4	16	85	VI
Shortage of finance	8	-	2	2	-	4	4	22	86	V
Delay from contractors	1	1	2	-	3	6	2	27	46	VII
Total	50	42	43	17	21	14	14	-	-	-

Source: Survey Data.

The weighted ranking shows that high price is the most important problem of clay procurement. Scarcity being the second important factor has the second rank. Poor quality is the third important factor having the third rank. Delay in delivery, shortage of finance, lack of quality test and delay from contractors obtained the fourth, fifth, sixth and seventh rank respectively.

(ii) Firewood - Tile industry, in general, uses coal as the main fuel for kilns. In some parts of the country, wood is still used. Firewood is the most commonly used fuel in tile factories in Kerala for burning tiles. 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 small units having intermittent kilns, while this is about 25 per cent in medium and large size units having long continuous kilns (Ambigapathy, 1988).[1] Hence, it is evident that any attempt in reducing fuel consumption in kilns will help the tile industry in reducing cost of production. Only about 20 per cent of the total tile factories in Kerala use other fuels like cashew shell and saw-dust.

Mostly rubber wood is being used as fuel by this industry. The availability and transportation cost of rubber woods have posed a serious threat to this industry. The cost of firewood has now touched the height of Rs. 1200/-per M.T. The average price of firewood in Kerala as a whole was Rs. 1160/tonne in 1996-97 which rose to Rs.1500/tonne in 2005-06, recording a decennial growth rate of 30 per cent.

Firewood price is increasing rapidly due to various reasons, of which, a few are mentioned below.

(i.) Reduction in the forest area and utilisation of land for cultivation. (ii.) Increasing demand for wood for other industries. (iii.) Increasing demand for wood as fuel in the domestic sector. (iv.) Increase in cost of all other sources of fuel.

Firewood is a renewable source of energy. Therefore, attempts should be made for producing more firewood by cultivating fast growing trees and maintaining forests. At the same time fuel cost should be reduced by choosing the following measures. (i.) Operation of kilns at optimum condition. (ii.) Use of alternate fuels like coal, cashew shell and saw-dust and (iii.) Using kilns having high thermal efficiency.

The feasibility of coal as a substitute for firewood has been studied by experts and it is found economical (Anantha Subramanian, 1986).[2]

The other important input required is lubricating oil. Kerosene is the most common one. The price of kerosene has also increased considerably over the years. The producers get kerosene oil according to certain quota on the basis of production capacity. As per ISI prescriptions, 1000 tiles require 5 litres of kerosene (Labour and Industrial Bureau, 1969)[3] but at present the sanctioned quantity is only 1.5 litres. Some other inferior type of commercial oils were tried but were not found successful (Anantha Subramanian, 1986).[4]

TABLE 7.2

RANKING OF PROBLEMS IN THE PROCUREMENT OF FIREWOOD

Weight	8	7	6	5	4	3	2	1	0	Weighted Score	Weighted Rank
Rank	1	2	3	4	5	6	7	8	9		
Problems											
High cost	35	5	2	-	-	-	-	-	-	327	I
Delay in delivery	1	2	3	-	-	-	1	-	35	42	VII
Shortage	20	10	7	2	2	-	-	-	1	290	II
Legal formalities	2	3	4	5	3	-	-	-	25	98	IV
Lack of finance	1	3	2	5	-	-	1	1	29	69	V
High demand from other industries	10	12	11	6	1	-	-	-	2	264	III
Faulty Govt. policy	1	2	1	1	3	-	-	2	32	47	VI
Others	-	-	-	1	1	4	5	6	25	37	VIII
Total	70	37	30	20	10	4	7	9	-	-	-

Source: Survey Data.

The various problems affecting firewood are scarcity, increasing price, delay in delivery, legal formalities, high demand from other industries, faulty government policy and so on. The relative importance of each problem is presented in Table 7.2 using weighted ranking method.

Since high cost gets the first rank, it is considered as the most important problem in firewood procurement. Shortage is the second important factor influencing its procurement. High demand from other industries, legal formalities, lack of finance, faulty government policy, delay in delivery and other problems come in the third, fourth, fifth, sixth, seventh and eighth position respectively.

7.1.2 Labour

Another basic problem is the non-availability of sufficient workers to do labour intensive operations such as carrying the clay, carrying the raw-tiles for drying, setting the tiles in the kiln , taking the fired tiles out of the kiln and so forth.

Wage rate throughout Kerala is increasing at an alarming rate impacting tile manufacturing also. The Minimum Wage Committees were constituted for the employees of tile manufacturing in 1958, 1961, 1968, 1977 and 1989. As per the recommendations of the Committee report, the wage rates were revised in 1965, 1971 and 1981. It can be noticed from these reports that the minimum wage rate in Kerala was much higher than that in the neighbouring States of Karnataka, Tamil Nadu and Andhra Pradesh.

It is argued that the labour cost is the highest in Kerala when compared to that of the neighbouring States. 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 will be Rs.44.26. However, the comparative analysis of wage-behaviour at macro level of the manufacturing sector across the three southern states in terms of various indicators does not provide conclusive evidence supporting the popular perception of Kerala as a high wage location for industrial investment and growth (Subrahmanian, 2003).[5]

In addition to payment of increased wages, the other labour problems faced by the industry include labour absenteeism, trade unionism, excess workers, strike, lack of skilled workers, lack of training and labour turn over.

The relative importance of each problem is examined with the help of a weighted ranking method and the result is presented in Table 7.3.

TABLE 7.3

RANKING OF LABOUR PROBLEMS

Weight	5	4	3	2	1	0	Weighted Score	Weighted Rank
Rank	1	2	3	4	5	6		
Problems								
Absenteeism	20	10	5	2	-	5	159	I
Trade unionism	14	5	1	-	-	22	93	III
Strike	5	7	6	1	1	22	74	IV
Excess workers	-	1	2	3	-	36	16	VIII
Lack of Skill	6	4	3	2	1	26	55	V
Lack of Training	1	3	2	3	1	32	30	VII
Labour Turnover	10	12	6	-	-	14	116	II
Others	2	1	3	1	1	24	32	VI
Total	58	43	28	12	4	-	-	-

Source: Survey Data.

Absenteeism is the most important labour problem. Labour turn over is the second important problem followed by trade unionism, strikes, lack of skilled workers, other problems, lack of training and excess workers respectively. As per the ranking of the various problems affecting the labour supply in the sample units, it is found that labour militancy does not pose a serious problem to the tile industry.

7.1.3 Technological Problems

The tile industry in Kerala has followed the traditional processing route of starting from a wet clay mass, extruded into slabs and shaped into tiles, drying and firing in a wood fired kiln into roofing tiles. More than 90 per cent of the job in handling of clay and shaped products is manual. Only 20 per cent or less of the industry has introduced minimal modernisation in terms of handling of clays.

Quality control is not adopted in any scientific manner in any of the methods in the manufacturing process, namely processing of clay, drying and burning tiles. Quality control is essential to ensure the availability of quality products. The quality of products depends on the availability of good quality clay. The quality or suitability of clay is now judged in the crude form of "feel by hand" and therefore involves a lot of variations. The most important factor responsible for low yield of good quality tiles is lack of awareness and absence of scientific data on the quality of raw-materials used at present. Quality control 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.

The age-old technique of drying the tiles by keeping them in pallets by sun-drying and burning of wood in drying sheds is followed throughout the State. Drying of tiles in this method requires more time, space and capital investment. Firing is done in less efficient kilns and therefore considerable fuel is lost. Introduction of new technologies and designs and product diversification are very seldom conducted in this sector of industry.

Practically all factories in the north and central Kerala and a few factories in the south use revolving press for pressing tiles. It is necessary to replace hand screw press by revolving press. It is desirable to use automatic edge trimmer for finishing the edges of tiles. Of the sample units surveyed, 70 per cent in Trichur region, 60 per cent in Calicut region and 17 per cent in Alwaye region have effected the replacement of screw press by revolving press.

7.1.4 Marketing Problems

The clay tiles manufactured in Kerala have both internal and external markets. The external market includes market outside Kerala but within the country and foreign market (export market). More than 50 per cent of the tiles manufactured are sold in other States like Tamilnadu, Karnataka, Maharashtra, Andhra Pradesh, Madhya Pradesh and Gujarat.

The share of Kerala tiles in other States is getting reduced day by day. It is because the entrepreneurs in these States have started tile factories. The manufacturers in Mangalore area are able to produce and sell good quality tiles. Kerala possesses good quality clay, but due to the increased cost of labour and hike in transportation cost, the sales price of tiles in Kerala is very high. The problem is further intensified when some tile factories have come up in other States like Tamil Nadu, Andhra Pradesh, Maharashtra and Gujarat where Kerala tiles had found potential market in earlier years. Lower cost of labour in other States prompted some manufacturers in Kerala to start factories in other States.

India, and particularly Kerala, dominated the tiles market in the world in early 20th century. Along with the Independence of India, most of the British colonies became independent. These countries started to develop their own tile factories to meet their demand, thereby reducing the demand for Indian tiles. It is evident from the study that, of the total production nearly 20 per cent was exported in 1960 which came down to a very negligible share since 1985.

Internal demand for tiles declined as a result of shifting preference for RCC and other types of houses, increase in maintenance cost of tiled houses and exorbitant increase in the price of wood which is a complementary material for tiled roofs.

The tile industry has no marketing strategy, since there was a ready demand. Over the last one decade, the user pattern of tiles has changed. With the availability of modern materials of better quality and strength, tiles have not been considered as a total roof but always as a relatively cheaper roofing material, basically because, tiles have never been projected widely as a total roof. Another reason for this is that no diversification over the conventional tiles has been made. The industry has to work out a new marketing strategy.

7.1.5 Quality Control and Research and Development (R&D)

The concept of quality control and R & D is rather unknown to this industry. The industry has seldom shown willingness to adopt the modernisation and diversification proposals of the research institutes working in the area of clays and building ceramics primarily because they never felt the need for it. Less than 1 per cent of the industry has quality control and testing facilities. As a result, the industry has remained in a stagnant state.

7.1.6 Financial Aspects

The tile industry has been traditional in nature. The plant and machinery have not been much modernised. Tile industry can be activated by the adoption of modern 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 main hindering factor of modernisation and diversification is the shortage of funds. In the changed circumstances, additional funds may be necessary and the industry will require financial support.

7.1.7 Policy constraints

There exists certain policy constraints in the areas of electrical power, incentives for product diversification, raw-material conservation, energy, auditing, and enforcing quality control as far as this industry is concerned.

SECTION B

7.2 Solutions

Following are the general solutions to the problems listed in the preceding section.

1. A systematic evaluation of raw-materials before collection and after blending should be done in the industry so as to select the optimum processing step for material and energy conservation. For this, a small in-plant laboratory should be set up by the industry.

2. Since the clay resources are getting depleted, it is also important to see the possibility of using alternative raw-materials such as solid industrial waste.

3. The quality of the product depends on the quality of clay. But clay testing facilities are not available in most of the tile units. Hence, clay testing facilities should be immediately provided. Scientific methods like testing of clay, pressing of tiles, temperature control in kiln, testing of burnt tiles and so on can be adopted by giving training to the supervisory staff in government laboratories.

4. Measures should be strengthened to make available the sanctioned quota of firewood to the tile factories.

5. There is an urgent need to pay attention towards problems like scarcity of red burning clay, firewood and traditional methods of manufacturing and initiate remedial measures for survival and growth of the industry.

6. The tile industry has very low levels of mechanisation and is labour intensive. The mechanisation should be introduced in modules, to start with clay mining and handling in the factory. Most important is the transportation of green tiles to the dryer. A controlled drying facility is very important, since the drying of tiles is key to quality control. The modification of the existing kilns with effective insulation, temperature measurement facilities and computerised control of the firing could be introduced first. Then one can think of installation of modern tunnel kilns fired by oil or gas.

7. The tile sector has to diversify into newer products such as coloured tiles, high density tiles, glazed tiles and eco-friendly ceramics to mention a few. The old concept of "tiles" should be removed and the new products should be projected as a new, high quality "roofing material". New product development as well as process problems can be jointly worked out in association with R and D institute as well as end users, architects and builders.

8. Regular training programmes in the area of ceramics processing and awareness building in the latest techniques as well as equipments and machinery are very important to catch up with international trends. Export-oriented product development is impossible without adequate exposure to the area. Reputed research centres in building ceramics should be identified for this purpose and suitably supported through funding.

9. The tile industry has shown great initiative recently for modernisation. There should be adequate financial assistance for those who want to modernise. Financial assistance should be planned on a long term basis.

10. Those industrial units which want to be closed should be provided with adequate support for winding up, while those going for modernisation and diversification should be promoted liberally with incentives, such as tax exemption and liberal loan refunding policy adopted for other sectors.

11. An effective marketing strategy should be introduced for marketing quality products manufactured in large quantities.

12. Managements must make research studies occasionally and try to get the feedback from the customers regarding the design, quality and services rendered.

13. New units should be exempted from all State taxes for the first five or seven years.

14. The manufacturer must try to use improved methods to reduce the quantity of firewood required through efficient burning. The use of alternate fuels like lignite, coal or other easily available fuel has to be tried.

15. Low cost housing technology such as "Baker Technology" is becoming popular in Kerala in recent times. Hence, the industry can diversify into the production of various materials required for low cost houses.

16. It is imperative to improve efficiency of energy utilisation through effective energy conservation measures. Even a slight reduction in energy consumption could enhance competitive strength. Therefore, an

incentive scheme for progressive energy reduction may be introduced to ensure continued interest, participation and support from all levels.

17. As needs of the customers are continuously changing, enhancement in the quality and range of products is essential for survival. This calls for continuing efforts to improve the performance, safety, reliability and cost standards of the tile industry.

18. The home market for tile industry products can be widened if the State government directs at least the government sponsored housing schemes to use only the tile industry products in the construction process.

19. Fuel efficiency can be increased by using the following measures: (i) Supply of secondary air above the grate through a sliding door arrangement; (ii) Maintenance of firing schedule; (iii) Use of either thermo-couples or seger cones for measuring the temperature during firing.

Conclusion

In the foregoing analysis, the major problems affecting the tile industry in Kerala have been examined. It is clear from the study that the most important problems faced by the industry, now a days, relate to shortage of raw-materials like clay and firewood, labour, technology and marketing, problems relating to finance, research and development and so forth. In order to find out the intensity of some of these problems weighted ranking method is applied. It is found from the weighted ranking that the most serious problem associated with clay is its non-availability and with firewood is its rising cost. The solutions to the problems of tile industry are also attempted at the end of this chapter.

Notes and References

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CHAPTER VIII

SUMMARY OF FINDINGS, SUGGESTIONS AND CONCLUSION

The tile industry is one of the well known traditional industries in Kerala. According to experts, it is an industry most suited to the conditions of the State because it is highly labour intensive and it uses low technology and does not require highly skilled labour. Kerala has been enjoying a dominant position in India with respect to this industry so much so that it is often referred to as the home of tile industry. As per the latest estimates, there are 283 registered tile factories in Kerala which provide direct employment to about 40,000 people and indirect employment to over 60,000 people in the State. Despite these realities, the industry is beset with a lot of problems in recent years.

However, studies on tile industry and its related problems are very few in Kerala. The few studies which were conducted mainly examined the growth, problems and prospects of this industry. No exhaustive research work has so far come out giving more importance to the examination of the extent and causes of underutilisation of installed capacity and financial performance of tile manufacturing units. In addition, no study has come up taking into account the different levels of technology followed by various tile factories. In this background, the present study is the first of its kind, which focuses on the economics as well as the physical and financial performance and capacity utilisation of tile factories in Kerala. The study also takes into account the impact of different levels of technology, especially in the field of productivity. Thus this study assumes significance in this context.

The main objectives of the study are: (i) to examine the economics of tile industry in Kerala, (ii) to analyse the financial performance of tile manufacturing units in Kerala, and (iii) to identify the problems and constraints of tile industry in Kerala.

Based on the objectives of the study, three hypotheses have been framed: (i) the economics of tile industry is becoming unfavourable over the years, (ii) the financial feasibility of tile industry is becoming unfavourable over the years, and (iii) modern technology based tile factories achieve higher level of productivity.

The study is confined to tile factories working in Kerala. This is a sample study. A two stage random sampling technique was adopted to select the samples. In the first stage, the regions in which the tile units are concentrated were selected. In the second stage, samples were selected from the identified regions. Data were collected with the help of a pre-tested schedule from a sample of 42 factories spread over three regions, namely, Calicut, Trichur and Alwaye for a period of ten years from 1996-97 to 2005-06. Primary data were collected from the managers and employees of the sample units. Sources of secondary data were published materials of various institutions and departments.

Five important aspects under investigation in the study are : (i) a descriptive analysis of different aspects of manufacturing process of tile industry, (ii) a detailed discussion of the economics of the tile industry in terms of fixed capital, productive capital, working capital, invested capital, gross profit, value-added and so on, (iii) analysis of trends in labour productivity and total factor productivity with the help of simple measures (iv) capacity utilisation analysis with the help of installed capacity approach, and (v) financial performance appraisal with the help of ratio analysis and Multiple Discriminant Analysis.

The study is presented in eight chapters. The introductory chapter introduces the topic; explains the significance of the study, review of literature, methodology and data source, sample design and also the limitations of the study. The origin and development of tile industry is provided in the second chapter. The economics of tile industry in Kerala is analysed in the third chapter. The fourth chapter analyses trends in productivity, especially labour productivity. The conceptual and empirical contours of capacity utilisation are presented in the fifth chapter. Financial performance of sample units using certain ratios is done in the sixth chapter. The problems and constraints of the tile manufacturing units are discussed in the seventh chapter. The last chapter gives the summary of findings, conclusions and suggestions.

The summary of major findings emerged from the study are the following.

8.1 Location

About 88 per cent of the selected sample units had a rural orientation due to factors like easy availability of basic raw materials viz., clay and firewood. The location and ownership pattern of the tile factories in Kerala show that certain historical factors played an important role in its establishment. In Trichur area, activities of Chakola Kunju Vareed Devasy at Manali and in Malabar area the activities of Basel Mission were noteworthy. Of the total 42 factories surveyed, 80 per cent were established prior to 1947. The present generation inherited the factories and this was mainly responsible for the lack of entrepreneurship in this industry. About 47 per cent of the sample units are organized on partnership basis, 30 per cent units are run on the sole proprietorship basis and 23 per cent are private limited companies and co-operatives.

8.2 Economics of Tile Industry-An Aggregate and a Regional Analyses

8.2.1 Capital Structure

Examination of the capital structure points out that significant changes have not taken place in the composition of fixed capital. It means that not much additional investment has taken place during the period under study. But a little amount of modernisation took place in certain units in Calicut region. Another feature is related to the composition of working capital. Analysis of trends in the composition of working capital revealed that most of the factories raised much of their working capital through loans and advances.

An examination of the productive capital gives an indication that not many change has taken place in productive capital, which strengthens the view that the tile factories in general, once established, do not incur any additional expenditure for any of the fixed capital items.

Another noteworthy feature is related to the number of workers employed in tile factories and their emoluments. Though the industry is labour intensive in nature, the number of people employed in this industry has been decreasing. There were 4057 tile workers in 1996-97, but, it declined to 2724 in 2005-06. The main reason for this decline has to be found in alternative employment opportunities in the State at a relatively higher wage rate. It can also be noticed that workers of tile factories in Calicut region enjoy almost all benefits along with higher wages.

A perusal of the composition of input cost of tile industry in Kerala shows that the most important input component is clay, which on an average, accounts for 41 to 44 per cent of the total input cost; while, another important input component--firewood-shares 38 to 42 per cent of the total input cost. The most important problem associated with clay is its shortage, whereas high price is the most important problem connected with firewood. Analysis of the cost structure reveals that, it varies among regions depending upon the nature of technology chosen.

8.2.2 Cost of Production

The cost of production is an important component of the economics of tile production. It is the summation of the input cost, labour cost and establishment cost. A close examination of the cost structure of selected tile units in Kerala shows that input cost as a proportion of total cost rose from 47.97 per cent in 1996-97 to 53.26 per cent in 2005-06. The other two components of cost of production are labour cost and establishment cost. The share of the former declined considerably from 45.56 per cent to 40.24 per cent and that of the latter marginally increased from 6.47 per cent to 6.50 per cent during the same period. This data very clearly proves that labour cost does not cause a serious problem to tile manufacturing units in Kerala.

Among the three regions, the rate of increase in input cost is high in Alwaye region and low in Trichur region. Similarly, the rate of increase in labour cost is high in Trichur region and low in Calicut region. Though total cost per unit is relatively high in Calicut region, this region is capable of producing better quality products at a relatively moderate price because of the economies of scale enjoyed by the factories in this region.

8.2.3 Products

Different tile factories in Kerala produce different types of clay products, of which, the most important one is roofing tiles. The share of roofing tile in total production was 67.88 per cent in 1996-97, which marginally declined to 65.49 per cent in 2005-06. Another important clay product is ridges, the share of which in total production slightly declined from 11.97 per cent in 1996-97 to 9.89 per cent in 2005-06. However, the share of brick in total production increased from 3.44 per cent to 10.80 per cent during the reference period. The results of the study adequately support the hypothesis that the economics of tile industry exhibits fluctuations over the period and it has been becoming unfavourable over the years.

8.2.4 Profit

The very existence and future prosperity of a manufacturing unit depends on the margin earned over the cost of production. The sample units together earned a profit worth Rs. 98.48 lakh in 1996-97 which increased to Rs. 313.20 lakh in 2005-06. Tile factories in the State are susceptible to periodic fluctuations in the volume of profit earned. These fluctuations are attributed to fluctuations in sales, input costs and in selling price. Among the three regions, gross profit was found to be greater in Calicut region and less in the other two regions. This variation may be due to economies of scale enjoyed by sample units in Calicut region.

8.2.5 Value-added

A close examination of value-added figure reveals that in 1996-97, the sample units enjoyed Rs.1102.48 lakh as value-added, which rose to Rs. 1461.98 lakh in 2005-06 recording 32.60 per cent increase over the period of reference. We can notice fluctuations in value-added also which may be due to the variations in input cost, and sales proceeds. Average value-added figure of Calicut region is found to be greater than that of the other two regions.

8.2.6 Structural Ratios

Another important aspect of the economics of tile industry is its structural ratios which provide the sign of the basic structure of the industry. The important findings emerged from the study are as follows:

1. During the period under study, fixed capital-invested capital ratio and fixed capital-productive capital ratio were found to be low. This is an indication of high labour productivity.

2. Invested capital-output ratio most often recorded a rising trend in all the regions, particularly in Alwaye region owing to accumulation of materials, semi-finished goods and finished goods.

3. Input-output ratio remained more or less constant in Calicut and Trichur regions but increased in Alwaye region.

4. Value-added-input ratio and value-added-invested capital ratio recorded fluctuations over the years.

5. Input per-worker, output-per-worker and value-added per-worker increased during the period under study. This may be attributed to price increase (raw-materials as well as finished goods) over the years.

8.3 Physical Performance

The physical performance of the selected samples is evaluated with the help of productivity analysis. Although, various productivity measures are available, we have made use of simple productivity measures. In this study mainly the partial productivity measure is attempted, that also, the labour productivity measures. There are certain justifications for this. First of all, most of the tile units were established 100 years ago, so that estimation of capital stock is a very difficult problem. Secondly, most of the tile factories are labour- intensive in nature. Therefore, analysis of labour productivity will provide a true picture of the contribution of the workers. Labour productivity is measured by using output per worker and value-added per worker approaches. The most important findings of this analysis are as follows:

a) Labour productivity is, in general, low in tile industry.

b) The mean annual output per worker is more in continuous kilns.

c) The mean output per rupee of wages is the highest in continuous kilns.

d) Region-wise analysis of productivity indicates that mean output per worker and value-added per worker are higher in Calicut and Alwaye regions.

Attempt has also been made to measure total factor productivity with the help of Direct Method, Kendrick Index method and Cobb-Douglas Production Function. Estimates of total factor productivity exhibited a fluctuating trend with different results at the aggregate and region level.

8.4 Capacity Utilisation

An attempt has been made in this study to examine the theoretical background and empirical results of capacity utilisation. We made use of the installed capacity concept for measuring capacity utilisation in selected tile units, according to which capacity utilisation ratio is found out by dividing the actual production by the installed capacity. An analysis of capacity utilisation in the sample units in Kerala as a whole shows that installed capacity is underutilised in almost all tile units. It comes to about 30 to 60 per cent of the installed capacity. Among the three regions, the average capacity utilisation is found to be higher in Trichur region (67.66 per cent) and the lowest level is recorded in Calicut region (57.45 per cent). Much wider fluctuation in capacity utilisation ratio could be found during the period of reference within each region itself. On the whole, all the regions recorded gross underutilisation in its capacity. An attempt has also been made to examine the causes of underutilisation. The most important among them are: shortage of raw-materials, shortage of power and so on.

In this context, the study has attempted to know whether there is any relationship between the amount of capital invested and capacity utilisation;

the level of employment and capacity utilisation, the level of capacity utilisation and profit, and market demand and capacity utilisation. The study indicates that there is no close association between size and capacity utilisation but there exists a positive correlation between capacity utilisation and profit and also between market demand and capacity utilisation.

8.5 Financial Performance

Analysis of physical performance alone will not give a true picture regarding the health of an industrial unit. Therefore, an attempt has been made to assess the financial performance of selected samples. The financial strength and weakness of a firm are communicated in a more easy and understandable manner by the use of certain ratios. The most important ratios used in the analysis are: liquidity ratio, activity ratio, profitability ratio, turnover ratio, etc. The overall financial performance is analysed with the help of Altman's model. From the analysis of financial performance, the following conclusions are drawn:

a) Financial performance of the tile manufacturing units in Kerala is not satisfactory, but it shows signs of improvement in recent years.

b) The overall performance of the tile industry is good as indicated by the average '**Z**' score.

8.6 Problems and Constraints

Examination of the problems facing the tile units shows that the major problems are: marketing, technological, raw-material, managerial, labour, financial, quality, research and development, and so on. Using the weighted score method, the intensity of each problem is ranked. It is found that the most serious problem confronting majority of the tile units in the State is the shortage of inputs, especially clay and firewood rather than lack of demand.

8.7 Major Recommendations

The following suggestions emerge from the findings of the study which can be used for the proper development of the tile industry.

(i) Modernisation

There is an urgent need for modernisation and technological upgradation of the existing small-scale tile factories. In the present context of *"Industrial Darwinism"* where "survival of the fittest" is the rule of the game, it becomes imperative to throw away the shackles of technological obsolescence. This is possible only through modernisation. Thus, "modernize or perish" or alternatively "modernize and prosper" has become the slogan of the day for small-scale tile factories.

Scope of Modernisation

About 95 per cent of the tile factories in Kerala are using the traditional methods for manufacturing their products. Therefore, there is enormous scope for modernisation at every stage of manufacture, marketing and management. Modernisation is the only panacea in the present industrial scenario of liberalization and globalisation in order to weed out wastage of resources and inefficiencies and improve competitive power. As a first step to modernisation, a B.Tech degree programme in Ceramic Technology/ Engineering with special emphasis on heavy clay industry can be introduced.

(ii) Cluster Approach

Cluster development approach is one of the emerging trends where the small-scale industrial units also can find a place of growth. Clustering is considered to be an effective platform to enlarge production, trigger growth and alleviate poverty. Clusters lower transaction costs, help realise informational economies and lower the costs of credit surveillance. Dynamic and successful clusters exhibit a great deal of formal co-operation in terms of collective ventures. In addition, economies of scale in business operations, information and knowledge net works, presence of specialised providers of support service are all advantages of dynamic clusters. Hence, it is high time that the tile industries should go for cluster approach in manufacturing.

(iii) Flexible Specialisation

The concept of flexible specialisation is "a new economic regime" based on less rigid manufacturing technologies than mass production. They challenge the mass production paradigm, which has dominated both theory and policy and point to the strength of the alternative paradigm-flexible specialisation. Being a peculiar strategy for competitive success based on efficient and flexible production and marketing of quality-competitive products, flexible specialisation will surely offer a paradigm shift for the industrial sector in general and tile manufacturing in particular.

Conclusion

From the analysis of the economics of tile industry in Kerala it is clear that, tile industry, though important in the early period, has been facing the threat of closure. The most serious problems affecting tile units are shortage of raw-materials, lack of modernisation and lack of diversification. It is true that the existing tile units in Kerala enjoy a wider market. Most of the tile units do not use their maximum capacity. Labour productivity of tile factories is low in Kerala and it varies among the regions. Financial performance is more or less satisfactory. The continued existence and survival of the existing units can be ensured only if modernisation, diversification, flexible specialization and cluster approach are introduced. In short, it is possible to bring up the tile factories to a reasonable level, if not to its earlier glory, if a pragmatic strategy is worked out. The most important component of such a strategy should be modernisation of existing units and diversification into value-added products.

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Appendix I

LIST OF TILE FACTORIES SURVEYED

Sl. No.	Name		Location
	CALICUT REGION		
1.	The Calicut Tile Works Ltd.	:	Cheruvannur, Calicut
2.	Malabar Tile Works	:	Feroke,Calicut.
3.	The Star Tile Works Ltd.	:	Panniyankara, Calicut
4.	The Standard Clay and Tile Works (P) Ltd.	:	Feroke, Calicut
5.	The Commonwealth Trust India (P) Ltd.	:	Feroke, Calicut
6.	The Commonwealth Trust India (P) Ltd.	:	Puthiyara, Calicut
	ALWAYE REGION		
1.	Paracka Industries	:	Chenakal, Kalady
2.	St. Joseph's Clay Works	:	Kalady
3.	Sree Krishna Tile Works	:	Chengamanad, Alwaye
4.	Anmary Tile Works	:	Maikkad, Angamaly
5.	Cera Tech	:	Nedumbassery, Alwaye
6.	Sreedevi Tile Works	:	Maikkad, Athani.
	TRICHUR REGION		
1.	Murali Tiles	:	Urakam, Trichur
2.	The South Indian Industry Ltd.	:	Kurumali, Puthukkad
3.	Kalyana Tile Company	:	Manali, Trichur
4.	Thomson Tile Factory	:	Annallur, Chalakkudy
5.	St. Pius Tile Industries	:	Marathakkara
6.	St. Thomas Tile Factory	:	Vainthala
7.	Swasthik Tile Industry	:	Pazookkara, Chalakkudy
8.	Puthanveettil Tile Works	:	Palayam Parambu, Ambazhakkad
9.	Anand Tile works	:	Kalloor
10.	Smarana Tiles	:	Chittissery
11.	Raja Trading Agencies	:	Maravanchery

12.	Elite Diamond Bricks and Tiles	:	Puthukkad
13.	Goodwin Tiles	:	Kalloor, Alagappanagar
14.	Grace Tiles	:	Chittissery
15.	St. Thomas Tile Works	:	Manaly
16.	Swamy Clay Works	:	Vallachira
17.	Sobha Tiles	:	Cherussery, Thaikkattussery
18.	Super Tiles	:	Thaikkattussery
19.	Sacred Heart Tiles	:	Perincheri
20.	Supreme Ceramics	:	Chittissery, Nandikara
21.	Annallur Tile Factory	:	Pazookkara, Annalloor
22.	Sakti Tiles	:	Parakkovil, Cherpu
23.	Chandrika Tile Works	:	Vallachira
24.	United Clay Works	:	Vendore, Alagappa Nagar
25.	Maveli Tiles	:	Kadalassery
26.	Udaya Clay Works	:	Chittissery, Puthukkad
27.	Edassery Ceramics	:	Palayam Paramba
28.	Archana Tile Works	:	Chittissery
29.	Sree Vally Company	:	Chittissery
30.	Maharaja Tiles	:	Manavancode

Appendix II

SCHEDULE

General Background

1.1	Name and address of the factory	:		
1.2	Year of establishment	:		
1.3	Location of the factory	:	1. Panchayat 3. Corporation	2. Municipality
1.4	Region code	:	1. Kozhikode 3. Quilon 5. Kannur	2. Trichur 4. Alwaye
1.5	Major factors influencing location	:	1. 2. 3. 4. 5.	

Nature of Acquisition

(1) Outright Purchase (2) Inherited

(3) Lease (4) Newly Started

(5) Others :

Type of ownership

(1) Proprietorship (2) Partnership

(3) Limited Co. (4) Others (Specify) :

How many times have the ownership been transferred since the factory was started?

Sl. No.	Year of Transfer	Nature	Details of Ownership	Reason

Educational qualification of the proprietor

1. Academic...
2. Technical..

Occupation of the Proprietor

(1) Engaged in the unit (2) Govt. Service

(3) Private occupation (4) Others ▯

Religion and Caste of the proprietor

1. SC/ST 2. OBC
3. Forward 4. Others : ▯

DETAILS OF CAPITAL STRUCTURE

Capital Structure (Fixed Assets)

	Item	Year of purchase	Depreciation	Net book value	Rent paid
1.	Land				
2.	Building				
3.	Kilns Installed capacity a) Down Draft - b) Semi continuous - c) Continuous - d) Others (Specify) -				
4.	Racks and Pallets				
5.	Pugmill				
6.	Cutting table				
7.	Presses a) Hand Press : b) Revolving : c) Conveyor :				
8.	Motors				
9.	Preliminary Expenses :				
10.	Others (Specify) a) b) c) d)				

CAPITAL STRUCTURE (Long Term Funds)

Year	Share Capital	Loan		Deposits	Other funds (Specify)
		(a) Govt.	(b) Others		
1996-97					
1997-98					
1998-99					
1999-00					
2000-01					
2001-02					
2002-03					
2003-04					

2004-05					
2005-06					

CAPITAL STRUCTURE (Current Liabilities)

Year	Bank loan	Creditors	Pvt. Loan	Other Loans (Specify)
1996-97				
1997-98				
1998-99				
1999-00				
2000-01				
2001-02				
2002-03				
2003-04				
2004-05				
2005-06				

CAPITAL STRUCTURE (Addition/Replacement/Improvements etc.)

Year	Nature of addition/replacement/improvement	Cost

DETAILS OF CAPITAL STRUCTURE (Current Assets)

Year	Stock of raw materials	Semi-finished tiles	Finished goods stock	Debtors	Cash Balance	Others (Specify)
1996-97						
1997-98						
1998-99						
1999-00						
2000-01						
2001-02						
2002-03						
2003-04						
2004-05						
2005-06						

MATERIALS AND FUEL

Year	Clay	Oil	Firewood	Cashew shell	Electricity	Labour		Others
						M	F	
1996-97								
1997-98								
1998-99								
1999-00								
2000-01								
2001-02								
2002-03								
2003-04								
2004-05								
2005-06								

DETAILS OF PRODUCTION

Year	Roofing Tiles	Flooring tiles	Bricks	Ridges	Hourids	Ceiling Tiles	Pottery and decorative tiles	Others
1996-97								
1997-98								
1998-99								
1999-00								
2000-01								
2001-02								
2002-03								
2003-04								
2004-05								
2005-06								

CAPACITY OF PRODUCTION

Year	Roofing tiles Maxi/Ut	Flooring Tiles Max/Ut	Bricks Max/Ut.	Ridges Max/Ut	Hourdis Max./Ut.	Ceiling M/Ut.	Pottery & Dec. M/Ut	Others M/Ut
1996-97								
1997-98								
1998-99								
1999-00								
2000-01								
2001-02								
2002-03								
2003-04								
2004-05								

2005-06								

MARKETING:

1. Nature of Sales (Percentage)

1. Cash Sales ☐ 2. Credit Sales ☐

2. Types of Sales

1. Retail ☐ 2. Wholesale ☐ 3. Agents ☐ 4. Others Specify ☐

3. Sales which are profitable why?

4. Area of sales (Percentage)

1. Local ☐ 2. Within the state ☐ 3. Outside the state ☐ 4. Export ☐

5. Sales turnover per annum : Rs.

6. Peak period of sales :

7. Advertising expenditure per annum : Rs.

8. Media of advertising : a)
b)
c)
d)
e)
f)

9. Sales per Year

Year	Roofing tiles Qty/Value	Flooring tiles Qty/Value	Bricks Q/V	Ridges Q/V	Hourdis Q/V	Ceiling Tiles Q/V	Pottery & Dec. Tiles Q/V	Others (Specify) Q/V
1996-97								
1997-98								
1998-99								
1999-00								
2000-01								
2001-02								
2002-03								
2003-04								
2004-05								
2005-06								

DETAILS OF ANNUAL SELLING AND DISTRIBUTION EXPENSES (average)

1. Advertisement
2. Packing and forwarding
3. Salesman's/Agents commission
4. Discount
5. Bad debt

6. Showroom rent/Branch rent
7. Others

IF ANY MARKETING PROMOTION TECHNIQUE ADOPTED? Yes ▯ No ▯

If the answer is YES specify — Rank

a) Separate sales division ▯

b) Salesmen's/Agents appointed ▯

c) Frequent advertisement ▯

d) High commission to agents ▯

e) Own transport facility available ▯

f) Discount allowed ▯

g) Housing trend is analysed ▯

h) Betterment of quality ▯

i) Others ▯

If answer is No state reasons

MANPOWER DATA

1. Average number of working days a year

J	F	M	A	M	J	J	A	S	O	N	D

2. No. of workers

Male	Female	Casual

3. Normal working hours :

4. No. of shift operating per day 1 ▯ 2 ▯ 3 ▯

LABOUR DETAILS

Type of Workers		No.	Wage rate	D.A.	E.S.I.	PF	Others (Specify)
1.	Permanent Skilled Unskilled						
2.	Temporary M F						
3.	Casual M/F						
4.	Contract						

AMENITIES PROVIDED FOR WORKERS

Item	Yes/No	Details (if any)
Medical		
Canteen		
Recreation		
Tour		
Co-operative society		
Others (Specify)		

	Yes	No
Are you satisfied with the existing wage and amenities (Percentage)	☐	☐
Are you prepared to work by accepting lower wage	☐	☐

PROBLEM OF THE UNIT

	Clay	Firewood
1. Raw materials problem: (clay/firewood etc.)		
a. Difficulties to produce	☐	☐
b. High cost	☐	☐
c. Scarce availability	☐	☐
d. Transport problem (specify)	☐	☐
e. Quality problem	☐	☐
f. Environmental problem (specify)	☐	☐

2. Managerial problem

   1. Qualification/ 2. Work experience/ 3. Others ☐

3. Financial problem (Rank)

   1. Related to working capital ☐
   2. Delay in payment by customers ☐
   3. Lack of resources ☐
   4. Difficulty in getting loan from bank ☐
   5. Others ☐

4. Technical problems

   1. Old machinery ☐
   2. Outdated design ☐
   3. Outdated production methods ☐

4. Quality ▯

5. Others (if any)

6. Break down of machinery: Frequently/ Not so frequently/ Occasionally

7. Causes of breakdown: Lack of premeasures/ improper handling/ inferior quality of machine/ others.

5. Economic Problems

   1. Location ▯

   2. Production ▯

   3. Demand: When/Why ▯

   4. Nature of the market: Oligipolistic/subcontract ▯

   5. Price ▯

   6. Product diversification ▯

   7. Others (specify if any)

6. Labour Problems: (Rank them)

   1. Absenteeism ▯

   2. Trade union involvement ▯

   3. Lack of skilled labour ▯

   4. Strikes ▯

   5. Excess workers ▯

   6. Lack of skilled workers ▯

   7. Lack of training facility ▯

   8. High labour turnover ▯

   9. Others ▯

7. Problems of Marketing (Rank them)

   1. Lack of market information ▯

   2. Competition from substitutes ▯

   3. Competition from units outside the state ▯

   4. Lack of combined market effort ▯

   5. Incidence of bad debts ▯

   6. High commission to agents ▯

7. Lack of credit ▯

8. Seasonal market ▯

9. Others (specify) ▯

8. Power Shortage

1. Limited quota supply ▯

2. Higher charges ▯

3. Frequent shutdown ▯

1. Do you conduct any quality test for finished product Yes ▯ No ▯

2. If yes what are the tests conducted?

a. Water absorption test ▯

b. Shrinkage test ▯

c. Breaking strength test ▯

d. Others ▯

3. Do you conduct any quality test for clay? Yes ▯ No ▯

4. If yes what are the tests of clay?

1. Sand content test ▯

2. Physical property test ▯

3. Chemical property test ▯

4. Others ▯

5. Cost of production of 1000 roofing tiles Rs. [ ]

Clay	Firewood	Direct wage	Oil etc.	Others

6. Selling price of 1000 roofing tiles of different qualities

I	II	III	IV	V	VI

7. Selling price of 1000 bricks Rs. [ ]

8. Do you feel that tile industry is facing any problem Yes ▯ No ▯

9. If yes what are the main problems

a.

b.

c.

10. Do you think that diversification will solve the problem Yes ▯ No ▯

11. Do you think that flexible specialisation will solve the problem Yes ▯ No ▯