In this chapter, a comprehensive review of various earlier studies relevant to brick industry is presented in order to have a better understanding of the present study area and to explore new areas and dimensions of research. A survey of earlier research works on brick industry is provided as a backdrop in this chapter.

The study undertaken by Chopra and Patwardan\(^1\) (1954) dealt with the characters and sources of raw materials, process of manufacturing and cost structure of brick industry. The study concluded that the brick industry was labour intensive in nature and revealed that the unit cost of production of bricks differs from unit to unit in clamp and Bull. The cost of clay and the distance of workyard caused much variation from the source of clay, its availability, productivity and remuneration to labour and cost of fuel.

Excavation at the Chalders, the city of Abraham has yielded brick tablets inscribed imperishably with the information about the life of people living six thousand years ago. The Sumerian palace of Kish in Mesopotamia built three thousand years B.C is another example of the ancient use of bricks. It is claimed that the bricks were manufactured twelve thousand years ago and undoubtedly the tower of Babel was constructed with bricks, if the Old Testament are to be believed.\(^2\)


\(^2\) Sardar Sarap Singh, Director, National Building Organization on *Symposium on Brick Manufacturer in India*” held in Calcutta from 15\(^{th}\) to 17\(^{th}\) February 1957, National Building Organization (Works, Housing and Supply Ministry) New Delhi.
Searie. Alfred\textsuperscript{3} (1956) mentioned in his book entitled “Modern Brick Making” that it is interesting to note that brick making started in Egypt, spread to create in Greece and travelled through Europe with the growth of the Roman Empire. The book contains all aspects relating to the production of bricks. The author has quoted both traditional and modern methods of production of bricks. But the author fails to compare the commercial aspects of traditional and modern methods of production of bricks.

Radhakrishnan Sarvepalli\textsuperscript{4}(1958) in his book entitled “The Cultural Heritage of India” mentioned that Brick industry employs large number of landless workers. He has also quoted the estimates of Planning Committee that rural labour force will be increasing from the present 215.93 million to 245.57 million by the end of the Sixth Plan. He has recommended that as this industry has also immense potentialities to provide employment opportunities in rural and backward areas through effective utilisation of locally available clay resources, top priority is required to be given for the development of brick industry in all schemes of rural employment. Though the study highlights the importance of brick industry from employment point of view, it does not suggest anything regarding the wage pattern relating to the workers of brick industry.


Aggarwal (1959)\(^5\) in his study on the socio-economic conditions of brick kiln workers in the Ghazipur village near Lucknow found that this industry employed semi-skilled and unskilled workers who included moulders, or the carriers. The employers for their recruitment contracted the labourers. In his study, he has found that lower caste Hindus outnumbered the intermediate castes while the higher castes did not take up this job. Illiteracy was a common feature among the workers; the working conditions were far from satisfactory with unsanitary surroundings, dusty environment, excessive temperature in May and June and excessive cold in December and January, lack of lighting and the long working hours. The employer provided the single room houses. Thus his study revealed that the labourers of brick industry do not lead a good standard of living. But the study did not provide any proper remedial measures to solve the problems faced by the labourers.

Shethy \(^6\) (1963) included the aspects of capital, labour and marketing of bricks in his study. The study emphasized that the capital productivity was the same for the clamp kilns and Bull’s Trench kiln and the production of bricks was affected by the shortage of labour and raw materials and the labour productivity was higher than the capital productivity. But, the study excludes the factors responsible for lower and higher productivity.

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Venkataraman\textsuperscript{7} (1968) in his book entitled “A History of Culture”, mentioned that the Indus valley civilization which dates back to 2500-1500 B.C. was only familiar in building with bricks and wood.

Muthiah\textsuperscript{8} (1969) in his book “Useful Mineral Resources” mentioned that the art of architecture was an ancient and intellectual step in human civilization. Hence, various technological changes have emerged in this art. For this intellectual art, various stones, minerals and materials are used. One among them is bricks. These bricks are manufactured by raw material clay. In nature, clay is an abundantly available raw material. It is utilized from his earlier days itself.

Encyclopedia Britannica \textsuperscript{9} (1971) states that the history of brick goes back to the earlier days of civilized man. Brick making was first carried on in the sunny relatively rain-free areas. The Roman knew the art of brick making and made the first bricks in Britain about 44 A. D. Brick making flourished during the Elizabeth era. Bricks were made in the American colonies from 1612 onwards. First produced in sun-dried from in Egypt about 6000 years ago, the burning, enamelling and glazing of bricks were later discovered in Babylon. In fact, the ancient river valleys and alluvial plains saw the beginnings of brick architecture. Brick was the chief building material of the Indus valley civilization of Mohen-jo-daro and Harappa.

\textsuperscript{9}Encyclopedia Britannica, Vol. 4 1971, p.10
Krishna Swamy\textsuperscript{10} (1971) in his book entitled “Treasure of the Earth: Minerals” mentioned that bricks are manufactured by residual or sedimentary clay. He also stated that such residual or sedimentary clay is available in all States throughout the country and added that the real brick clay could be available at top portion of the soil profile. He has suggested that the clay should neither be in liquid form nor in sand form rather it should have both plasticity and tenacity. He said that in some cases the clay may be getting ready for production of brick but only after mixing with sand and the clay which should have consistency and the purity.

Patil\textsuperscript{11} (1975) in his study ‘Brick-Kiln workers in Greater Bangalore’ stated that the Brick kiln workers in Bangalore constitute a group of ‘forced labour’ in terms of long hours of work for aggressive wages to recover the interest free advance paid and extraction of continuous labour without rest and holidays. He has also stated that the Trade Union Organisations have neglected the brick-kiln workers. He has pointed out that until those workers were organized, their exploitation would continue. But he does not mention the ways and means to make the workers organized.

Encyclopedia Americana \textsuperscript{12}(1976) states that bricks were first brought to the United States from England through boats. Soon after the settlement of

\textsuperscript{10} Krishna Swamy "Treasure of the Earth: Minerals", Tamilnadu Textbook Society, Madras,1971, p.383


\textsuperscript{12} \textit{Encyclopedia Americana}, Vol.4, 1976, p.159.
Virginia and Massachusetts, small brick making kilns and machines were setup. Brick making machines were invented in 1880 in England.

According to Hayward\(^\text{13}\) (1976), the word “Brick” has come to suggest solidity and performance. Essentially, the story of brick building is the story of finding good quality brick-making earth in places where there is lack of other building materials like wood and stone.

Leonard Correll\(^\text{14}\) (1977) in his book “History of the World” mentioned that the Sumerians were both builders as well as farmers. There were no natural stones for building in Mesopotamia nor was there much timber. So they made bricks by moulding the thick clay of the river banks into the block and leaving them in the scorching sun to bake. Many of the bigger Sumerian buildings were made of brick stones.

Mary Ann Baily\(^\text{15}\) (1978) considered the case as brick manufacturing industry in Columbia and examined the causes for the existence of wide disparity in size and capital intensive nature across firms in the manufacturing industries of less developed countries (LDCs) as compared to those in developed countries (DCs). She tested the hypothesis that such disparities result from the relatively tardy diffusion of modern sophisticated technology. Finally, she had founded that there was a little scope of dispersion to become narrower even though individual


firms may adopt higher technology. But her study does not mention the alternate ways of production of bricks with the available labour and capital.

Curtin and Sawko\textsuperscript{16}(1978) says that the Egyptians are said to have used brick as early as 20,000 years ago and in India brick were used 4000 years B.C.

The investigation of United Nations Industrial Development Organisation\textsuperscript{17}(1978) on marketing of bricks had pointed out the heavy competition between hand made and machine made bricks in developing countries. The hand-made bricks are around 29 per cent lower priced than machine made bricks of same size. The study had observed that marketing of hand-made bricks in developing countries had been carried out fully by the intermediaries who accounted for the significant difference between the ‘at kiln price’ and ‘delivered price’ of hand made bricks. But the study has not mentioned anything about fluctuation in the prices of bricks in various seasons. The present study has made an attempt to analyse the price fluctuations.

Gulati Leela\textsuperscript{18}(1979) in her profile of a middle aged, untouchable women brick worker mentions that there is a rigid compartmentalisation of work on the basis of sex in brick industry. Women are employed exclusively for carrying head loads, while men do all skilled and semi-skilled works such as moulding and

\begin{itemize}
\item \textsuperscript{18} Gulati Leela, “Female Labour in the Unorganized Sector: Profile of a Brick Worker”, \textit{Economic and Political Weekly}, Vol.XVI, 1979,p.21.
\end{itemize}
shaping. As a result, women’s wages for the work which is not physically less exhausting than that done by men, are only about half those earned by men.

Hiralal and Manjumar\(^{19}\) (1979) in their study on manufacturing process of brick industry concluded that production of modular bricks by mechanical method has been observed to be economical as compared to conventional hand moulding process. They have appreciated that the quality is also good and they readily adopted in the market and the semi-mechanised process is labour intensive and the plant provided direct employment to 15 skilled and 65 unskilled labourers. But their study does not mention anything about the cost of production of bricks by mechanical method.

The living and working conditions of the labourers engaged in the brick industries and kilns in Delhi and Haryana were studied by Amiya Rao\(^{20}\) (1981) who found that the workers were living in poverty and bondage. They were not paid properly according to their work and they were very unsafe. The study revealed that child labour was a phenomenon in the industry; they were suffering from tuberculosis and were unorganized, ignorant, illiterate and unaware of their basic rights in the brick industry.


Kerala State Land Use Board \(^{21}\)(1981), made a detailed survey in Thrissur and Thiruvananthapuram districts to know the impact of tile and brick clay mining on the fertility and agricultural activities of the respective areas. The result of the survey mentioned that the mining activity was not so widespread and did not create serious concern, as the quantity of mining was very limited.

Lim Chee Peng \(^{22}\)(1981) examined the aspects like production, wages and capital intensity (fixed capital per worker) and factors which influence the choice of technology in leather shoe and brick industry. The study included that different sizes of units co-existed in the industry. But the study was not concerned with the cost-structure of the brick industry.

Dhar \(^{23}\) (1982) in his book entitled “Brick” mentioned that the British used bricks that could withstand the fury of water for over 100 years to prove the ability of manufacturing good bricks.

Dharkara Doss \(^{24}\), (1982) in his book “Ceramic Industry in Tamilnadu”, mentioned that there are a number of Small Scale Industries which fall under the category of rural industries and one of the important rural industries is the chamber brick industry. It is also considered as the backbone of the construction

\(^{21}\) KSLUB, *Reports of the Study of Clay Mining areas in Thrissur and Thiruvananthapuram Districts*, Kerala State Land Use Board, Thiruvananthapuram, Kerala State Land Use Series No.8 and 14, 1981.


industry. Today, it gives employment to more than any three industries put together. The ceramic industry which includes brick and tile manufacturing at present, affords employment to over two lakh persons of all categories.

Puri\textsuperscript{25}(1983) in his article based on the proceedings of the historic meeting of 4000 employers and workers representatives of the 30,000 brick kilns employing nearly 30 lakh labourers held at the Asian Games Village in Delhi in 1983, brings forth the conflicting claims of the two parties - the owners and the workers. In his article, he has mentioned that, while, the owners’ were sour at the lack of Government support in the form of credit facilities, the allocation of coal at economical prices and the low support price for the bricks, the workers stressed for the proper implementation of labour laws. But the study did not provide any idea to make a balance between the two parties - the owners and the workers of brick works.

Randeria and Yagnik\textsuperscript{26} (1983) in their article expressed their concern over non-implementation of labour laws in brick kilns in Gujarat. It was primarily because the workers’ are difficult to be organized as the kilns are scattered all over the countryside in the State. Secondly, since most of these workers in this industry are migrant labours, they feel isolated in terms of language and other socio-economic variables. But the study mentions about the problems faced by the brick workers but excludes the benefits available to those workers.

\textsuperscript{25} Puri.Anil “The season that never started”, \textit{Business India}, New Delhi, 1983, pp.55-56

International Labour Organisation (ILO)\textsuperscript{27}(1984) states that brick and tile making may be found in most of the countries and the clays suitable for their manufacture are associated mainly with geologically recent deposits. Good deposits of the tile and brick clay are found in gently rolling hills.

The Tripartite Committee on Brick Kiln Industry\textsuperscript{28} (1984) passed a resolution. This tripartite committee unanimously recommends that the Ministry of Railways is advised to move coal to the brick kiln industry at par with other industries and to apply pro-rate cuts as applicable to other industries, that the Ministry of Energy be advised to allow movement of good quality of coal by rail and by road to the brick kiln industry, that the Ministry of Finance be advised to issue instructions to all banks and financial institutions to give financial accommodations to this industry liberally at lesser rate of interest as is being done in the case of other rural based Small Scale Industries, that the Ministry of Industry be advised to direct all State Government and Union Territories to register Brick Kiln Industry under the rural industries scheme to extend all benefits by way of Tax Holiday, subsides and supply of raw material.

Pandey\textsuperscript{29} (1985) in his study “Employment Potential of Brick Kiln” revealed that brick industry created employment opportunities for 120 to 150 days in 2 years. The total capital outlay per kiln was Rs. 6.74 Lakhs. This study


\textsuperscript{28} \textit{Report of the Tripartite Committee on Brick Kiln Industry}, New Delhi, July 1984

identified that 46 per cent of the total expenditure was incurred on fuel alone. So he suggested various measures to control fuel cost. He suggested that white ware items and terra-cotta products have good export potential if quality goods are produced.

Pandey, Sarup and Prakash (1985) examined the extent and pattern of employment of rural population through brick kiln industry. They have found that the brick manufacturing industry provides employment to skilled, semi-skilled and unskilled workers of about 40-55 families for 120-150 days in a year. But the study did not duly analyse the wage structure of the workers.

A study made by Thirugnana Sambandam (1985) on the structure and importance of the brick manufacturing co-operative society run by the Adi-Dravida Brick manufactures’ co-operative society in Venkatachalapuram village, Trichy district observed that the society provided employment opportunities to a large number of male and female members of the Adi-Dravida community far and near for twenty four hours a day during 8 months in a year and all the workers were permanent. They were paid in accordance with their job performance. The study also revealed that the society was instrumental in avoiding monopoly in brick manufacturing in Trichy district.

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Gothoskar Sujatha\(^{32}\) (1986) in his article entitled, “Where will they be on Children’s day?” stated that there are thirty five thousand child labour engaged in the brick kilns of West Bengal.

The Survey of the Labour Bureau, Government of India, carried out in 1988, in North Indian states of Punjab and Haryana, found out that the women workers employed in the brick kilns were mostly migrant labour brought from areas either within or outside the state of the kiln. Women do not do the work like earth digging, transportation of mud and preparation of mud mixture for moulding. Brick kilns had no fixed working hours and usually the spread over was of hutsments which were erected out in and around the kilns with the help of the material supplied by the employers. The facilities of separate kitchen, bathrooms, crèche or a latrine were non existent.\(^{33}\)

Deliege\(^{34}\) (1989) in his study highlights the particular prospective job mobility in relation to the community of brick makers. According to the author, a team of two workers who can be husband-wife, father-son, brother-sister or the like carries out brick making work. The study also explains the baking and transporting operations in the kilns and underlines that the work in brick kilns is very hard, the working conditions are harsh and workers exert under the burning

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\(^{32}\) Gothoskar Sujatha “Where will they be on Children’s Day?” *Femina*, Bombay, November1986, p.28.


sun. But the study does not mention anything about the wage structure of the brick workers.

Vasan\textsuperscript{35} (1989) in his book “How to Reduce Electricity Consumption in Factories?” stated that of the total elements in the selling price of bricks, eight percentages constitutes electricity expenses. He also added that electrical firing of bricks per ton consumes 393.68 to 7871.36 units of electricity. He feels satisfied with the views that though the fact regarding firing of bricks is like above, it is some what a consoling factor that most of the brick manufacturers avoid electrical firing and use firewood or charcoal or some other natural fuels for firing purpose.

Mathur\textsuperscript{36}(1990) stresses the need for manpower planning in brick kiln industry because this industry has been facing shortage of skilled labour such as moulders and fireman. To cater to the needs of this industry and to increase productivity, it is necessary to make an assessment of the availability and the demand of manpower for operating this industry. Training is required for inculcating requisite type of skills and orients the skilled workers to newer skills.

According to Saran and Sandhwar\textsuperscript{37} (1990), most of the migrant labours in brick industry are treated as bonded labourers. They are neither allowed to communicate their family members nor permitted to go back to their native places during mid season. All sorts of inhuman measures like physical and mental


\textsuperscript{36} G.C. Mathur,”Employment potential of brick industry”, \textit{Yojana,} Vol.35 No.5, 1990, pp.19-23.

\textsuperscript{37} A.B. Saran and A.N. Sandhwar, “Problems of Women Workers in unorganised sectors”, Northern Book Centre, New Delhi, 1990, pp.38 - 42.
torture and sexual abuses and kidnapping of kids are adopted by the employers. The maternity benefits are not provided and no medical assistance is paid to them for common diseases. No compensation was paid to the injured and the deceased labourers or to their dependents. Living conditions of these women workers is extremely inhuman.

Upadhye-Chavan\textsuperscript{38} (1991) in his study entitled “A Socio Economic Survey of Immigrant Labour in Brick Making Industry in the Sangli District” provides an extensive review of studies in migration besides finding out the reasons of low living standards, poverty, indebtedness, illiteracy and unemployment of the workers in brick kiln industry. But the study did not provide any proper suggestions to overcome the problems faced by labourers of brick industry.

Aslam\textsuperscript{39} (1993) in his article entitled, “Environmental Concerns in Brick Industry” provided various suggestions for environmental conservations to brick industry such as adoption of more fuel efficient technology, utilisation of non-feasible soils, regeneration of excavated lands, adoption of latest technologies such as gas-fired and oil fired kilns and insisted the brick industry to give its whole hearted support by adopting those techniques which do not add to environmental degradation.


Koopamns and Joseph\textsuperscript{40} (1993) are of the opinion that the capacity of a tunnel kiln is about 50000-15000 bricks per day. It requires less labour other than kilns. They mentioned that these kilns are suitable for mass production and widely used in USA and Europe and used in some high capacity brick making factories in Indonesia.

According to Overseas Development administration (ODA) Report\textsuperscript{41}, vertical shaft brick kiln is a high energy efficient up-draft continuous kiln which was first developed in China in the late 1960s. This kiln comprises of a top lid for loading, firing shaft of about 6-8 meters, insulation fill, tile roof with ventilation opening and chimney. The smallest unit has two shafts, each with a capacity of about 200-240 bricks.

While preparing a report on the conversion of paddy land in the State, the Kerala Statistical Institute (KSI)\textsuperscript{42} made a systematic documentation of the area affected by tile and brick clay mining in various districts of Kerala. They found that Thrissur is the worst affected area due to mining.

Sinha Manju’s\textsuperscript{43} study based on a survey conducted in the month of March 1987 in four brick kilns of Alipore situated at about 20 km away from the main city of Calcutta in India aimed at highlighting the extent of applicability of the  


labour legislations relating to the women in brick kilns and also the procedures of recruitment, working conditions, wage structures and welfare measures for these women. The main findings were that these women face exploitation, remain ignorant of their rights and privileges in relation to their service and situation in which they work and live and work in hazardous conditions. But the suggestions provided in the study are practically not so possible to implement.

Dharmalingam\textsuperscript{44}(1995) by analyzing his paper understood that the wage of the co-workers is determined by the number of bricks made, but the wage of the main worker was fixed by the owner on the basis of the capacity of the co-worker. If rain destroys the laid out bricks, then the main worker has to forego his wage and the wage of his co-workers.

Narandra Kumar and Prasad\textsuperscript{45}(1995) in their article “The Working Children: A Case Study of Brick Kiln industry in Nandyal”, analysed various aspects of child labour such as their caste, number of working days, wages and their family income. The study has observed that the working environment of brick industries is not proper and congenial. The study recommended that poverty alleviation programmes like Jawahar Rozgar Yojana, Integrated Rural Development Programme and Prime Minister Rozgar Yojana must be effectively implemented in the child labourers’ prone regions and univerralization of primary


education should be accompanied with special emphasis of child labourers’ prone regions.

Anand Damile\(^{46}\) (1996) in his article entitled, “On the Indian Brick Industry- on the Threshold of Mechanization of Brick Industry” stated that brick had earned an inevitable position among various building materials. He identified that opposition from environmentalists and social workers and absence of appropriate technology were the serious burning problems faced by the brick industry. In his article, he attributed the significance of appropriate technology as a remedy to many ills. He recommended the manufacturers to use fly-ash as the basic raw material. He has advised the manufacturers to use extrusion and wire cutting machinery to have a high output and stressed to use Bull’s trench kiln to overcome pollution. But he did not mention anything about the cost of production aspects.

The circular issued by Maharashtra Pollution Control Board \(^{47}\) (1997) insisted all the District Collectors to issue brick permissions only to the entrepreneurs who follow the brick regulations such as setting up of brick units at a safer distance and using low ash coal, mechanical strikers, avoiding noise pollution, constructing a cavity wall around trench kilns and avoiding usage of toxic fuels and harmful chemicals in manufacturing.

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\(^{47}\) *Maharashtra Pollution Control Board*, Circular, 18\(^{th}\) February 1997
Muthuraja\textsuperscript{48} (1997) has analysed the economic status, nature of work, working hours and gender bias of child labour in brick industry. The study has found those causes responsible for child labour, are utter poverty, under-employment of parents and vested interest of employers. He suggested that there should be immediate elimination of exploitative child labour and special drive for providing education to these children.

Prasertsan and Theppaya\textsuperscript{49} (1997) have developed a four chamber downdraft kiln to suit the needs of small brick producers in Thailand. This kiln consists of four interconnected chambers, where all the processes namely cooling, firing, preheating and drying take place in each of the chambers. However, the kiln operation is quite complicated and training may be needed for the operators. This kiln is still under development.

Pronk\textsuperscript{50} (1997) made a systematic documentation on the changing land use pattern with special emphasis on the motives and consequences of clay mining and brick producing industries of Thrissur district, Kerala.

A paper entitled “Cleaner Brick Production in India: A Transectoral Initiative” was published by Kumar Arun\textsuperscript{51}. According to him, there has been an


\textsuperscript{50}M.Pronk \textit{“Changing Land Use Practices: Motives and Consequences of Clay Mining and Brick Production in Thrissur District, Kerala, India”}, Thrissur, Project Paper No.11, 1997.
extremely serious and fast growing housing shortage. As such, burnt bricks are the most common building material. He has mentioned that the current demand for bricks is estimated at about 55 billion per year. But he blamed that the Indian Brick industries have failed to involve it in improved technologies and to achieve other environmental objectives. He further added that in China they followed the most promising method of decentralized burnt brick production and Vertical Shaft Brick Kiln (VSBK) technology. He has assured that through that VSBK technology, environmental performance and product quality could be improved.

Manoharan\textsuperscript{52} (1998) in his study, “Scale, Technology and Efficiency in Brick industry in Tamilnadu”, has analysed the scale, technology and efficiency in brick industry of the two sample areas selected by him namely Chengalpattu and Dharmapuri districts of Tamil Nadu. According to him, scale implies the size of the brick units. He has tabulated the size of both clamp kilns and Bulls’ trench kiln by means of number of workers, value of assets and by volume of output. He has also analysed both the reasons for success of traditional technology and reason for failure of sophisticated technology. He has suggested the government to encourage brick kilns by abolishing sales tax and to provide assistance at lower rates of interest to brick kilns.

Nilson and Nystrom\(^5\) (1998) are of the opinion that Bulls’ trench kiln and Hoffmann kiln (continuous type) have comparable specific energy consumption values. Though the stove kiln consumes less energy, the quality of the brick is not satisfactory since all the bricks are not burnt thoroughly.

Bhikkabai.Oza\(^4\)(1999) in his article entitled “Problems of Brick Industry of Gujarat State” has stated that the report made by the Tripartite committee - a committee formed by the Central Government for framing comprehensive labour laws for the brick industry, was of no use if those laws were not passed by the parliament. In this article, he suggested the Gujarat State and Central Government to provide financial assistance and accomodation for the brick industry at a lesser rate of interest. He had also obligated the Central Government for the stoppage of manufacture of automatic plant which would lead to create unemployment of lacks of labour of the State.

Bas Rozenmuller\(^5\) (1999) undertook a study entitled, “An overview of Bricks and Tiles manufacturing industries in Northwest Cambodia”. This study attempted to analyse the problems with regard to production, labour, marketing, finance, political and environmental problems faced by bricks and tiles manufacturing industries. The study revealed that lack of welfare and safety measures, lack of government support and non availability of timely finance had


been the factors responsible for the problems of the industry. But the study does not mention any suitable suggestions to meet those factors.

Lakshmikanthan\(^{56}\) (1999), in his article entitled, “Vertical Shaft Brick Kiln Technology in India” has identified the VSBK technology as a result of his search for cleaner brick production technology. He has mentioned that the VSBK technology has been originally developed in China. He has appreciated that the VSBK technology as a means to have an energy efficient and eco-friendly technology to produce quality bricks.

Mathur\(^{57}\) (1999) in his article entitled “The Heritage of Brick and Brick Masonry” stated that significance of brick industry has not been properly appreciated. He considered brick as a pre-dominant building material both in urban and rural areas. He has suggested that proper training of labour, conducting various Entrepreneur Development Programmes (EDPs) and proper liaison with the government are the various measures to safeguard the heritage of the brick industry.

Nagarajan\(^{58}\) (1999) in his article entitled “The Neglected Brick Industry” identified that though the brick industry paid crores of rupees to the Government in the form of income tax, Sales tax, besides the local body taxes like license fees and professional tax, the authorities had failed to see the problems confronted by


\(^{57}\) G.C. Mathur “The Heritage of Brick and Brick Masonry” Annual 1999 Newsletter- [http://www.brickindia.com/Corporate Overview](http://www.brickindia.com/Corporate Overview)

the industry. He insisted the government to take corrective measures regarding the up-gradation of the industry.

Padmalal, Maya, Narendra Babu and Mini\textsuperscript{59}(1999) in their research programme entitled, “Tile and Brick Clay Mining and Related Environmental Problems in the Chalakudy Basin, Central Kerala”, had analysed clay mining from Chalakudi basin, characterization and nutrient load, water quality in areas adjoining tile and brick clay based industrial units and origin and occurrence of tile and brick clays. The research programme finally suggested that tile and clay brick resources should be quantified by grade wise and suggested to limit extraction of tile and brick clays.

Rajendralala Mithra\textsuperscript{60} (1999) in his book, “Indo-Aryans: Contributions towards the elucidation of their Ancient and Mediaeval History” specified that bricks were common everywhere and have been so since the date of Rig Veda, but the details for manufacturing them were not been given at length. He also found that in those days Suslvasutras had supplied rules for the making of bricks for fire altars. He had also mentioned that those rules were not evenly followed. He had quoted that the Agni-Puranam has a few verses for the digging of clays and the making of bricks.


\textsuperscript{60} Rajendralala Mithra, “Indo-Aryans: Contributions towards the elucidation of their ancient and mediaeval history”, Priya Publications, Mysore, Vol. X (I), 1999, p.82.
Swapan Kumar Babu\textsuperscript{61} (1999) in his article entitled “Brick Industry of West Bengal: Unfulfilled expectations” stated that though the brick industry being a seasonal industry, has provided a huge job opportunities to vast sections of the economically weaker rural population. He found that the perennial problems of the industry were acute crisis of raw material, bureaucratic taxes and revenues. According to him, the only remedy for those problems was to seek redressal in the Supreme Court. He has stated that such cases were part heard and were waiting for final hearing.

The Ministry of Environment and Forests in its Gazette has notified that the brick manufacturers within 50 kilometers of radius from thermal power plants should not enter into production process without mixing at least 25 percent of ash with soil on weight to weight basis. It had also authorized various officials such as Regional Officers of State Pollution Board or Pollution Control Committee for the cancellation of license and mining lease of those manufacturers who were in non-compliance of the notification. It had also ordered the thermal power plants to constitute a dispute settlement committee consisting of General Manager of Thermal Power Plants and a representative of All India Bricks and Tiles Manufacturers’ Federation (AIBTMF) as members.\textsuperscript{62}

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\textsuperscript{61} Swapan Kumar Basu,”Brick industry of west Bengal: Unfulfilled expectations” Annual 1999 Newsletter, http://www.brickindia.com/Corporate Overview

\textsuperscript{62} The Gazette of India-Ministry of Environment and Forests, Part I- Sec 3-Subsection (II) New Delhi, September 1999.
\end{flushright}
Andrew Miller\textsuperscript{63} (2000) in his article entitled “Making of Fired Bricks in Tamilnadu” mentioned that Tamilnadu has an old tradition in making fired bricks and it is the main building material. Those bricks are made of sandy loom that is found close to river beds. Sites for brick making are found just outside the villages. Brick making factories are small scale industries that employ ten to thirty people. Also, he specified clearly the process of manufacturing bricks in Tamilnadu.

An order made by High court (Delhi) to Delhi Pollution Control Committee revealed that usage of fly-ash in manufacturing of bricks would not pollute the environment. Hence, the brick manufacturers using fly-ash as their basic raw material should be permitted to operate without any hazard. It also added that any petition made by the fly-ash brick manufacturers should also be cleared within six weeks from the date from which such petitions were filed.\textsuperscript{64}

The news published in “The Local News”, Kathmandu, Nepal revealed that 37 brick kilns in Siraha (Nepal) had been closed down. The reason mentioned for such a closure being the smuggling of low quality bricks from India through various check points along the open border with the help of employees of customs office and the police. It was also revealed that the excise office (Siraha, Nepal) had received Rs. One lakh in three installments from each brick kiln in the


\textsuperscript{64} The Indian Express, New Delhi, 12\textsuperscript{th} October 2000, http://www.theindianexpress.com
district. It had stated that such closure had caused a decline in the government revenue.65

Robert Brockhus66 (2002) in his “Second Letter to the Ambassador of the State of India” stated that production of green bricks in India would lead to future collapse of building. He also identified that up to ninety percent of the toxic waste and fly-ash were used in the manufacture of green bricks. He has also warned that migration of highly toxic materials out of those brick would poison the environment especially the level of the ground water.

Daram Pal Singh67(2003) in his paper submitted in Nagasaki International University, Japan looked into some of the aspects relating to housing, health, safety, education and welfare facilities of women workers of brick kiln industry. The study has been done by the author on 54 brick kilns selected randomly out of 547 units located in the five districts of Hissar division of the State of Haryana. Having analysed the above aspects, he has suggested the owners of the bricks kiln industry to provide a proper healthy, safety and welfare measures to the women who spend their efforts towards the working on the brick-kiln . But the study does not stress the duties that are to be performed by the women workers of brick industry.

Mande and Kishore\textsuperscript{68} (2003) in their paper entitled “Eco-Friendly and Energy Efficient Green Brick Drying” have mentioned the problems of drying process of green brick drying. They have stressed the importance of eco-friendly gasified based system, as developed by Techno Economic Research Institute (TERI). They have pointed out the major benefits of gasified system as substantial fuel saving, reduced drying time, suitable for remote unelectrified locations, reducing inventory requirement and improved working conditions. However, their paper did not mention any precautions to be taken while dealing with eco-friendly gasified based system.

In a study on the evolution South Kerala Sedimentary Basin (SKSB), Nair and Padmalal\textsuperscript{69} (2003) attempted to unfold the origin of tile and brick clays of SKSB, located between Kollam in the south and Kodungallur in the north.

Vijay Kutty and Chitra Narayanan\textsuperscript{70}(2003) in their book entitled, “Greening Red Earth – Bamboo’s Role in the Environmental and Socio-Economic Rehabilitation of Villages Devastated by Brick Mining” had blamed the brick manufacturers of villages surrounding Allahabad. They had specified that Allahabad has created a rich loom of the area and which has further attracted the brick miners and due to that activity, productive land was gobbled up to feed


\textsuperscript{69}Nair, K.M and D.Padmalal, \textit{“Quaternary Sea level oscillations, geological and geomorphologic evolution of South Kerala Sedimentary Basin”}, project final report, Department of Science and Technology, Government of India, 2003.

\textsuperscript{70}Vijay Kutty and Chitra Narayananan, \textit{“Greening Red Earth – Bamboo’s Role in the Environmental and Socio-Economic Rehabilitation of villages devastated by Brick Mining”} INBAR, 2003, p.52
the incessant demand of the construction industry. They had mentioned that only after the efforts taken by International Network for Bamboo and Rattan (INBAR) during 1996, there entered a project which had bamboo as the backbone. They had further noted that the effect of the project of INBAR has resulted in the replacement of red-earth by green expanses during the year 2003.

According to Pant71 (2004), Deputy Chairman of Planning Commission, the heartening feature of the economic growth has been the performance of the brick and mortar sectors. They have demonstrated a degree of vitality that makes us confident about the future of India which has the potential to emerge as a manufacturing hub for the international market.

On March 25-26, 2004, climate change Centre Development Alternatives, New Delhi and the Institute for Global Environmental Strategies (IGES), Japan, jointly organized a workshop in New Delhi on CDM opportunities in small scale sectors like brick, rice mills and energy efficient buildings. The central theme of the workshop was to implement various projects in small scale sector including bricks. Among the small and medium enterprises (SMEs), brick making is a traditional industry in India. As with other SMEs, the brick industry is also highly polluting in nature and very energy intensive. These highly polluting industries are the major health hazards not only for the workers but also to the surrounding populations. Though there have been new technologies like VSBK which are highly energy efficient and pollution free, their wide dissemination is yet to be fixed. The brick industry thus offer a vast scope for the introduction of cleaner

production schemes and energy efficiency improvements which can have much impact on the rate of return of such projects and also take the advantage of the CDM projects.\textsuperscript{72}

According to the news published by Times New Network (2004) the vertical shaft brick kiln (VSBK) technology has been provided very successfully in peninsular India. It has also mentioned that such VSBK technology has also been supported by Development Alternatives (DA), a non governmental organization and India – Canada Environment Facility (ICEF). It has recognized that Jharkhand Pollution Control Board has accepted such VSBK technology.\textsuperscript{73}

Bhusan Tuladar\textsuperscript{74}(2005), Chief of Clean Energy Nepal(CEN) said in a program organized by CEN that out of 150 brick kilns registered in Katmandu valley, 60 units had embraced environment friendly technologies. He also claimed that if all of the brick kiln operators begin to make use of less polluting technologies, the problems of worsening air pollution can be tackled effectively.

Choudhary\textsuperscript{75} (2005) in his article “Structural Safety of Residential Buildings with respect of earthquakes” mentioned some recommendations for the construction of earthquake resistant small residential buildings (as per IS: 4326)

\textsuperscript{72} Mallik.S. Roy,\textsuperscript{, mallika@solalt.ernel.in.} , 2004
\textsuperscript{74} Bhusan Tuladhar, “A number of brick kiln entrepreneurs are switching for less polluting technologies”, Brick Kiln Industry News, Haryana, issue 3, R.N.No.11804, 2005, p.10
as small residential buildings are normally load bearing brick wall structures, load bearing peripheral brick walls and intermediate R.C.C column structures and framed structures (column beams) with unfilled brick work. He insisted the builders that the quality of construction should be monitored ensuring first class brick work in cement sand mortar 1:5 in foundation/ substructure and first class brick work 1:6 in superstructure.

An article entitled, “Pull and Push Factors in Labour Migration: A Study of Brick Kiln Workers in Punjab” was Published by Naresh Kumar and Sidhu\textsuperscript{76}. This paper is an attempt to identify the push and pull factors which influence workers’ interstate migration on the basis of perceptions of workers. This study found that industrial development, better job opportunities and comparatively higher wages in Punjab have emerged as the most important pull factors which motivate labour to migrate. The study further found that economic factors have emerged more significant as compared to non-economic factors in the process of migration. Their Study recommends that in view of the slow absorption rate in the urban industrial sector, the labour migration should be regulated Concrete plans and their effective implementations are necessary in order to minimize the differences between the economic opportunities in urban and rural sectors.

Ruma Ghosh\textsuperscript{77} (2005) in his study “Brick Kiln Workers: A Study of Migration, Labour Process and Employment” has analysed various aspects of brick kiln workers. The study highlights that the brick making industry provides employment to a large workforce from the rural and semi-rural areas, yet in terms of the quality of employment, the industry lags far behind most other industries in the unorganized sector having a direct employer-employee relationship. An important contribution of the study is the analysis in terms of linking the low price rated wages to the problem of child labour. The study shows that while on the one hand lack of job opportunities of the seasonal migrants and their low wages leave no option for the workers but to involve as many family members as possible including the children below the age of fourteen years, on the other, this extra income with the help of the family members is enough for the employers to keep the prevalent piece rated wages low under the pretext of workers getting adequate wages.

News entitled “Bonded Labourers Rescued from Brick Kiln” published by Times of India mentioned that forty four bonded labourers including 28 children who had been toiling away at a Ranchi brick kiln in just for food have been rescued by police. In that news, it is mentioned that the labourers were lured with handsome wages but were given only food and when they asked for money, they

were beaten up. The news finally said that thousands of people work as bonded labourers, mostly in brick kiln industry.\textsuperscript{78}

Deccan Herald reported that the problems suffered by the brick manufacturers were non-availability of suitable soil, insufficient supply of fly-ash, tough labour problems, increasing trends in the price of fly-ash and fuel and stiff competition. These problems have led to increase in the cost of production and narrow profit margin. Moreover, a recent flood in Krishna River has washed away lakh of raw bricks. The paper has finally suggested that Government should extend financial, organizational, technical and other types of assistance to that ailing brick industry.\textsuperscript{79}

News entitled, “Pakistani Brick Kiln Workers launch Indefinite Strike” said that an indefinite national strike by Bhatt (brick kiln) workers began and was marked by violence, kidnappings, arrests and torture of workers by the bosses and police all over Pakistan. It was further stated that the Pakistan Bhatt Masdoor Union (PBMU) called a strike against non implementation of courts’ order to abolish pestigi (advance) system. The government invited the union leaders to a discussion at which the labour secretary assured that the government would take action against those brick kiln owners who are deducting the pestigi from workers’ wages.\textsuperscript{80}


News entitled “Ground-Breaking Changes in Brick Industry” was published by “The Hindu”. In that news, it was mentioned that in Thrissur district of Kerala, closure of brick manufacturing units took place due to the usage of poor quality clay. It has focused the expert view regarding the clay problem for brick manufacturing. The experts are in the view that the only solution for clay problems is to replace clay with fly-ash. That news gave many beneficial aspects of usage of the fly-ash in brick manufacturing and has highlighted various points to be discussed at Fly-ash Utilisation Seminar, Angamaly, Kerala.\textsuperscript{81}

Saravanan, a manufacturer of fly-ash bricks, Madurai in his interview with Junior Vikatan Journal said that at the initial stage Government supplied fly-ash at free of cost. But at present, prices are fixed for fly-ash. Moreover, there are various political problems regarding fly-ash supply. In the mean time, cement manufacturers created some problems regarding fly-ash supply.\textsuperscript{82}

In the part II proceedings of XIV Lok Sabha an issue regarding the imposition of 16 per cent central excise duty on rural industries including brick chambers in the Union Budget 2006-07 has been discussed. Kharvendhan and Krishnaswamy brought this issue to the attention of the Government. They had pointed out that more than 2500 brick chamber industries in Tamilnadu gave employment to more than 50 lakh people belonging to the downtrodden community and OBCs. Such an imposition of excise duty to the tune of 16 per cent in the Finance Bill 2006 would affect the economy also. They further added

\textsuperscript{81} The Hindu, (on line edition), dated 15\textsuperscript{th} July 2006, http://www.hinduonline.com
\textsuperscript{82} “Fly-Ash Scarcity”, Junior Vikatan, Chennai, 30\textsuperscript{th} July, 2006, p.17.
that the exception for excise duty given to brick chamber with annual rate upto Rs. 1 crore would not help in any way. They appealed to the Union Government to drop that proposal.\textsuperscript{83}

**Research Gap**

In the present study, the researcher has made an attempt to present a few concepts and views to throw relevant light on the economic and commercial performance of the brick manufacturing units located in Tirunelveli and Thoothukudi districts area. In addition, the views and opinions of the owners of brick units, traders and customers are collected and discussed.

The study has also accorded due importance to an analysis of the cost, financial aspects and profit levels with respect to brick units and their performance. A simple SWOT analysis given in this study throws much useful light on several facts and facets of the problem.

The new dimension and observations made by these works are hoped to fill in some of the gaps left out so far. Such inputs can add to the creative assets of wisdom in a modest manner.

\textsuperscript{83} Part II Proceedings other than Questions and Answers (Xiv Lok Sabha), *Parliament of India*, New Delhi, 2006-2007.