THE BRICK INDUSTRY IN TRANSITION: AN EXPLORATORY STUDY OF CHALLENGES, ECONOMIC PROSPECTS AND FUTURE SUSTAINABILITY IN SOUTH KARIMGANJ DEVELOPMENT BLOCK OF SRIBHUMI DISTRICT, ASSAM

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ABSTRACT

This study, entitled "***The Brick Industry in Transition: An Exploratory Study of Challenges, Economic Prospects and Future Sustainability in South Karimganj Development Block of Sribhumi District, Assam,***" examines the economic performance, production activities, employment generation, investment patterns, and operational challenges of the brick industry in the study area of Sribhumi district, Assam. The study is based on primary data collected through field surveys of five selected brick industries: Valley Brick Industry, Delux Brick Industry, Star Brick Industry, Paul Brick Industry and Sunny Brick Industry. The analysis focuses on differences in investment, annual brick production, labour employment, establishment periods, and operating expenditure. The collected data reveal variations in the scale and operational characteristics of the selected industries. Valley Brick Industry reported the highest annual production among the five surveyed units, while Delux Brick Industry reported the highest investment. The study highlights the contribution of brick manufacturing to local employment and the supply of construction materials. It also identifies important areas requiring attention, including production costs, access to finance, labour welfare, technological improvement, market development, and environmental sustainability. The study recommends adopting energy-efficient technologies, improving financial management, strengthening institutional support, enhancing workers' skills, and promoting environmentally responsible production practices. Since the research covers only three selected industries, the findings primarily represent the surveyed units and should not be generalised to all brick industries in the district without further investigation. The study provides a useful foundation for future research and policy measures aimed at improving the efficiency, competitiveness, and long-term sustainability of the brick industry in South Karimganj Development Block.

Keywords: Brick Industry; South Karimganj Development Block; Primary Data; Investment; Brick Production; Employment Generation; Operating Expenditure; Labour Conditions; Environmental Sustainability; Technological Development; Industrial Challenges; Future Outlook.

I. INTRODUCTION

The brick industry is an important component of the construction sector, providing essential building materials for residential houses, commercial establishments, roads, and other infrastructure projects. It also contributes to employment generation and supports the livelihoods of workers, transporters, suppliers, and small entrepreneurs. In developing regions such as Assam, brick manufacturing plays a significant role in meeting the growing demand for construction materials. However, the industry faces several challenges, including rising production costs, labour-related difficulties, limited access to finance, traditional manufacturing techniques, and environmental concerns. Therefore, studying the economic and operational conditions of brick industries is essential for understanding their contribution to regional development and identifying opportunities for sustainable growth.

The present study, entitled "***The Brick Industry in Transition: An Exploratory Study of Challenges, Economic Prospects and Future Sustainability in South Karimganj Development Block of Sribhumi District, Assam,***" focuses on five selected brick industries: Valley Brick Industry, Delux Brick Industry, Star Brick Industry, Paul Brick Industry and Sunny Brick Industry, located in the study area of Sribhumi district, Assam. The research is based on primary data collected through field surveys to examine investment patterns, annual production, labour employment, establishment periods, and operating expenditure. The collected information helps compare the operational characteristics of the selected industries and understand their economic significance. The study also considers the practical difficulties faced by brick manufacturers in maintaining production, managing costs, securing labour, and responding to changing market conditions.

The study aims to identify the major challenges affecting the brick industry and suggest suitable measures for its future development. Particular attention is given to improving production efficiency, strengthening financial management, promoting workers' welfare, adopting appropriate technologies, and encouraging environmentally responsible manufacturing practices. The findings may help industry owners, policymakers, financial institutions, and future researchers understand the needs of brick manufacturers in the study area. Although the investigation covers only three selected industries, it provides useful insights into their operational conditions and development prospects. Ultimately, the study seeks to contribute to the sustainable growth of the brick industry in South Karimganj Development Block through better resource utilisation, institutional support, technological improvement, and effective business management.

II. OBJECTIVES OF THE STUDY

1. To examine the present status of the brick industry of South Karimganj Development Block area in Sribhumi district of Assam. This objective aims to understand the existing condition, production practices, operational structure, and overall development of the brick industry in the study area.

2. To analyse the economic contribution of the brick industry. This objective focuses on assessing the industry's role in employment generation, income creation, livelihood support, and the local economic development of the area.

3. To identify the major challenges faced by brick kiln owners and workers. This includes examining problems related to production costs, availability of raw materials, labour supply, financial resources, transportation, market demand, and seasonal fluctuations.

4. To examine the environmental and technological issues associated with brick production. This objective seeks to understand the environmental impacts of traditional brick manufacturing and assess the scope for adopting cleaner technologies and sustainable production practices.

5. To evaluate the future prospects of the brick industry and suggest suitable measures for its sustainable development. This objective aims to identify opportunities for improving productivity, profitability, working conditions, and long-term sustainability based on the primary data collected from the study area.

III. SIGNIFICANCE OF THE STUDY

1. Understanding the Present Condition of the Industry: The study helps to understand the existing condition of the brick industry of South Karimganj Development Block area in Sribhumi district, including its production methods, operational practices, market conditions, and major challenges. It provides an overview of the industry's current position and development prospects.

2. Assessing Employment and Economic Contribution: The study highlights the contribution of the brick industry to employment generation, income creation, and livelihood opportunities for local people. It also examines the industry's role in supporting brick kiln owners, workers, transport operators, and other individuals associated with construction activities.

3. Identifying Major Challenges: The research identifies important problems faced by brick kiln owners and workers, including rising production costs, labour shortages, seasonal fluctuations, financial difficulties, and environmental concerns. Understanding these challenges can help stakeholders develop appropriate strategies to improve the industry's performance.

4. Promoting Sustainable Development: The study emphasises the importance of adopting cleaner technologies, improving energy efficiency, and reducing the environmental effects of brick manufacturing. It may encourage greater awareness of environmentally responsible production methods and sustainable industrial practices.

5. Providing Suggestions for Future Development: The findings, based on primary data collected from the study area, may help researchers, policymakers, entrepreneurs, and other stakeholders understand the industry's requirements. The study can also provide a foundation for developing practical measures to improve productivity, profitability, working conditions, and the long-term sustainability of the brick industry in Sribhumi district.

IV. PROJECT OUTCOMES

The expected outcomes of the present study are presented below. Since the study is based on primary data collected from respondents, the final outcomes will be determined by the information obtained through field surveys and its subsequent analysis.

1. Understanding the Present Condition of the Brick Industry: The study is expected to provide a comprehensive understanding of the present condition of the brick industry in South Karimganj Development Block. It will examine the establishment, operational structure, production capacity, investment patterns and overall functioning of brick kilns.

2. Assessment of Investment and Sources of Finance: The study will identify the average investment required to establish and operate brick kilns. It will also examine the major sources of finance, including personal savings, bank loans, borrowings from private lenders and other financial sources, to understand the financial position of brick entrepreneurs.

3. Evaluation of Production Capacity: The research is expected to determine the average production of bricks per kiln during a production season. It will also examine the relationship between kiln capacity, availability of raw materials, labour supply, weather conditions and production costs.

4. Analysis of Employment Generation: The study will assess the contribution of the brick industry to employment generation in the study area. It will examine the number of workers employed, the nature of employment, seasonal employment patterns and the industry's role in providing livelihood opportunities to local and migrant labourers.

5. Examination of Profitability and Returns: The research will investigate the average returns earned by brick kiln owners and the major factors influencing profitability. It will consider expenditure on raw materials, wages, fuel, transportation, maintenance and other operating costs to understand the economic viability of brick manufacturing.

6. Identification of Major Problems and Challenges: The study is expected to identify the principal challenges faced by brick kiln owners and workers, such as rising production costs, inadequate finance, labour shortages, transportation difficulties, seasonal interruptions, market competition and limited access to modern technology.

7. Assessment of Environmental Impacts: The research will examine environmental concerns associated with brick manufacturing, including air pollution, fuel consumption, soil degradation and the possible effects of emissions on local communities. It will also explore the awareness and adoption of environmentally sustainable production practices.

8. Evaluation of Technology and Modernisation: The study will assess the extent to which brick kilns use traditional and improved manufacturing technologies. It will identify opportunities for adopting energy-efficient kilns, cleaner fuels, improved firing techniques and other modern methods to enhance productivity and reduce environmental damage.

9. Understanding Market Conditions: The research will investigate the demand and supply conditions of bricks in the study area. It will examine pricing patterns, transportation expenses, competition among producers and the influence of local construction activities on the sale and profitability of bricks.

10. Assessment of Government Support and Policies: The study will explore the awareness and accessibility of government assistance, institutional credit, technological support and environmental regulations among brick entrepreneurs. It will help identify gaps between available support measures and the practical needs of brick kiln operators.

11. Examination of Labour Conditions: The research will provide insights into the working conditions of brick kiln labourers, including wages, working hours, occupational safety, access to basic facilities and employment security. These findings may help identify areas where labour welfare and working conditions require improvement.

12. Identification of Sustainable Development Opportunities: The study is expected to identify opportunities for making the brick industry more economically viable and environmentally sustainable. Cleaner technologies, efficient resource utilisation, better labour management and improved financial planning may contribute to the industry's long-term development.

13. Formulation of Remedial Measures: Based on the findings, the study will suggest practical remedial measures to address the problems faced by brick entrepreneurs and workers. These may include improved access to institutional finance, skill development, technological modernisation, better transportation facilities and stronger implementation of environmental safeguards.

14. Contribution to Local Economic Development: The research will help explain the role of the brick industry in supporting construction activities, creating employment and generating income in Sribhumi district. It may also highlight the industry's contribution to related economic activities, including transportation, raw-material supply and local trade.

15. Suggestions for Future Research and Policy Planning: The findings may provide useful baseline information for researchers, policymakers, government departments and industry stakeholders. They can support future investigations into productivity, profitability, labour welfare, environmental sustainability and the long-term development prospects of the brick industry in Assam.

V. RESEARCH QUESTIONS

- What are the investment patterns and sources of finance of the selected brick industries in South Karimganj Development Block area?
- What is the annual production capacity and actual production of the selected brick industries?
- How many permanent and seasonal labourers are employed by the selected brick industries?
- What are the major operating costs and financial challenges faced by brick industry owners?
- What are the major problems associated with raw materials, fuel, labour availability, and transportation?
- How do technological limitations and traditional manufacturing methods affect production efficiency and environmental sustainability?
- What role do the selected brick industries play in local employment generation and economic development?
- What measures can be adopted to overcome existing challenges and improve the future prospects of the brick industry in the South Karimganj Development Block area?

VI. LIMITATIONS OF THE STUDY

1. Limited Geographical Coverage: The study is confined to the brick industry of South Karimganj Development Block area in Sribhumi district. Therefore, the findings may not represent the conditions of the brick industry in other districts of Assam or other states of India, where production practices, market conditions, and industrial challenges may differ.

2. Limitations of Primary Data: The study depends on primary data collected from selected brick kiln owners, workers, and other relevant respondents. The accuracy of the findings depends on the respondents' willingness to participate and provide reliable information. Some respondents may hesitate to disclose financial details or other sensitive information.

3. Time and Financial Constraints: Limited time and financial resources may restrict the number of brick kilns surveyed and the geographical area covered. Seasonal variations in brick production may also affect data collection. Consequently, the study may not capture every operational difficulty or fully assess the industry's long-term future prospects.

VII. AREA OF THE STUDY

1. Geographic Conditions: South Karimganj Development Block, located in Sribhumi district, Assam, forms the geographical focus of the present study. The area lies in the southern part of Assam's Barak Valley, a region characterised by low-lying plains, river systems, fertile alluvial soils, and a humid subtropical monsoon climate. The geographical conditions of the wider region influence agricultural activities, transportation, settlement patterns, and the availability of natural resources. Clay-rich soil and access to locally available raw materials can support brick manufacturing, although their suitability depends on soil composition and environmental regulations. Seasonal rainfall, flooding, and waterlogging may create difficulties for brick production, particularly during the monsoon, when drying freshly moulded bricks and transporting finished products can become challenging. Therefore, geographical and climatic conditions are important factors influencing the operation and productivity of brick industries in the study area.

2. Economic Conditions: The economy of the South Karimganj Development Block area is closely connected with the wider rural economy of Sribhumi district, where agriculture, small businesses, trade, transportation, construction, and other local economic activities provide livelihoods to residents. The district's predominantly rural population creates an important role for agriculture and village-based enterprises, while the demand for housing and infrastructure supports construction-related activities. The brick industry contributes to this local economic structure by supplying building materials and creating employment for permanent and seasonal labourers. The three selected industries—Valley Brick Industry, Delux Brick Industry, and Sunny Brick Industry—also generate demand for raw materials, fuel, transportation, and other supporting services. However, rising production costs, access to finance, seasonal interruptions, and environmental requirements may affect their economic performance. The development of these industries therefore depends on improved infrastructure, efficient production methods, adequate working capital, and access to reliable markets.

VIII. THEORETICAL LITERATURE REVIEW

A literature review is an essential component of research because it provides a theoretical and empirical foundation for the study. It helps the researcher understand previous studies, existing knowledge, and major findings related to the research topic. In the present study, ***"The Brick Industry in Transition: An Exploratory Study of Challenges, Economic Prospects and Future Sustainability in South Karimganj Development Block of Sribhumi District, Assam,"*** the literature review helps identify economic, social, environmental, and technological issues associated with brick manufacturing. It also assists in identifying research gaps, formulating research objectives, selecting appropriate research methods, and developing relevant questionnaires for primary data collection. Furthermore, it helps compare the present findings with existing research and establish the study's significance.

1. Kumar and Sharma (2021): An Empirical Study on Brick Industry of India—A Perspective of Cost Analysis

Kumar and Sharma (2021) examined the economic structure of the brick industry, particularly in western Uttar Pradesh. Their study focused on production costs, profitability, technological alternatives, and the economic difficulties experienced by brick kiln owners. The research highlighted the importance of evaluating both private production expenses and the broader social costs associated with brick manufacturing. It provides a useful foundation for understanding the financial challenges faced by brick entrepreneurs.

2. Dey and Dey (2015): Deterioration and Degradation of Aquatic Systems Due to Brick Kiln Industries—A Study in Cachar District, Assam

Dey and Dey (2015) investigated the environmental effects of brick kiln industries in Cachar district of Assam. Their study examined water quality around selected brick kilns and identified environmental concerns associated with brick manufacturing. The researchers discussed problems including land degradation, air pollution, deterioration of water quality, and threats to biodiversity. This research is particularly relevant because Cachar and Sribhumi are neighbouring districts in southern Assam and share regional environmental and economic contexts.

3. Kumar (2014): A Study on Brick Kiln and Its Social Assessment

Kumar (2014) examined the social and environmental challenges associated with brick kiln production in India. The study addressed concerns such as air pollution, greenhouse gas emissions, bonded labour, child labour, inadequate sanitation, and occupational health risks. It also highlighted the importance of considering social indicators when evaluating the performance of the brick manufacturing sector. The research suggests that industrial development should not be assessed exclusively through production volume or economic returns. Workers' welfare and the surrounding community's quality of life are equally important.

4. Kumar and Sharma (2021): Production Costs and Social Costs of the Brick Industry

Kumar and Sharma (2021) also examined brick production costs in western Uttar Pradesh, considering the relationship between industrial profitability and social consequences. Their research is relevant to understanding how expenditure on labour, fuel, raw materials, and other inputs influences the economic performance of brick manufacturing enterprises. The study's consideration of social costs further suggests that pollution and other external effects should be recognised when evaluating the industry's overall contribution. This perspective is useful for investigating whether brick kiln owners can maintain profitability while improving production methods and environmental performance.

5. Reconciliation of Energy Use Disparities in Brick Production in India (2023)

A study published in Nature Sustainability in 2023 investigated differences in energy consumption among major

brick kiln technologies in India. Its analysis indicated that specific energy consumption varies considerably across traditional clamps, Bull's Trench kilns, and zigzag kilns. The research highlighted the potential for reducing fuel consumption through technological improvements, particularly the transition towards more efficient kiln designs. These findings demonstrate that technological choices can affect both production expenses and environmental performance. The study is relevant to the present research because energy costs may influence profitability and competitiveness.

6. Forecasting Environmental and Social Benefits of Adopting Cleaner Technologies in Indian Brick Manufacturing

A study published in 2022 examined the potential long-term environmental and social benefits of adopting cleaner technologies in India's brick manufacturing sector. Using scenario-based modelling, the researchers assessed possible changes in fuel requirements, greenhouse gas emissions, air pollutants, and associated external costs. The study considered alternatives such as zigzag kilns, vertical shaft brick kilns, and tunnel kilns. Its analysis highlighted the potential advantages of improved energy efficiency and lower-emission production methods. This research provides a useful foundation for examining the future outlook of the brick industry.

IX. RESEARCH METHODOLOGY

1. Nature of the Study: The present study is empirical and descriptive in nature. It examines the operational and economic conditions of the brick industry of South Karimganj Development Block, Sribhumi district, Assam. It focuses on investment, production, employment, expenditure, industrial challenges, and future development prospects.

2. Area of the Study: The study was conducted in South Karimganj Development Block in Sribhumi district, Assam. The area was selected to understand the functioning of local brick manufacturing units and their contribution to employment, construction activities, and the regional economy.

3. Sources of Data: The study primarily uses primary data collected directly from the selected brick industries through field visits and interviews with respondents. Information was obtained regarding investment, establishment year, labour employment, production, operating expenditure, and other aspects of industrial operations.

4. Sample Size and Selection: The study covers three selected brick industries: Valley Brick Industry, Delux Brick Industry, and Sunny Brick Industry. These industries constitute the sample for the investigation. The study compares their reported operational and economic characteristics to identify similarities, differences, and major challenges.

5. Method of Data Collection: The schedule method was used to collect primary data from the respondents. A structured set of questions guided the field survey and helped maintain consistency in the information collected from the three industries. Direct interaction with respondents also helped the researcher understand their business activities and practical difficulties.

6. Tools and Techniques of Analysis: The collected data were organised, tabulated, compared, and interpreted using descriptive statistical techniques. Absolute figures, percentages, and comparative analysis were used where appropriate. Pie charts, bar diagrams, and histograms may be used to present the findings clearly, depending on the type and distribution of the variables.

7. Classification and Interpretation of Data: The collected information was classified under major categories, including investment, annual production, employment, establishment period, and operating expenditure. The information was then interpreted to understand variations among the selected industries. Financial indicators should be calculated only when the necessary data, such as revenue and net profit, are available.

X.CONCEPTUAL FRAMEWORK

Bricks are rectangular construction materials manufactured from clay, shale, concrete, or other suitable materials and used in building walls, foundations, pavements, and other structures. They are important construction materials because of their strength, durability, availability, and suitability for different architectural purposes. The conceptual framework of bricks explains their classification according to raw materials, manufacturing processes, physical properties, and uses. The selection of bricks depends on factors such as cost, strength, water absorption, durability, and availability in the local market.

Types of Bricks

Sun-Dried Bricks: These bricks are moulded from clay and dried naturally under sunlight without being burnt in a kiln. They are relatively inexpensive but generally less durable and less resistant to moisture than burnt bricks.

Burnt Clay Bricks: These bricks are manufactured by moulding clay, drying it, and burning it in a kiln. They are widely used in construction because of their strength, durability, and availability.

Concrete Bricks: These bricks are produced using cement, sand, aggregates, and water. They are used in walls, facades, and other construction works, depending on their strength and design.

Fly Ash Bricks: These bricks are manufactured using fly ash, cement or lime, sand, and other suitable materials. They can utilise industrial by-products and may offer improved dimensional consistency.

Engineering Bricks: These are specially manufactured bricks designed to provide high strength, low water absorption, and resistance to demanding conditions. They are

commonly used in foundations, retaining walls, and civil engineering projects.

Sand-Lime Bricks: These bricks are produced from sand and lime through a controlled manufacturing process. They generally have uniform shapes and are used in various masonry applications.

Hollow Bricks: These bricks contain cavities that reduce their weight and may improve thermal insulation. They are used in selected wall construction applications where their structural properties are suitable.

The different types of bricks serve different construction purposes according to their composition, manufacturing methods, strength, and durability. Understanding brick classification is relevant to the present study because the choice of brick type influences production costs, raw material requirements, technology adoption, market demand, and the future development of the brick industry in Sribhumi district of Assam.

XI. PROFILES OF THE BRICK MANUFACTURING FIRMS

The present study, entitled "***The Brick Industry in Transition: An Exploratory Study of Challenges, Economic Prospects and Future Sustainability in South Karimganj Development Block of Sribhumi District, Assam***," is based on primary data collected from selected brick industries in the study area. The field survey was conducted at Valley Brick Industry, Delux Brick Industry, Star Brick Industry, Paul Brick Industry and Sunny Brick Industry to understand their operational activities, investment patterns, production capacity, employment generation, sources of finance, profitability and major challenges. These industries were selected as the units of investigation to obtain practical information about the functioning of the local brick industry.

TABLE-1

NAME OF THE BRICK MANUFACTURING FIRM	VALLEY BRICK INDUSTRY
Establishment Year	2007
Average Investment	₹20 Lakh
Sources of Funds for Operating Business	Partnership Capital
Permanent Labourers	107
Seasonal Labourers	85
Annual Expenditure on Labour Wages	₹12 Lakh
Total Production Capacity	40 Lakh Bricks
Average Actual Production	20 Lakh Bricks
Average Annual Expenditure	₹1.5 Crore
Average Annual Revenue and Net Return	Above ₹10 Lakh
Major Problem Affecting Investment, Production and Profitability	Rising Fuel and Raw Material Costs, Seasonal and Weather-Related Problems, Low Selling Prices or Market Demand
No. of Months of Brick Kiln Operate in a Year	4 Months
Major Raw Materials Used in Brick Manufacturing	Mud, Sand, Coal, Wood etc.
Source of Obtaining Raw Materials	Through Transportation
Channels of Selling Bricks	Directly to Consumers, Through Wholesalers, To Construction Contractors
Average Selling Price Per 1000 Bricks	₹9000
Measure to reduce Environmental Pollution and Manage Waste	Hydra Blower Fan
Technique of Brick Production	Multiple Chamber
Main Method Used for Moulding and Shaping Bricks	Both Manual and Machine Moulding

TABLE-2

NAME OF THE BRICK MANUFACTURING FIRM	DELUX BRICK INDUSTRY
Establishment Year	2017
Average Investment	Above ₹50 Lakh
Sources of Funds for Operating Business	Bank Loans
Permanent Labourers	6
Seasonal Labourers	60
Annual Expenditure on Labour Wages	₹360000
Total Production Capacity	Above 20 Lakh Bricks
Average Actual Production	15 Lakh Bricks
Average Annual Expenditure	₹65 Lakh
Average Annual Revenue and Net Return	₹10 Lakh
Major Problem Affecting Investment, Production and Profitability	Seasonal and Weather-Related Problems, Low Selling Prices or Market Demand
No. of Months of Brick Kiln Operate in a Year	4 Months
Major Raw Materials Used in Brick Manufacturing	Mud, Sand, Coal, Wood etc.
Source of Obtaining Raw Materials	Through Transportation
Channels of Selling Bricks	Directly to Consumers, Through Wholesalers
Average Selling Price Per 1000 Bricks	₹9000

Measure to reduce Environmental Pollution and Manage Waste	Hydra Blower Fan
Technique of Brick Production	Placed in a Single Place
Main Method Used for Moulding and Shaping Bricks	Manual Moulding (Hand-Moulded Bricks)

TABLE-3

NAME OF THE BRICK MANUFACTURING FIRM	SUNNY BRICK INDUSTRY
Establishment Year	2007
Average Investment	₹15 Lakh
Sources of Funds for Operating Business	Bank Loans
Permanent Labourers	20
Seasonal Labourers	40
Annual Expenditure on Labour Wages	₹5 Lakh
Total Production Capacity	Above 20 Lakh Bricks
Average Actual Production	10 Lakh Bricks
Average Annual Expenditure	₹80 Lakh
Average Annual Revenue and Net Return	₹30 Lakh
Major Problem Affecting Investment, Production and Profitability	Shortage or High Cost of Labour, Seasonal and Weather-Related Problems
No. of Months of Brick Kiln Operate in a Year	4 Months
Major Raw Materials Used in Brick Manufacturing	Mud, Sand, Coal, Wood etc.
Source of Obtaining Raw Materials	Through Transportation
Channels of Selling Bricks	Directly to Consumers, Through Wholesalers
Average Selling Price Per 1000 Bricks	₹9000
Measure to reduce Environmental Pollution and Manage Waste	Hydra Blower Fan
Technique of Brick Production	Different Chamber
Main Method Used for Moulding and Shaping Bricks	Manual Moulding (Hand-Moulded Bricks)

TABLE-4

NAME OF THE BRICK MANUFACTURING FIRM	STAR BRICK INDUSTRY
Establishment Year	2018
Average Investment	Above ₹20 Lakh
Sources of Funds for Operating Business	Own Capital, Bank Loans
Permanent Labourers	8
Seasonal Labourers	85
Annual Expenditure on Labour Wages	₹ 4 Lakh
Total Production Capacity	35 Lakh Bricks
Average Actual Production	Above 25 Lakh Bricks
Average Annual Expenditure	₹ 60 Lakh
Average Annual Revenue and Net Return	₹ 40 Lakh
Major Problem Affecting Investment, Production and Profitability	Seasonal and Weather-Related Problems, Low Selling Prices or Market Demand
No. of Months of Brick Kiln Operate in a Year	4 Months
Major Raw Materials Used in Brick Manufacturing	Mud, Sand, Coal, Wood etc.
Source of Obtaining Raw Materials	Through Transportation
Channels of Selling Bricks	Directly to Consumers, Through Wholesalers, To Construction Contractors
Average Selling Price Per 1000 Bricks	₹9000
Measure to reduce Environmental Pollution and Manage Waste	Hydra Blower Fan
Technique of Brick Production	Multiple Chamber
Main Method Used for Moulding and Shaping Bricks	Both Manual and Machine Moulding

TABLE-5

NAME OF THE BRICK MANUFACTURING FIRM	PAUL BRICK INDUSTRY
Establishment Year	2012
Average Investment	Above ₹ 30 Lakh
Sources of Funds for Operating Business	Own Savings, Informal Money Lenders
Permanent Labourers	5 to 10
Seasonal Labourers	40 to 80
Annual Expenditure on Labour Wages	Above ₹5 Lakh
Total Production Capacity	15 Lakh Bricks
Average Actual Production	12 Lakh Bricks
Average Annual Expenditure	₹15 Lakh
Average Annual Revenue and Net Return	₹4 Lakh
Major Problem Affecting Investment, Production and Profitability	High cost of coal/fuel, Irregular weather/unseasonal rainfall, Scarcity of local skilled labour, or High transportation costs.
No. of Months of Brick Kiln Operate in a Year	4 Months
Major Raw Materials Used in Brick Manufacturing	Mud, Sand, Coal, Wood etc.

Source of Obtaining Raw Materials	Through Transportation
Channels of Selling Bricks	Directly to Consumers, Through Wholesalers, To Construction Contractors
Average Selling Price Per 1000 Bricks	₹9000
Measure to reduce Environmental Pollution and Manage Waste	Hydra Blower Fan
Technique of Brick Production	Multiple Chamber
Main Method Used for Moulding and Shaping Bricks	Both Manual and Machine Moulding

XII. DATA ANALYSIS AND INTERPRETATION

Overview of the Five Sample Firms

Valley Brick Industry was established in 2007. It reports an average investment of Rs 20 lakh, financed through partnership capital. It has the largest permanent labour force in the sample (107) and 85 seasonal labourers. Annual labour-wage expenditure is Rs 12 lakh. Capacity is 40 lakh bricks with average actual production of 20 lakh bricks. Average annual expenditure is Rs 1.5 crore, with average annual revenue and net return reported as above Rs 10 lakh. Major problems include rising fuel and raw-material costs, seasonal and weather-related problems, and low selling prices or market demand. It uses multiple-chamber technique and both manual and machine moulding, and sells through direct, wholesale and contractor channels.

Delux Brick Industry (2017) is the most capital-intensive unit in the sample, with average investment above Rs 50 lakh, funded mainly by bank loans. It operates with only 6 permanent and 60 seasonal labourers. Capacity is above 20 lakh bricks; actual production averages 15 lakh. Annual expenditure is Rs 65 lakh and net return about Rs 10 lakh. Problems centre on seasonal and weather-related issues and low selling prices or market demand. Production is described as "placed in a single place," with purely manual (hand-moulded) bricks. Sales are direct and through wholesalers.

Sunny Brick Industry (2007) has a relatively modest investment of Rs 15 lakh (bank loans). It employs 20 permanent and 40 seasonal workers. Capacity is above 20 lakh bricks; actual output averages 10 lakh. Annual expenditure is Rs 80 lakh, while net return is reported at Rs 30 lakh—the second-highest in the sample. Problems include shortage or high cost of labour and seasonal and weather-related problems. Technique is "different chamber"; moulding is manual. Sales channels are direct and wholesale.

Star Brick Industry (2018) reports average investment above Rs 20 lakh from own capital and bank loans. Permanent labour is 8; seasonal labour 85. Capacity is 35 lakh bricks; actual production is above 25 lakh—the highest utilisation in the sample. Annual expenditure is Rs 60 lakh and net return Rs 40 lakh, the highest reported. Problems are seasonal and weather-related issues and low selling prices or market demand. It uses multiple-chamber technique and mixed moulding, and sells through all three channels (direct, wholesale, contractors).

Paul Brick Industry (2012) has average investment above Rs 30 lakh from own savings and informal money lenders. Permanent labour is 5–10; seasonal 40–80. Capacity is 15 lakh bricks; actual 12 lakh. Annual expenditure is only Rs 15 lakh, with net return Rs 4 lakh. It faces a wider set of problems including high cost of coal/fuel, irregular weather/unseasonal rainfall, scarcity of local skilled labour, and high transportation costs. Technique is multiple chamber; moulding is mixed. Sales channels include direct, wholesale and contractors.

A. INVESTMENT AND SOURCES OF FUNDS

Average investment across the five firms spans a wide range. Sunny reports the lowest figure at Rs 15 lakh, Valley Rs 20 lakh, Star "above Rs 20 lakh," Paul "above Rs 30 lakh," and Delux "above Rs 50 lakh." For comparative charts, conservative approximations of Rs 25 lakh (Star), Rs 35 lakh (Paul) and Rs 55 lakh (Delux) are used. The distribution shows that three of the five firms have investment at or below Rs 25–30 lakh, while one unit stands out as clearly larger.

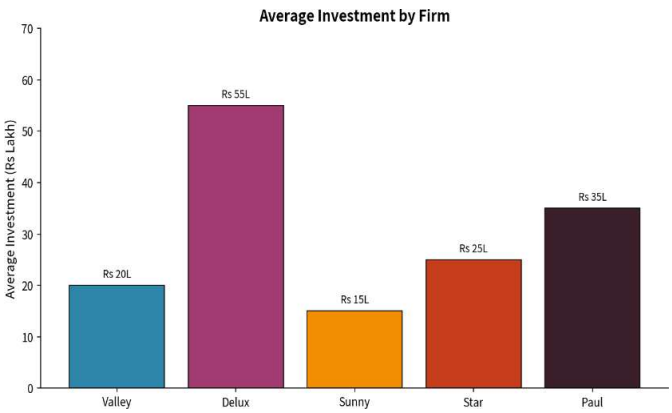


Figure 5.1: Average Investment by Firm (Rs Lakh)

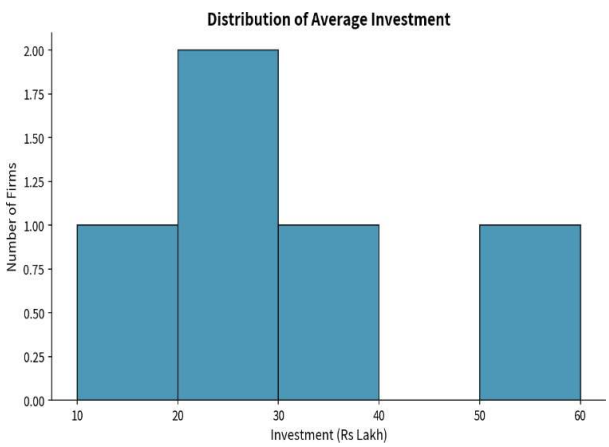


Figure 5.2: Histogram of Average Investment Distribution

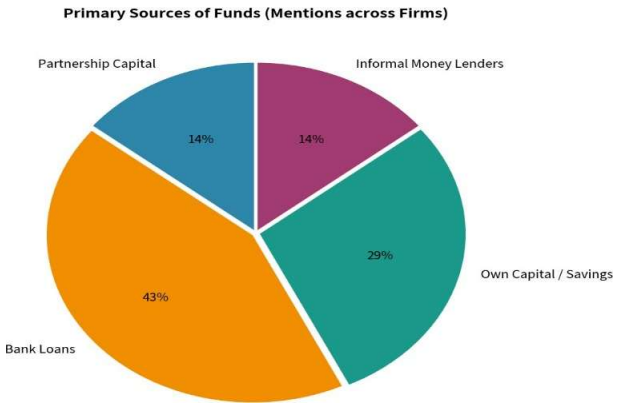


Figure 5.3: Primary Sources of Funds (Mentions across Firms)

Sources of funds vary. Valley relies on partnership capital. Delux and Sunny depend on bank loans. Star combines own capital with bank loans. Paul uses own savings and informal money lenders. Bank finance appears in three firms, indicating that formal credit is accessible to at least part of the cluster, while informal sources remain relevant for others. Partnership and own capital still play an important role, especially for older or smaller units.

Interpretation: The investment profile suggests a mixed cluster of small and medium units. Access to bank loans for newer and larger units (Delux, Sunny, Star) is a positive sign, but the continued presence of informal lenders for Paul indicates that not all operators find formal credit sufficient or accessible. Higher investment does not automatically translate into higher net return (compare Delux with Star and Sunny), which points to the importance of capacity utilisation, cost control and market access rather than capital size alone. The partnership structure of Valley may have supported a large permanent workforce, while bank-financed units show more variation in labour strategy.

B. LABOUR FORCE STRUCTURE AND WAGES

The labour structure is strongly dualistic. Valley employs 107 permanent and 85 seasonal workers—by far the largest permanent workforce. Delux has only 6 permanent against 60 seasonals. Sunny has 20 permanent and 40 seasonals. Star has 8 permanent and 85 seasonals. Paul reports ranges of 5–10 permanent and 40–80 seasonal. Seasonal labour therefore dominates the peak production period in most units, while permanent labour provides continuity for maintenance, management and off-season tasks.

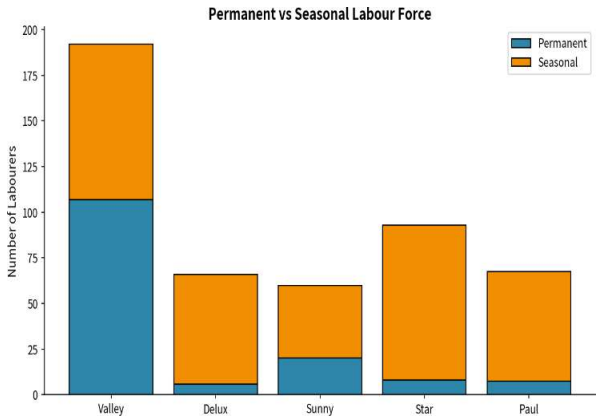


Figure 5.4: Permanent vs Seasonal Labour Force

Annual expenditure on labour wages ranges from Rs 3.6 lakh (Delux) to Rs 12 lakh (Valley). Sunny and Paul report around Rs 5–5.5 lakh; Star Rs 4 lakh. When approximate annual wage per labourer is computed (total wage bill divided by total permanent plus seasonal headcount), the intensity varies, reflecting differences in skill mix, days worked and wage rates. Valley's large permanent force raises its total wage bill substantially even if per-head cost is moderate.

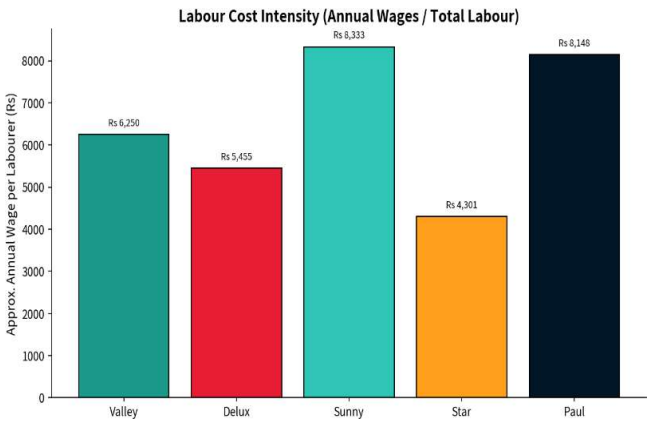


Figure 5.5: Approximate Annual Wage per Labourer

Interpretation: Heavy reliance on seasonal labour is rational given the four-month operating season, but it creates risks of skill shortage, recruitment difficulties and variable quality. Valley's large permanent base may support more consistent operations and knowledge retention, at the cost of higher fixed labour expenditure. Units with very small permanent staff (Delux, Star, Paul) are more exposed to seasonal labour-market fluctuations. Policies that improve skill availability and social security for seasonal brick workers would benefit the entire cluster. The data also suggest that wage bills are a significant but not dominant cost item compared with overall annual expenditure in the larger units, consistent with the importance of fuel and materials.

C. PRODUCTION CAPACITY, ACTUAL OUTPUT AND UTILISATION

Reported production capacity ranges from 15 lakh bricks (Paul) to 40 lakh bricks (Valley). Delux and Sunny report "above 20 lakh"; Star 35 lakh. Average actual production is lower in every case: Valley 20 lakh, Delux 15 lakh, Sunny 10 lakh, Star above 25 lakh, Paul 12 lakh. Capacity utilisation, computed from the figures used for charts, is approximately 50 per cent (Valley), 68 per cent (Delux), 45 per cent (Sunny), 77 per cent (Star) and 80 per cent (Paul).

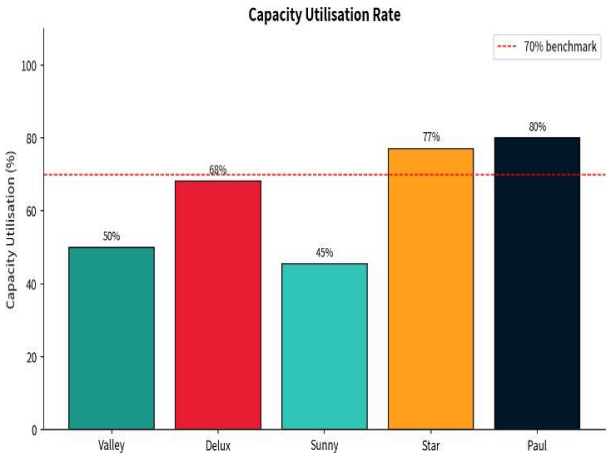


Figure 5.6: Production Capacity vs Actual Production

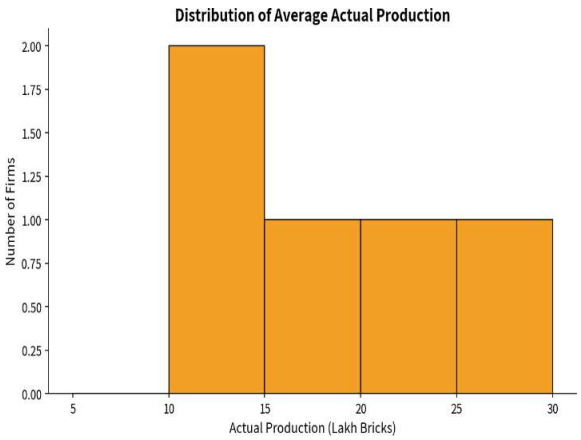


Figure 5.8: Histogram of Actual Production

Interpretation: Star and Paul achieve relatively high utilisation, while Sunny and Valley leave a large part of capacity idle. Under-utilisation may stem from demand constraints, fuel or weather interruptions, working-capital limits, or technical issues. High capacity that is only half used (Valley) implies that fixed costs are spread over a smaller output, squeezing margins. Improving utilisation—through better market linkages, more reliable fuel supply, or modest extension of the operating season—would raise both revenue and efficiency without necessarily requiring large new investment. The fact that a newer firm (Star) and a smaller-capacity firm (Paul) show higher utilisation suggests that scale alone does not determine efficiency; operational and market factors matter.

D. COST STRUCTURE, REVENUE AND PROFITABILITY INDICATORS

Average annual expenditure varies dramatically: Valley Rs 1.5 crore, Sunny Rs 80 lakh, Delux Rs 65 lakh, Star Rs 60 lakh, Paul only Rs 15 lakh. Reported average annual revenue and net return are: Valley above Rs 10 lakh, Delux Rs 10 lakh, Sunny Rs 30 lakh, Star Rs 40 lakh, Paul Rs 4 lakh. A rough profitability indicator—net return as a percentage of annual expenditure—shows Star and Sunny in a stronger position, while Valley's large expenditure base yields a low percentage return despite a non-trivial absolute net figure.

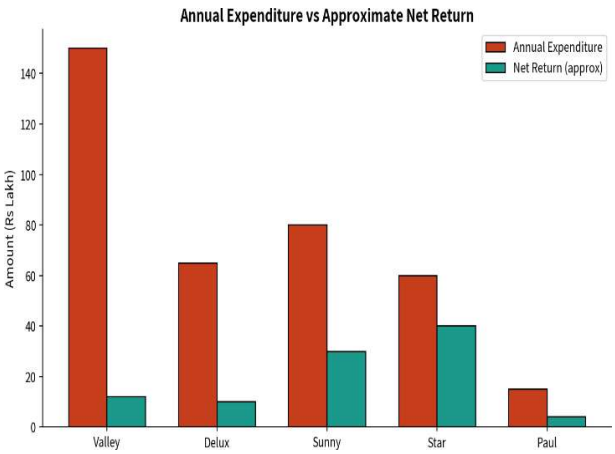


Figure 5.9: Annual Expenditure vs Approximate Net Return

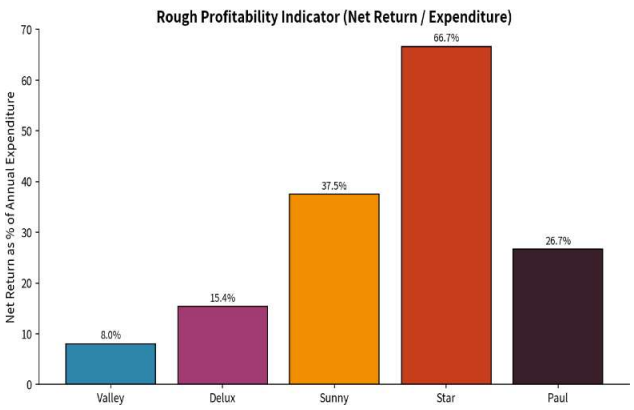


Figure 5.10: Net Return as Percentage of Annual Expenditure

Interpretation: Absolute scale of expenditure is not a reliable predictor of net return. Star combines high actual production with moderate expenditure and the highest reported net return. Sunny reports strong net return relative to its scale. Valley's high expenditure and only moderate net return suggest either higher input costs, lower effective realisation, or different accounting of what is included in "expenditure" and "net return." Paul's very low expenditure and low net return are consistent with a smaller operation facing multiple cost and labour constraints. These patterns underline the need for firm-level cost accounting and for interventions that raise utilisation and reduce fuel and transport costs. They also caution against assuming that larger investment or larger capacity automatically yields superior financial outcomes.

E. MARKETING CHANNELS AND PRICING

All five firms sell directly to consumers and through wholesalers. Three firms (Valley, Star, Paul) also sell to construction contractors. The average selling price per 1000 bricks is uniformly reported as Rs 9000. Uniform pricing may reflect a local market equilibrium or limited product differentiation. Dependence on direct and wholesale channels means that firms are exposed both to retail demand fluctuations and to the bargaining power of intermediaries.

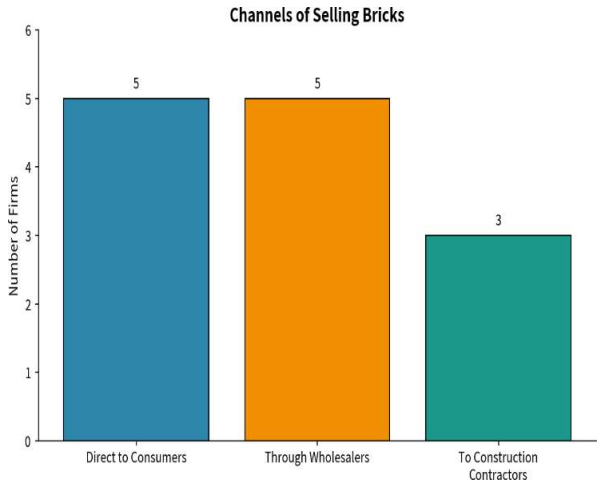


Figure 5.11: Channels of Selling Bricks

Interpretation: The absence of large institutional or government-contract channels in the reported data suggests that the cluster is oriented toward private residential and small commercial demand. Strengthening contractor linkages and exploring bulk supply arrangements for local infrastructure projects could improve demand stability. Price uniformity at Rs 9000 per 1000 bricks implies that competition is largely on volume, reliability and location rather than on price differentiation; quality grading and branding are potential areas for future development. The three firms that sell to contractors (Valley, Star, Paul) may enjoy somewhat more stable offtake; Star's high utilisation and net return are consistent with effective use of multiple channels.

F. TECHNOLOGY, MOULDING METHODS AND ENVIRONMENTAL MEASURES

Three firms (Valley, Star, Paul) use multiple-chamber technique; Delux reports production "placed in a single place"; Sunny uses "different chamber." Moulding is mixed (manual and machine) in Valley, Star and Paul, and purely manual (hand-moulded) in Delux and Sunny. All five firms report the use of Hydra Blower Fan as a measure to reduce environmental pollution and manage waste.

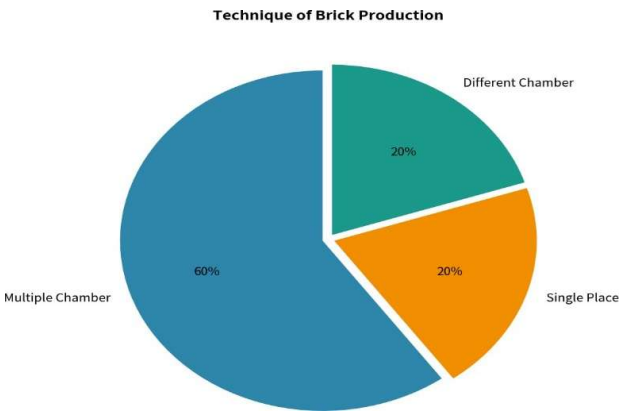


Figure 5.12: Technique of Brick Production

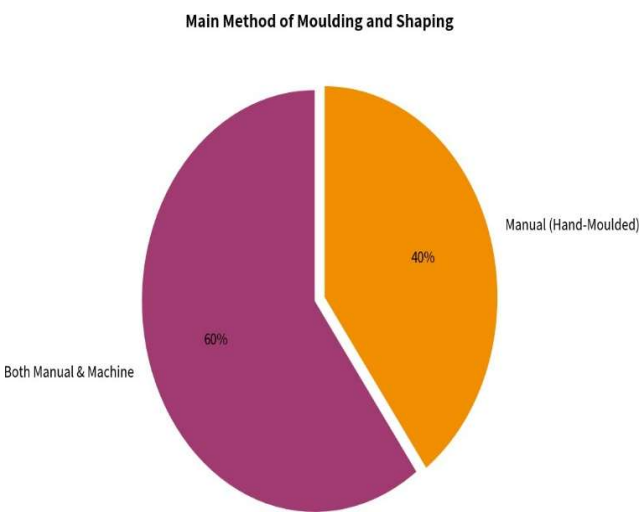


Figure 5.13: Main Method of Moulding and Shaping

Interpretation: Adoption of Hydra Blower Fan across the entire sample is a positive environmental signal and may reflect regulatory pressure as well as operational benefits (better draft and combustion). Multiple-chamber systems are associated with the larger or more diversified units. Persistence of hand-moulding in two firms indicates that labour-intensive methods remain viable, especially where capital for machinery is limited or where traditional quality is preferred by buyers. Gradual introduction of improved moulding equipment, combined with training, could raise productivity without fully displacing seasonal labour. The uniformity of the pollution-control measure is striking and suggests either a common regulatory requirement or a widely perceived operational advantage; either way, it provides a foundation for further environmental improvement.

G. OPERATING SEASON AND RAW MATERIAL BASE

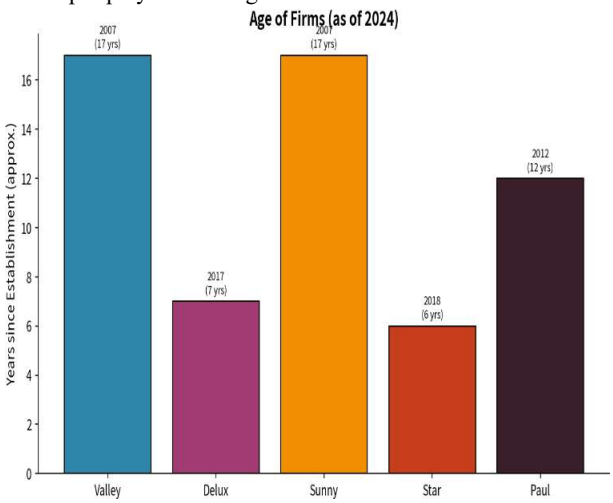
Every firm reports that the brick kiln operates for four months in a year. Major raw materials are mud, sand, coal and wood; all are obtained through transportation. The short season is the single most binding structural constraint: fixed costs and capital must be recovered from a limited production window, and weather disruptions within those four months have a disproportionate impact on annual output and profitability.

Interpretation: Extending the effective operating season—even by a few weeks—through better rain protection, improved kiln design, or alternative low-season products could significantly improve capacity utilisation and returns. Dependence on transported coal and wood exposes firms to fuel-price volatility and supply interruptions; exploration of agricultural-residue briquettes or other alternative fuels, where technically and environmentally suitable, is a relevant long-term option. Local availability of mud and sand is an advantage, but transport costs for fuel and for finished bricks remain a recurring burden, especially for units that reported high transportation costs as a major problem. The identity of raw-material sources across all firms points to a shared logistics and cost environment.

H. AGE PROFILE OF FIRMS

Valley and Sunny were established in 2007 (approximately 17 years of operation by 2024). Paul dates from 2012, Delux from 2017 and Star from 2018. The sample therefore includes both established and relatively new entrants. Newer firms (Delux, Star) show higher investment and, in Star's case, strong utilisation and net return, suggesting that recent entrants can still find viable positions in the local market.

Interpretation: Longevity does not by itself guarantee superior performance. Valley, one of the oldest, has high capacity but only moderate utilisation and net return relative to expenditure. Star, the newest, reports the highest net return and high utilisation. Entry after 2015–16 has been possible with bank or mixed finance, indicating that the industry has not been closed to new capital. At the same time, the survival of older units shows that the market continues to support multiple players. The age distribution is therefore consistent



with a still-active, if constrained, local industry.

I. CROSS-CUTTING COMPARATIVE INSIGHTS

Several cross-cutting observations emerge from the preceding sections. First, performance (utilisation and net return) is not monotonically related to investment size or to age. Second, the four-month season and weather-related problems are binding for all, so any firm-level advantage must be sought within that constraint. Third, labour strategy varies sharply—from Valley's large permanent force to the minimal permanent staff of Delux, Star and Paul—with implications for fixed cost and flexibility. Fourth, environmental practice (Hydra Blower Fan) is already uniform, so differentiation on this dimension is limited. Fifth, marketing channel diversity (especially contractor sales) appears associated with better offtake for some firms. These insights inform the discussion of challenges and the design of recommendations in the following chapters.

J. OVERVIEW OF REPORTED PROBLEMS

The firms were asked about major problems affecting investment, production and profitability. The responses, grouped into broad categories, show a clear hierarchy of constraints.

Seasonal and weather-related problems are reported by all five firms. Low selling prices or market demand are cited by three (Valley, Delux, Star). Rising fuel and raw-material costs appear for Valley and Paul (high cost of coal/fuel). Labour-related difficulties—shortage or high cost of labour, scarcity of local skilled labour—are reported by Sunny and Paul. High transportation costs are specifically mentioned by Paul. Valley additionally notes rising fuel and raw-material costs together with seasonal and price problems.

This frequency ranking is important for prioritisation. A constraint that affects every firm (seasonality and weather) deserves collective and policy attention. Constraints that affect a subset may be more amenable to firm-level or targeted interventions. The following subsections examine each major challenge in turn.

K. SEASONAL AND WEATHER-RELATED PROBLEMS

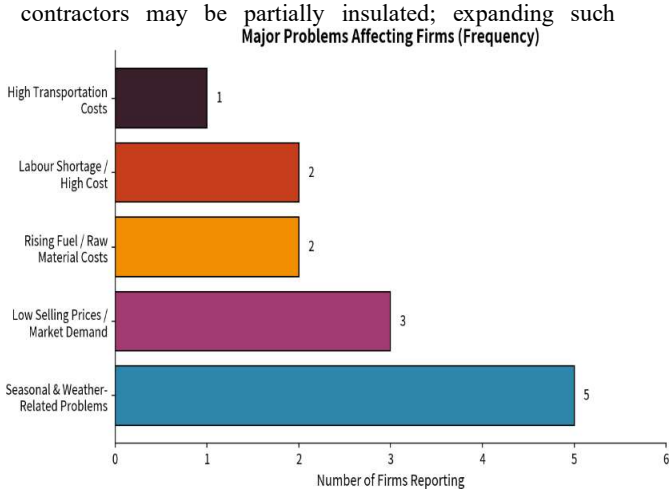
The universal four-month operating season and the explicit mention of seasonal and weather-related problems by every firm make this the central challenge. Heavy rainfall, unseasonal showers and humidity disrupt drying of green bricks, delay firing schedules and can damage stock. Because the production window is already short, any interruption translates quickly into lost annual output. Climate variability may be intensifying this risk.

Without investments in covered drying areas, improved kiln designs or alternative scheduling, firms will remain highly vulnerable to weather shocks. The data do not allow quantification of output lost to weather in a given year, but the consistency of the complaint across firms of different sizes and ages indicates that this is a structural rather than a firm-specific issue. Addressing it would improve utilisation and returns for the cluster as a whole.

L. MARKET DEMAND AND SELLING PRICES

Three firms report low selling prices or weak market demand as a major problem. The uniform price of Rs 9000 per 1000 bricks suggests limited ability to pass on cost increases. Demand for bricks is derived from construction activity, which itself fluctuates with income, credit conditions and public investment. In a small local market, over-capacity in peak periods can depress realisations.

Strengthening market information, diversifying buyer segments (including institutional buyers) and improving quality consistency could help stabilise demand and support better prices. The firms that already sell to construction contractors may be partially insulated; expanding such



linkages for the remaining firms is a practical step. In the longer run, quality grading and modest branding could create room for price differentiation, though this would require collective or support-agency effort given the small scale of individual units.

M. FUEL AND RAW-MATERIAL COSTS

Coal and wood are essential fuels. Rising or high fuel costs are highlighted by Valley and Paul. Fuel often constitutes a large share of variable cost in brick production. Price spikes or supply disruptions directly compress margins and can force temporary shutdowns. Dependence on transported coal also adds logistics cost and uncertainty.

Transition toward more efficient kilns and, where feasible, alternative fuels is both an economic and an environmental priority. Even incremental improvements in combustion efficiency (to which the Hydra Blower Fan may already contribute) can reduce specific fuel consumption. Cooperative or bulk procurement of coal, where organisationally feasible, could improve bargaining power. Monitoring of fuel-price trends and building of limited buffer stocks within working-capital constraints are managerial practices that larger or better-financed units may already use and that others could adopt.

N. LABOUR ISSUS

Sunny reports shortage or high cost of labour; Paul reports scarcity of local skilled labour. The dualistic labour structure means that peak-season recruitment is critical. Competition with agriculture and with other local employers, migration patterns, and the physically demanding nature of kiln work can create shortages. Skill gaps in moulding and firing affect quality and efficiency.

Improving working conditions, timely wage payment and basic skill training can help retain workers and reduce turnover. Formalisation of seasonal contracts, where

acceptable to both parties, and linkage to available social-security schemes could improve the attractiveness of kiln work. For firms with very small permanent staff, the risk of losing key skilled seasonal workers is particularly high; retention strategies are therefore especially important for Delux, Star and Paul.

O. TRANSPORTATION COSTS

Paul explicitly lists high transportation costs among major problems. Raw materials and finished bricks both move by road. Poor road conditions, rising diesel prices and distance from coal sources or from major demand centres raise unit costs. Collective arrangements for transport, better local road maintenance and location decisions that minimise haulage can mitigate this constraint.

Although only one firm listed transportation as a major problem, the universal reliance on transportation for raw materials implies that logistics costs affect all units. Firms closer to demand centres or with better road access may enjoy a cost advantage that is not separately quantified in the data. Infrastructure improvement is therefore a public-good intervention that would benefit the entire cluster.

P. INTERLINKED NATURE OF CHALLENGES

These challenges are interlinked. Weather interruptions reduce effective capacity utilisation; low utilisation raises average cost; high fuel and transport costs further squeeze margins; low prices limit the ability to invest in weather-resilient infrastructure or cleaner technology; labour shortages can reduce quality and output within the already short season. Addressing any single constraint in isolation is therefore less effective than a coordinated approach that combines technology, market, finance and labour measures.

The comparative data also show that firms under the same broad constraints can still achieve different levels of utilisation and net return. This residual variation points to the role of management, market relationships and possibly technical practice. Recommendations in the next chapter therefore address both the common structural constraints and the firm-level practices that appear associated with better performance.

XIII. COMPARATIVE DATA SUMMARY TABLES

Table A.1: Establishment, Investment and Funds

Indicator	Valley	Delux	Sunny	Star	Paul
Establishment Year	2007	2017	2007	2018	2012
Avg. Investment	Rs 20 Lakh	Above Rs 50 Lakh	Rs 15 Lakh	Above Rs 20 Lakh	Above Rs 30 Lakh
Sources of Funds	Partnership Capital	Bank Loans	Bank Loans	Own Capital, Bank Loans	Own Savings, Informal Lenders

Table A.2: Labour and Wages

Indicator	Valley	Delux	Sunny	Star	Paul
Permanent Labourers	107	6	20	8	5 to 10
Seasonal Labourers	85	60	40	85	40 to 80
Annual Labour Wages	Rs 12 Lakh	Rs 3.6 Lakh	Rs 5 Lakh	Rs 4 Lakh	Above Rs 5 Lakh

Table A.3: Production, Expenditure and Return

Indicator	Valley	Delux	Sunny	Star	Paul
Total Capacity	40 Lakh	Above 20 Lakh	Above 20 Lakh	35 Lakh	15 Lakh
Actual Production	20 Lakh	15 Lakh	10 Lakh	Above 25 Lakh	12 Lakh
Annual Expenditure	Rs 1.5 Crore	Rs 65 Lakh	Rs 80 Lakh	Rs 60 Lakh	Rs 15 Lakh
Revenue / Net Return	Above Rs 10 Lakh	Rs 10 Lakh	Rs 30 Lakh	Rs 40 Lakh	Rs 4 Lakh

Table A.4: Operations, Technology and Marketing

Indicator	Valley	Delux	Sunny	Star	Paul
Months of Operation	4	4	4	4	4
Avg. Price / 1000	Rs 9000	Rs 9000	Rs 9000	Rs 9000	Rs 9000
Pollution Measure	Hydra Blower Fan	Hydra Blower Fan	Hydra Blower Fan	Hydra Blower Fan	Hydra Blower Fan
Technique	Multiple Chamber	Single Place	Different Chamber	Multiple Chamber	Multiple Chamber

Moulding Method	Manual + Machine	Manual (Hand)	Manual (Hand)	Manual + Machine	Manual + Machine

Table A.5: Major Problems Reported (by Firm)

Indicator	Valley	Delux	Sunny	Star	Paul
Seasonal / Weather	Yes	Yes	Yes	Yes	Yes
Low Price / Demand	Yes	Yes	—	Yes	—
Fuel / Raw Material Cost	Yes	—	—	—	Yes
Labour Shortage / Cost	—	—	Yes	—	Yes
High Transport Cost	—	—	—	—	Yes

XIV. PROBLEMS ASSOCIATED WITH BRICKS INDUSTRY

The brick industry plays an important role in meeting the demand for construction materials in South Karimganj Development Block, Sribhumi district. However, brick manufacturing units may face several economic, technological, environmental and labour-related problems. The following points explain the major problems of the brick industry in the area.

1. Shortage and Rising Cost of Raw Materials: The brick industry depends heavily on suitable clay, water and other essential raw materials. Brick manufacturers in South Karimganj Development Block may face difficulties in obtaining good-quality clay at reasonable prices. Increasing transportation and extraction costs can raise production expenses and reduce the profitability of brick kilns.

2. High Cost of Fuel: Fuel is essential for burning bricks and maintaining the required temperature inside kilns. Rising prices of coal, firewood and other fuels increase the overall cost of production. Small brick manufacturers often struggle to manage these expenses, particularly when selling prices cannot be increased proportionately.

3. Seasonal Nature of Production: Brick manufacturing is highly dependent on weather conditions, especially during drying and firing. Heavy rainfall during the monsoon can interrupt production, damage unfired bricks and reduce working days. Consequently, brick kiln owners may experience irregular income, underutilisation of facilities and difficulties in meeting market demand.

4. Shortage of Skilled Labour: The brick industry requires workers with practical knowledge of moulding, drying, kiln operation and brick firing. However, some brick kilns may experience shortages of experienced workers. Limited training opportunities and migration to alternative employment can affect productivity, product quality and the timely completion of production.

5. Low Wages and Labour Problems: Brick kiln workers generally perform physically demanding tasks under difficult working conditions. Inadequate wages, irregular payments and limited employment security can create dissatisfaction among workers. These problems may contribute to labour shortages, reduced productivity and difficulties in maintaining a stable workforce throughout the production season.

6. Traditional Production Technology: Many small brick manufacturing units depend on traditional methods of moulding, drying and firing. Limited adoption of modern machinery and energy-efficient kiln technology can result in higher fuel consumption, uneven brick quality and lower productivity. Financial constraints often prevent small producers from investing in technological improvements.

7. Environmental Pollution: Brick kilns can release smoke, particulate matter and other pollutants during the firing process. Improper fuel use and inefficient kiln designs may worsen local air quality. Such pollution can affect nearby residents, agricultural activities and workers, making environmental management an important challenge for the brick industry.

8. Heavy Rainfall and Flooding: Sribhumi district experiences substantial monsoon rainfall, and some locations may be vulnerable to waterlogging or flooding. Excessive water can damage clay deposits, destroy freshly moulded bricks and interrupt transportation. These weather-related disruptions can cause financial losses and increase uncertainty for brick manufacturers.

9. Inadequate Transportation Facilities: Transportation is essential for bringing raw materials to kilns and delivering finished bricks to construction sites. Poor road conditions, high vehicle-hiring charges and longer travel distances can increase operational costs. During heavy rainfall, transportation difficulties may become more serious, delaying deliveries and reducing the competitiveness of local producers.

10. Limited Access to Finance: Small brick kiln owners may find it difficult to obtain adequate institutional credit for purchasing raw materials, machinery and fuel. Limited financial resources restrict business expansion and technological modernisation. High borrowing costs and seasonal cash-flow problems can further increase financial pressure on manufacturers, particularly smaller enterprises.

XV. ENVIRONMENTAL ISSUES AND CHALLENGES ASSOCIATED WITH THE BRICK INDUSTRY

The brick industry plays an important role in the construction sector by providing essential building materials and generating employment for rural and semi-urban populations. However, traditional brick manufacturing creates several environmental problems, particularly through the extraction of clay, burning of fuel, and emission of pollutants. These issues are relevant to the study of the brick industry in South Karimganj Development Block.

Major Environmental Issues and Challenges

1. Air Pollution: Traditional brick kilns release smoke, particulate matter, and harmful gases during the firing process. These emissions deteriorate air quality and may cause respiratory problems among workers and nearby residents.

2. Greenhouse Gas Emissions: The burning of coal, firewood, and other fuels releases carbon dioxide into the atmosphere. These emissions contribute to global warming and increase the environmental footprint of brick production.

3. Soil Degradation: The removal of fertile topsoil for brick manufacturing reduces soil fertility and damages agricultural land. Excessive clay extraction can also disturb the natural structure of the land and reduce its productivity.

4. Deforestation: Some brick kilns use firewood as a source of fuel. Where wood is harvested unsustainably, this practice contributes to forest degradation, loss of biodiversity, and reduced availability of natural resources.

5. Water Pollution: Brick manufacturing and associated activities may cause sediment and soil runoff into nearby water bodies. Poorly managed waste and fuel residues can also contaminate local water sources.

6. High Energy Consumption: Traditional kilns often use energy inefficiently, requiring large quantities of fuel to produce bricks. This increases production costs, resource consumption, and pollution.

7. Dust Pollution: Dust generated during clay extraction, moulding, handling, and transportation can affect workers and nearby communities. Prolonged exposure to airborne dust may cause respiratory irritation and other health problems.

8. Loss of Biodiversity: Land excavation, smoke, and habitat disturbance can affect plants, insects, birds, and other organisms. The conversion of natural or agricultural areas into industrial sites may reduce local biodiversity and disturb ecological balance.

9. Occupational Health Hazards: Workers may experience prolonged exposure to heat, smoke, dust, and hazardous working conditions. Without appropriate protective equipment, ventilation, and health monitoring, these conditions can increase occupational health risks.

10. Noise Pollution: Machinery, earth-moving equipment, and trucks transporting clay and finished bricks generate noise. Continuous exposure can disturb nearby residents and affect workers' comfort, particularly where kilns operate close to settlements.

11. Land Degradation and Unused Ash: Improper disposal of kiln ash, broken bricks, and other waste can degrade land and create local pollution. Poor waste management also reduces the scope for recycling materials and maintaining a clean production site.

12. Agricultural Productivity Loss: Removing fertile topsoil reduces the quality of agricultural land and can adversely affect crop production. Dust deposition and other pollution may also affect nearby vegetation, creating additional difficulties for farming communities.

XVI. FUTURE PROSPECTS

1. Ensuring Adequate Supply of Raw Materials: Brick manufacturers should ensure a regular supply of good-quality clay and other essential raw materials at reasonable prices. Scientific clay extraction, proper storage and efficient utilisation of available resources can reduce wastage, control production costs and maintain the continuous operation of brick kilns.

2. Reducing Fuel Costs: Brick kiln owners should adopt energy-efficient technologies and improved firing methods to reduce fuel consumption. The use of suitable, legally permitted fuels and regular maintenance of kiln equipment can lower production expenses. Government assistance and technical guidance can encourage small manufacturers to introduce fuel-saving technologies.

3. Improving Seasonal Production Planning: Brick manufacturers should prepare production schedules according to local weather conditions, particularly the monsoon season. Producing and drying bricks during favourable weather, maintaining covered storage facilities and protecting unfired bricks from rainfall can reduce losses and ensure a more reliable supply throughout the year.

4. Providing Skilled Labour Training: Training programmes should be organised for workers involved in brick moulding, drying, firing and kiln management. Technical training can improve production efficiency, reduce wastage and maintain uniform brick quality. Government departments and industry associations should support skill development and encourage workers to adopt safer working practices.

5. Improving Wages and Working Conditions: Brick kiln owners should provide fair wages, timely payments, safe drinking water, sanitation facilities and appropriate protective equipment. Compliance with applicable labour laws and social security provisions can improve workers' welfare. Better working conditions can also reduce labour turnover, strengthen productivity and promote stable employment.

6. Adopting Modern Production Technology: Brick manufacturers should gradually introduce improved kiln designs, efficient machinery and suitable mechanised production methods. Modern technology can reduce fuel consumption, improve the quality of finished bricks and increase productivity. Financial assistance, technical training and access to affordable equipment can help small-scale manufacturers modernise their operations.

7. Controlling Environmental Pollution: Brick kiln operators should adopt cleaner production methods, maintain proper combustion systems and install appropriate pollution-control equipment wherever required. Regular monitoring of emissions and compliance with environmental regulations can reduce air pollution. Promoting energy-efficient kilns can protect public health while supporting environmentally responsible industrial development.

8. Developing Flood and Rain Protection Measures: Manufacturers should identify flood-prone locations carefully and improve drainage around brick kilns. Covered drying areas, raised storage platforms and protective arrangements for unfired bricks can minimise rainfall-related losses. Proper disaster preparedness and seasonal planning can help maintain production and reduce financial damage during extreme weather.

9. Improving Transportation Infrastructure: The government should improve rural roads, drainage systems and connectivity between brick kilns, raw-material sources and construction markets. Better transportation facilities can reduce delivery delays, vehicle maintenance expenses and material losses. Improved road connectivity would also help local manufacturers reach a wider market within and beyond Sribhumi district.

XVII. GOVERNMENT INITIATIVES

Government initiatives can improve the condition of the industry through financial assistance, cleaner production technologies, environmental regulation, skill development, infrastructure improvement and social-security measures. Some relevant schemes are already available nationally or in Assam, while other measures discussed below are recommendations that could be implemented specifically in South Karimganj. The existence of a scheme does not automatically mean that every brick manufacturer in the development block has received its benefits.

1. Implementation of Assam Brick Kilns Establishment and Regulation Rules, 2013

The Government of Assam can improve the brick industry by enforcing the Assam Brick Kilns Establishment and Regulation Rules, 2013. These rules regulate kiln location, land suitability, raw-material sources and pollution-control requirements. In South Karimganj, the Pollution Control Board, Assam, and relevant district authorities should help manufacturers understand the rules, complete required procedures and operate legally while protecting nearby communities and natural resources.

2. Financial Assistance through the Prime Minister's Employment Generation Programme

The Prime Minister's Employment Generation Programme (PMEGP) provides credit-linked subsidies for eligible new micro-enterprises. Brick entrepreneurs in South Karimganj may explore this programme through the District Industries and Commerce Centre, banks and implementing agencies, subject to the scheme's eligibility conditions and current guidelines. Financial support can help eligible entrepreneurs establish or expand manufacturing facilities, purchase equipment, generate employment and strengthen the local construction-materials sector.

3. Affordable Business Loans under the Pradhan Mantri MUDRA Yojana

The Pradhan Mantri MUDRA Yojana supports eligible micro-enterprises through loans offered by participating financial institutions. Brick manufacturers in South Karimganj could explore this facility to finance working capital, purchase tools, improve transportation arrangements or upgrade small production operations. Local banks should provide clear information about loan categories, documentation, repayment obligations and eligibility. Access to suitable finance can reduce dependence on informal borrowing and help businesses manage seasonal cash-flow difficulties.

4. Credit Guarantees for Eligible Small Brick Enterprises

The Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE) supports eligible lending to micro and small enterprises through credit guarantees to participating lenders. The government can improve awareness of this mechanism among brick entrepreneurs in South Karimganj so that eligible businesses can approach banks for loans without necessarily providing conventional collateral. Approval is not automatic, and the enterprise and proposed loan must meet applicable eligibility requirements.

5. Energy-Efficient Technology through the ADEETIE Scheme

The Assistance in Deploying Energy-Efficient Technologies in Industries and Establishments (ADEETIE) scheme of the Bureau of Energy Efficiency includes eligible brick-sector MSMEs in identified energy-intensive clusters. Under the scheme, eligible Udyam-registered enterprises may obtain interest-subvention support for qualifying energy-efficiency investments during its implementation period. Authorities should assess whether brick units in South Karimganj qualify geographically and technically, enabling suitable manufacturers to explore modern kilns and energy-saving improvements.

6. Promotion of Zigzag Kiln Technology

The government should encourage eligible brick manufacturers to adopt improved zigzag kiln technology wherever technically appropriate. Better combustion and more uniform heat distribution can reduce fuel consumption and improve brick quality when kilns are correctly designed and operated. In South Karimganj, technical demonstrations, engineering advice and financial assistance could help manufacturers assess the costs and benefits of upgrading traditional kilns. Any conversion must comply with applicable pollution-control permissions and standards.

7. Pollution-Control Assistance from the Pollution Control Board, Assam

The Pollution Control Board, Assam, can support the industry by explaining consent requirements, emission standards,

monitoring procedures and pollution-control measures. In South Karimganj, periodic awareness camps and technical visits could help manufacturers identify compliance gaps and make practical improvements. Guidance should cover stack requirements, dust control, fuel efficiency and environmental monitoring. Such assistance can reduce preventable violations while encouraging responsible production and protecting the health of workers and nearby residents.

8. Support for Alternative and Fly-Ash Bricks

Government agencies can promote suitable alternatives to conventional burnt-clay bricks, including fly-ash bricks and other approved masonry products. Training, demonstrations and information on quality standards can help entrepreneurs assess whether alternative products are commercially viable in South Karimganj. These materials may reduce dependence on agricultural topsoil when manufactured with appropriate inputs. Authorities should also encourage quality testing and responsible sourcing to ensure that alternative bricks meet relevant construction requirements.

9. Training Programmes for Brick-Kiln Workers

The government can arrange practical training programmes for workers involved in clay preparation, moulding, drying, firing, equipment operation and brick stacking. Skill-development agencies and technical institutions could conduct local sessions in South Karimganj, focusing on safer working practices, consistent product quality and efficient use of fuel. Training can increase workers' productivity and employability while helping owners reduce wastage. Programmes should accommodate seasonal workers and use languages participants understand.

10. Registration of Workers through the e-Shram Portal

The e-Shram portal creates a national database of eligible unorganised workers and helps connect them with relevant social-security programmes. Authorities can organise registration camps in South Karimganj to assist eligible brick-kiln labourers with registration and information about applicable benefits. Registration alone does not guarantee a particular benefit, so officials should also explain eligibility conditions, required documents and available welfare programmes to workers and their families.

XVIII. FINDINGS

1. Differences in Investment Patterns: The study reveals considerable differences in the investment levels of the three selected brick industries. Valley Brick Industry invested approximately ₹20 lakh, Delux Brick Industry invested more than ₹50 lakh, and Sunny Brick Industry invested approximately ₹15 lakh. These differences indicate variations in capital requirements and business scale.

2. Variation in Annual Brick Production: The production data show that Valley Brick Industry reported annual production of approximately 20 lakh bricks, followed by Delux Brick Industry with 15 lakh bricks and Sunny Brick Industry with 10 lakh bricks. This indicates differences in production volume among the selected industries.

3. Employment Generation: The selected brick industries provide employment to both permanent and seasonal workers. Valley Brick Industry reported 107 permanent and 85 seasonal workers, Delux Brick Industry reported 6 permanent and 60 seasonal workers, and Sunny Brick Industry reported 20 permanent and 40 seasonal workers. Thus, the industry contributes to local employment opportunities.

4. Differences in Establishment Periods: Valley Brick Industry and Sunny Brick Industry were established in 2007, whereas Delux Brick Industry was established in 2017. This indicates that the selected industries have different operating histories and levels of business experience, which may influence their production practices and business development.

5. Variation in Operating Expenditure: The reported expenditure differs substantially among the three industries. Valley Brick Industry reported approximately ₹1.5 crore, Delux Brick Industry ₹65 lakh, and Sunny Brick Industry ₹80 lakh. These figures highlight the importance of controlling operating costs and comparing expenditure with sales revenue and production.

6. Importance of Labour in Brick Manufacturing: The employment figures demonstrate that brick manufacturing depends on a workforce that includes both permanent and seasonal labourers. Seasonal workers represent a substantial component of employment in the surveyed industries, making workforce availability and appropriate labour management important for maintaining production activities.

7. Differences in Industrial Scale and Operations: The variations in investment, production, expenditure, and employment suggest that the three brick industries operate at different scales or under different production arrangements. Consequently, their financial requirements, labour-management practices, and opportunities for technological improvement may also differ.

8. Need for Better Financial Management: The differences in investment and expenditure indicate the importance of maintaining systematic financial records. Proper documentation of production costs, wages, fuel expenses, transportation costs, sales revenue, and net profit would help industry owners assess profitability and make informed business decisions.

9. Importance of Technological Improvement: The study highlights the need to consider production efficiency and cleaner manufacturing methods. Appropriate technological improvements may help reduce fuel consumption, improve product quality, minimise production losses, and address environmental concerns associated with conventional brick manufacturing.

10. Scope for Future Development: The existence of three brick industries with different investment and production characteristics indicates scope for further development in the study area. Better financial support, improved technology, skilled labour, market linkages, and environmental management could strengthen the long-term sustainability of these enterprises.

XIX. CONCLUSION

In conclusion, the empirical study demonstrates that the brick industry is an important part of the local productive economy of South Karimganj Development Block, Sribhumi district, Assam. The five surveyed industries—Valley Brick Industry, Delux Brick Industry, Star Brick Industry, Paul Brick Industry and Sunny Brick Industry—differ in their establishment history, investment, production, employment, and reported expenditure. These differences demonstrate that brick manufacturing in the study area is not uniform and that each industry has its own operational requirements and development challenges.

The study also establishes the importance of brick manufacturing as a source of employment and as a supplier of essential construction materials to the local economy. At the same time, the industry's continued development depends on managing production costs, maintaining an adequate labour force, improving access to finance, strengthening marketing arrangements, and adopting environmentally responsible manufacturing practices.

The findings suggest that the long-term development of the brick industry requires cooperation among industry owners, workers, financial institutions, government departments, and other relevant stakeholders. Appropriate technological improvements, better business management, skill development, and targeted institutional support can help improve the industry's competitiveness and resilience.

Ultimately, the future outlook for the brick industry in South Karimganj Development Block is promising if its economic contribution can be strengthened through efficient production, sustainable practices, and appropriate institutional support. The study concludes that addressing the industry's existing challenges is essential not only for the growth of individual brick enterprises but also for employment generation, construction-sector development, and the broader economic progress of the study area.

XX. SUGGESTIONS/RECOMMENDATIONS

1. Expansion of the Sample Size: Future surveys should cover a larger number of brick industries of South Karimganj Development Block. A larger sample would provide a broader understanding of the industry's economic conditions, operational difficulties, and development prospects.

2. Regular Collection of Primary Data: Future researchers should conduct surveys at regular intervals to identify changes in investment, production, employment, operating expenditure, and sales revenue. Comparing data across different years would help reveal trends and changes in the performance of the brick industry.

3. Detailed Financial Investigation: Future surveys should collect detailed information about fixed investment, working capital, production costs, selling prices, total revenue, and net profit. This would enable researchers to calculate profitability ratios and compare the financial performance of different brick industries more accurately.

4. Assessment of Labour Conditions: Future surveys should examine wages, working hours, employment security, seasonal migration, occupational safety, and access to welfare facilities. Interviews with both permanent and seasonal workers would help researchers understand labour-related challenges and identify opportunities to improve working conditions.

5. Investigation of Environmental Impacts: Future researchers should examine smoke emissions, fuel consumption, dust pollution, soil use, and other environmental concerns associated with brick manufacturing. Where feasible, field observations and appropriate environmental measurements should complement questionnaire responses to provide more reliable evidence.

6. Study of Technology and Kiln Efficiency: Future surveys should collect detailed information about kiln capacity, kiln technology, actual production, fuel requirements, and the proportion of defective bricks. Comparing traditional and improved production methods could help identify opportunities to increase efficiency and reduce environmental impacts.

7. Analysis of Market Demand and Pricing: Future research should investigate the demand for bricks, seasonal fluctuations in sales, selling prices, transportation costs, competition, and customer preferences. Information from builders, contractors, retailers, and construction workers would provide a more comprehensive understanding of the local brick market.

8. Evaluation of Government Schemes and Institutional Support: Future surveys should investigate whether brick manufacturers have access to bank loans, government assistance, technical training, insurance, and relevant environmental guidance. Researchers should also examine the barriers that prevent eligible industries from obtaining available institutional support.

9. Comparative Study of Brick Industries: Future researchers should compare brick industries across different villages and development blocks of Sribhumi district. Such comparisons could identify differences in investment, production capacity, employment, profitability, technology, and business challenges, helping policymakers develop area-specific strategies.

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