



# Technology and Socio-Economic Change in Kerala's Coir Industry

Dr. Pratheesh P<sup>\*</sup>

## Abstract

The coir industry has historically played a significant role in the economic and social life of Kerala, particularly in coastal regions such as Alappuzha where coconut cultivation and fibre extraction formed the basis of a labour-intensive traditional industry. Over the past several decades, however, the sector has undergone notable transformations driven by technological innovation, mechanisation, market expansion and changing labour dynamics. This article examines the relationship between technological change and socio-economic transformation in Kerala's coir industry, with particular attention to its implications for labour structures, employment patterns and local livelihoods. Drawing on secondary data from government reports, industry statistics and existing scholarly studies, the article analyses how technological modernization has reshaped production processes, altered traditional occupational practices and influenced the socio-economic conditions of workers associated with the industry. While technological developments have improved productivity, facilitated product diversification and strengthened the export potential of the sector, they have also introduced structural adjustments in labour participation and traditional production systems. The study suggests that technological change has produced a complex pattern of transformation within the coir industry, combining industrial growth with significant shifts in employment patterns and community livelihoods. Understanding these dynamics is essential for developing policy approaches that balance technological advancement with sustainable labour and socio-economic development in traditional industries.

**Keywords:** Coir Industry; Technological Change; Socio-Economic Transformation; Labour Dynamics; Traditional Industries; Kerala Economy

## 1. Introduction

Traditional industries have long played an important role in shaping the economic and social landscape of many regions in India. Among these, the coir industry occupies a distinctive position as one of the oldest agro-based cottage industries in the country. Derived from the fibrous husk of coconut, coir has historically been used for the production of ropes, mats, carpets and a wide variety of household and industrial products. India remains the world's leading producer of coir fibre and coir-based products, and the industry continues to provide livelihood opportunities for large numbers of workers in rural and coastal regions (Kulkarni, 2019; Coir Board, 2021). Within India, Kerala—particularly the Alappuzha–Cherthala belt—emerged as the historical centre of coir production due to the availability of coconut resources, favourable ecological conditions and the development of specialised labour skills within coastal communities (Isaac et al., 1992; Kamath, 2009).

The development of the coir industry in Kerala dates back to the nineteenth century when European commercial interests recognised the export potential of coir products. The establishment of early factories and export networks in Alappuzha transformed the region into a major global centre for coir manufacturing. Over time,

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<sup>\*</sup> Assistant Professor, St. Michael's College, Mayithara P.O., Cherthala, Alappuzha, Kerala, India – 688539. Email: [drpratheeshraghav@gmail.com](mailto:drpratheeshraghav@gmail.com)



the industry expanded through household units, cooperative societies and small-scale production centres, creating extensive employment opportunities, particularly for women workers engaged in fibre extraction, spinning and weaving activities (Isaac et al., 1992; Madhesh & Parvathi, 2025). The industry thus evolved not merely as an economic activity but also as an important component of the socio-cultural and occupational structure of coastal communities.

Despite its historical significance, the coir sector has experienced considerable structural transformation in recent decades. Technological modernization, mechanisation of production processes, and increasing integration with global markets have significantly altered the organisational structure of the industry. Innovations such as mechanical defibering machines, improved spinning technologies and product diversification into geotextiles, horticultural products and industrial materials have enhanced productivity and expanded export markets for coir products (Florence & Padath, 2024; Saminathan & Nayaki, 2022). These technological changes have contributed to the economic resilience of the industry and enabled it to respond to new market demands in an increasingly competitive global environment.

However, the introduction of modern technologies has also generated important socio-economic implications for workers and local communities dependent on the industry. Historically, coir production in Kerala was characterised by labour-intensive manual processes that supported large numbers of workers in household and cooperative sectors. With the gradual shift towards mechanised production systems, the structure of labour participation and employment patterns within the industry has begun to change. Studies indicate that modernization has influenced labour relations, altered traditional occupational roles and contributed to the gradual restructuring of the workforce in certain segments of the sector (Pratheesh, 2021; Pratheesh & Nair, 2022). At the same time, technological advancement has created new opportunities for product innovation, industrial entrepreneurship and export growth.

Within this broader context of industrial transformation, an important question emerges regarding the relationship between technological change and socio-economic restructuring in Kerala's coir industry. While modernization has improved production efficiency and market expansion, it has also introduced shifts in labour dynamics and traditional production structures that require careful examination. The **central research problem** of this study therefore concerns how technological changes within the coir industry have influenced the socio-economic conditions, labour organisation and occupational structures associated with the sector in Kerala. Addressing this problem is essential for understanding the evolving nature of traditional industries in the context of technological modernization.

This article seeks to examine the interplay between technological change and socio-economic transformation within Kerala's coir industry. By drawing on secondary data, industry reports and existing scholarly studies, the paper analyses how technological modernization has reshaped production processes, labour structures and community livelihoods within the sector. In doing so, the study aims to contribute to a broader understanding of the challenges and opportunities associated with technological transformation in traditional labour-intensive industries.



## 2. Review of Literature

The coir industry has attracted considerable scholarly attention due to its historical importance as a traditional agro-based industry and its role in providing employment and supporting rural economies. Early studies on the coir sector primarily examined the industrial structure, labour relations and economic organisation of the industry, particularly in Kerala where the industry historically developed. One of the most influential works in this area is the study by Isaac et al. (1992), which analysed the relationship between industrial modernization and employment in Kerala's coir industry and highlighted the tensions between technological change and labour-intensive production systems. Subsequent research has also emphasised the centrality of labour relations and cooperative production structures in shaping the development of the industry (Kamath, 2009).

A significant body of literature has focused on the economic contribution of the coir industry and its role in rural development. The sector is widely recognised as an important source of employment in coastal regions and a contributor to India's export economy. Studies examining the performance of the industry indicate that coir production and export activities have expanded through product diversification and improved processing technologies (Kulkarni, 2019; Saminathan & Nayaki, 2022). These developments have enabled the industry to maintain its relevance in global markets while continuing to support livelihoods in rural communities.

Another important theme in the literature concerns the socio-economic conditions of workers engaged in coir production. Research conducted in different regions indicates that the industry remains labour intensive and continues to employ a large number of workers, particularly women, who are involved in fibre extraction, spinning and weaving activities (Madhesh & Parvathi, 2025). However, studies have also pointed to challenges such as irregular employment, wage disparities and the gradual decline of traditional occupational participation within the sector.

Recent scholarship has increasingly examined the impact of technological modernization on the organisation of the coir industry. Technological innovations in fibre extraction, spinning and processing have significantly altered production methods and industrial structures. Research on technological modernization highlights that mechanisation has improved productivity, enhanced product quality and enabled the development of new coir-based products such as geotextiles and eco-friendly materials (Florence & Padath, 2024). These innovations have expanded the range of industrial applications for coir and strengthened the export potential of the industry.

At the same time, several studies have explored the implications of modernization for labour dynamics within the industry. Research on labour transformation suggests that technological change has gradually altered employment patterns, reduced dependence on manual production processes and contributed to the restructuring of traditional occupational systems (Pratheesh, 2021). In some cases, modernization has resulted in labour displacement or shifts in the nature of work, particularly in segments where mechanised production has replaced manual processes. Studies focusing on the Alappuzha region also indicate that modernization has influenced labour mobility and the changing occupational preferences of younger workers (Pratheesh & Nair, 2022).



Further research has also examined broader industrial and policy contexts influencing the development of the coir sector. Government initiatives, including support from the Coir Board and various development programmes, have played an important role in promoting technological innovation, skill development and product diversification within the industry (Coir Board, 2021). Such policy interventions have aimed to strengthen the competitiveness of the industry while supporting employment generation in rural areas.

In addition to industry-specific studies, research on natural fibres and fibre-based technologies has contributed to understanding the technological potential of coir. Studies examining the physical and mechanical properties of natural fibres highlight the increasing use of coir in engineering applications, including soil reinforcement, construction materials and eco-friendly industrial products (Mwaikambo, 2006; Hejazi et al., 2012). These technological developments have broadened the industrial significance of coir beyond traditional household products.

Despite the growing body of literature on the coir industry, existing studies often focus either on economic performance or technological development without fully examining the relationship between technological change and socio-economic transformation within the sector. In particular, there remains limited integrated analysis of how technological modernization influences labour structures and community livelihoods in regions historically dependent on the industry. Addressing this gap, the present study examines the relationship between technological change and socio-economic transformation in Kerala's coir industry, with particular attention to its implications for labour organisation and employment patterns.

### **3. Methodology**

The coir industry of Kerala has historically functioned as a labour-intensive traditional sector closely connected with coastal livelihoods, particularly in regions such as Alappuzha where coconut cultivation, fibre extraction and mat weaving developed as important occupational activities. Although a considerable body of literature has examined different aspects of the industry, including export performance, technological modernization and labour conditions, much of the existing research has tended to address these dimensions separately. Studies have analysed industrial performance and technological innovation (Kulkarni, 2019; Florence & Padath, 2024), while others have focused primarily on labour relations or socio-economic conditions of workers (Isaac et al., 1992; Madhesh & Parvathi, 2025). Consequently, there remains a relative lack of integrated analysis examining how technological transformation within the coir industry intersects with broader socio-economic changes in labour organisation, employment patterns and community livelihoods. This gap in the literature forms the basis for the present study.

Against this background, the central problem addressed in this article concerns the nature and implications of technological change in Kerala's coir industry and its relationship with socio-economic transformation within the sector. While technological modernization has contributed to increased productivity, product diversification and expansion of export markets, it has also altered traditional labour structures and production practices. Understanding these transformations is essential for evaluating the contemporary dynamics of the industry and its implications for



labour and regional development. The primary objective of this study is therefore to examine the relationship between technological change and socio-economic transformation in Kerala's coir industry. In particular, the study seeks to analyse how technological modernization has influenced production processes, labour organisation and employment patterns within the sector. A related objective is to explore the broader socio-economic implications of these transformations for communities historically dependent on coir production.

The study is based primarily on secondary sources of data. Relevant information has been collected from government reports, industry statistics, policy documents, and academic studies related to the coir industry. Important sources include reports of the Coir Board, industry publications, and research studies examining technological modernization and labour dynamics in the sector. In addition, scholarly articles and books addressing natural fibre technologies, industrial transformation and rural labour structures have been consulted to provide a broader analytical context.

The methodological approach adopted in the study is analytical and interpretative in nature. The analysis involves a critical examination of existing literature, industry reports and statistical information in order to understand the evolving relationship between technology, labour and socio-economic change within the coir sector. Rather than focusing on quantitative modelling, the study emphasises qualitative interpretation of trends and patterns identified in the available data and scholarly discussions. This approach allows for a comprehensive understanding of how technological innovations, industrial policies and market dynamics collectively shape the transformation of a traditional industry. Through this methodological framework, the study seeks to provide a coherent analysis of technological modernization in the coir industry and its socio-economic implications, thereby contributing to a deeper understanding of structural changes occurring within traditional labour-intensive industries in Kerala.

#### **4. Results and Analysis**

The transformation of Kerala's coir industry over the past few decades has been shaped by the interaction between technological innovation, changing labour structures and expanding global markets for natural fibre products. Historically, the sector functioned through labour-intensive production systems organised around household units and cooperative societies. However, increasing technological interventions, including mechanised fibre extraction, improved spinning technologies and product diversification, have gradually altered both the economic organisation of the industry and the socio-economic conditions of workers associated with it. The following analysis examines these transformations through key dimensions of industrial change.

##### **4.1 Technological Modernization in Coir Production**

Technological change in the coir sector has primarily involved the transition from manual fibre extraction and spinning methods to mechanised and semi-mechanised production systems. Earlier production methods depended heavily on manual retting, fibre beating and hand-operated spinning wheels, which required extensive labour



participation and supported large numbers of workers in coastal regions. Over time, technological innovations such as mechanical defibering machines, automatic spinning units and improved fibre processing technologies have been introduced to increase productivity and reduce production time. These technological developments have also enabled the production of value-added coir products including geotextiles, horticultural substrates and erosion control materials, thereby expanding the industrial applications of coir fibre (Florence & Padath, 2024; Pratheesh, 2024).

**Table 1: Mechanisation in Coir Production Units (Indicative Trend)**

| Production Type             | Traditional Units (%) | Mechanised Units (%) |
|-----------------------------|-----------------------|----------------------|
| Fibre Extraction            | 68                    | 32                   |
| Yarn Spinning               | 62                    | 38                   |
| Mat / Product Manufacturing | 55                    | 45                   |

*Source: compiled from Coir Board reports and industry studies*

The data presented in Table 1 indicates that although traditional production systems still dominate certain segments of the coir industry, mechanised technologies have gradually expanded across various stages of production. Mechanisation appears more prominent in product manufacturing and spinning activities compared to fibre extraction processes, where traditional techniques continue to persist in many small-scale units. The gradual increase in mechanised production units suggests a transitional industrial structure in which modern technologies coexist with traditional labour-intensive systems. From an analytical perspective, this pattern indicate that technological modernization in the coir industry has occurred unevenly across production stages. While mechanisation has enhanced productivity and enabled the development of new coir products, the persistence of traditional production systems reflects the continued importance of labour-intensive practices in sustaining employment within the sector.

**Table 2: Export Performance and Growth of Coir and Coir Products from India**

| Year     | Quantity Exported (Metric Tonnes) | Export Value (₹ Crores) |
|----------|-----------------------------------|-------------------------|
| 2017–18  | 1,018,167                         | 2,532                   |
| 2018–19  | 1,098,981                         | 2,728                   |
| 2019–20  | 988,996                           | 2,757                   |
| 2020–21  | 1,163,213                         | 3,778                   |
| 2021–22  | 1,226,940                         | 4,377                   |
| 2022–23  | 1,168,000                         | 4,200                   |
| 2023–24  | 1,204,000                         | 4,450                   |
| 2024–25* | 1,240,000                         | 4,720                   |

*Note: 2024–25 figures are estimates based on recent export trend reports.*

*Source: Compiled from Coir Board Annual Reports and industry statistics.*

The Table 2 demonstrates a sustained expansion in the export performance and market value of coir and coir products from India during the period from 2017–18 to 2024–25. The export quantity increased from 1,018,167 metric tonnes in 2017–18 to an estimated 1,240,000 metric tonnes in 2024–25, reflecting an overall growth of approximately 21.8 percent over the period. This steady increase indicates the



growing international demand for Indian coir products and the expanding integration of the coir sector into global eco-friendly product markets. Although export quantity experienced a temporary decline in 2019–20, falling to 988,996 metric tonnes, the sector recovered strongly in the following years. The increase from 988,996 metric tonnes in 2019–20 to 1,226,940 metric tonnes in 2021–22 represents a growth of nearly 24 percent within two years, highlighting the resilience of the industry and its ability to regain export momentum despite global economic disruptions and trade uncertainties during the pandemic period.

A more significant transformation is visible in the export value of coir products. Export earnings increased from ₹2,532 crores in 2017–18 to an estimated ₹4,720 crores in 2024–25, recording a cumulative growth of approximately 86.4 percent during the study period. The rate of increase in export earnings is substantially higher than the growth in export volume, indicating that the coir sector has increasingly shifted towards higher-value products rather than relying solely on volume expansion. While export quantity increased by about 21.8 percent, export value grew by more than four-fifths, clearly demonstrating a qualitative transformation in the structure of exports.

The data further reveals that the average export realization per metric tonne has improved considerably over the years. In 2017–18, the approximate export value per tonne was around ₹24,870, whereas by 2024–25 it increased to nearly ₹38,065 per tonne, representing an increase of roughly 53 percent in unit export value. This rise reflects the growing importance of processed and diversified coir products such as coir geotextiles, rubberised coir products, pith blocks, erosion control materials, garden articles and other eco-friendly value-added commodities that command higher prices in international markets. The increasing global preference for sustainable and biodegradable materials has also contributed significantly to this upward trend in export earnings.

The fluctuations visible during certain years also provide important economic insights. For instance, despite the decline in export quantity during 2019–20, export value did not decline proportionately, increasing marginally from ₹2,728 crores in 2018–19 to ₹2,757 crores in 2019–20. This suggests that even during periods of reduced export volume, the industry-maintained value generation through better product composition and relatively higher-priced exports. Similarly, the sharp increase in export value from ₹2,757 crores in 2019–20 to ₹3,778 crores in 2020–21 represents an increase of nearly 37 percent within a single year, indicating rapid export recovery and expanding international market opportunities for value-added coir products. So, the trends presented in Table 2 indicate that the Indian coir industry is undergoing a gradual structural transformation from a predominantly raw-material and low-value export sector to a more technology-oriented and value-added manufacturing industry. Improvements in mechanisation, processing efficiency, product diversification and quality enhancement appear to have strengthened the international competitiveness of the sector. The rising export earnings, combined with moderate but consistent growth in export quantity, suggest that technological modernization and industrial upgrading have played a crucial role in enhancing productivity, increasing market value and expanding the global commercial significance of the coir industry.



## 4.2 Labour Transformation and Employment Patterns in the Coir Industry

The transformation of Kerala's coir industry has been closely linked to changes in labour organisation and employment patterns. Traditionally, the sector functioned as a labour-intensive industry providing substantial employment in coastal regions, particularly for women engaged in fibre extraction, spinning and weaving through household units, small-scale enterprises and cooperative societies (Isaac et al., 1992; Pratheesh & Nair, 2022). However, over the past two decades, technological modernization and mechanisation—such as mechanical defibering and automated spinning—have increased productivity while reducing reliance on manual labour. These changes have altered both the scale and nature of employment, requiring workers to adapt to new skill demands and occupational roles within the industry (Florence & Padath, 2024; Pratheesh, 2021).

**Table 3: Estimated Employment in the Coir Industry in India**

| Year     | Estimated Employment (Lakhs of Workers) |
|----------|-----------------------------------------|
| 2018–19  | 7.20                                    |
| 2019–20  | 7.10                                    |
| 2020–21  | 6.80                                    |
| 2021–22  | 6.70                                    |
| 2022–23  | 6.60                                    |
| 2023–24  | 6.50                                    |
| 2024–25* | 6.40                                    |

*Source: Compiled from Coir Board reports and industry estimates.*

The data presented in Table 3 indicates a gradual decline in the total number of workers engaged in the coir industry during the period under consideration. Employment levels decreased from approximately 7.20 lakh workers in 2018–19 to around 6.40 lakh workers in 2024–25, representing a decline of about 11.1 percent over the seven-year period. The reduction in employment is particularly noticeable after 2020–21, when the workforce declined from 6.80 lakh workers to approximately 6.40 lakh workers by 2024–25, reflecting a decrease of nearly 5.9 percent within four years.

The decline in employment does not indicate contraction of the coir industry but reflects the impact of technological modernization on labour demand. Mechanised fibre extraction and automated spinning have increased production efficiency, enabling higher output and export value with fewer workers. At the same time, the nature of work has shifted toward skilled roles in machine operation, product processing and industrial management, while traditional workers increasingly face the need to adapt or shift occupations. These trends highlight the restructuring of labour within the coir sector, where technological advancement enhances productivity and market competitiveness while gradually reducing the industry's traditional labour-intensive character.

## 4.3 Socio-Economic Implications for Traditional Coir Communities

The technological and structural transformation of the coir industry has had significant socio-economic implications for communities historically dependent on



the sector, particularly in districts such as Alappuzha, Kollam and Ernakulam. Traditionally organised through household units, cooperatives and small-scale enterprises, the industry provided widespread employment across stages such as retting, fibre extraction, spinning and weaving, supporting the livelihoods of coastal populations (Isaac et al., 1992; Pratheesh & Nair, 2022). However, technological modernization—including mechanised fibre extraction and automated spinning—has improved production efficiency and expanded market opportunities while reducing reliance on manual labour. As a result, employment patterns have shifted, with declining demand for traditional workers alongside emerging opportunities for skilled labour in machine operation and industrial management (Florence & Padath, 2024; Pratheesh, 2021).

**Table 4: Distribution of Employment by Production Segment in the Coir Industry**

| Production Segment                  | Estimated Share of Employment (%) |
|-------------------------------------|-----------------------------------|
| Fibre Extraction and Processing     | 32                                |
| Yarn Spinning                       | 27                                |
| Mat and Product Manufacturing       | 24                                |
| Processing, Finishing and Packaging | 10                                |
| Marketing and Export Activities     | 7                                 |

*Source: Compiled from industry reports and coir sector studies.*

The data presented in Table 4 illustrate the distribution of employment across different segments of the coir production chain. Fibre extraction and primary processing continue to account for the largest share of employment, representing approximately 32 percent of the total workforce in the sector. Yarn spinning activities constitute about 27 percent of employment, followed by mat and product manufacturing which accounts for nearly 24 percent. Together, these three segments represent roughly 83 percent of total employment within the industry, highlighting the continued importance of traditional production activities in sustaining labour participation. In contrast, more technologically oriented activities such as processing, finishing, packaging and export-related operations together account for about 17 percent of employment.

Despite technological modernization, the coir industry continues to retain a significant labour-intensive component, with traditional production stages employing large numbers of workers, particularly in rural and coastal areas. At the same time, the expansion of processing, packaging and export-oriented activities reflects the gradual diversification of employment within the sector. These changes indicate a transitional phase in which traditional labour systems coexist with modernised production processes. While modernization has enhanced productivity and export growth, it has also altered occupational roles and skill requirements, contributing to broader socio-economic adjustments in communities historically dependent on the coir industry.

#### **4.4 Technological Transformation and Changing Production Structure in the Coir Industry**

Technological modernization has become a key factor in the transformation of the coir industry. Traditionally based on labour-intensive processes such as retting,



manual fibre extraction and hand-operated spinning, the sector provided extensive employment in coastal communities. However, increasing global competition, rising labour costs and the need for improved product quality have encouraged the gradual adoption of mechanised technologies (Florence & Padath, 2024; Pratheesh, 2024). The introduction of mechanical defibering machines, automatic spinning equipment and semi-mechanised production units has increased production efficiency and improved fibre quality. These technological advancements have also enabled the development of diversified coir products such as geotextiles, horticultural substrates and rubberised coir materials, expanding the industry's product base and access to domestic and international markets.

**Table 5: Adoption of Mechanised Technologies in Coir Production Units**

| Year    | Traditional Units (%) | Semi-Mechanised Units (%) | Fully Mechanised Units (%) |
|---------|-----------------------|---------------------------|----------------------------|
| 2018–19 | 68                    | 24                        | 8                          |
| 2019–20 | 65                    | 26                        | 9                          |
| 2020–21 | 62                    | 28                        | 10                         |
| 2021–22 | 59                    | 30                        | 11                         |
| 2022–23 | 56                    | 31                        | 13                         |
| 2023–24 | 53                    | 33                        | 14                         |
| 2024–25 | 50                    | 34                        | 16                         |

*Source: Compiled from industry reports and coir sector studies.*

The data presented in Table 5 demonstrate a gradual but consistent shift in the technological structure of coir production units during the period from 2018–19 to 2024–25. The proportion of traditional production units declined from 68 percent in 2018–19 to approximately 50 percent by 2024–25, representing a reduction of 18 percentage points over the period. In contrast, the share of semi-mechanised units increased from 24 percent to 34 percent, while fully mechanised production units expanded from 8 percent to 16 percent during the same period. This indicates that the proportion of units using some form of mechanised technology increased from 32 percent in 2018–19 to nearly 50 percent in 2024–25, effectively doubling the presence of modern production technologies within the industry.

The decline of traditional production units alongside the expansion of mechanised and semi-mechanised units reflects the ongoing structural transformation of the coir industry. Mechanisation has improved production efficiency and product quality while enabling the sector to respond to growing international demand. At the same time, the continued coexistence of traditional and mechanised units indicates a gradual and phased transition. Overall, technological modernization has strengthened the industry's productivity and competitiveness while simultaneously reshaping its traditional labour-intensive production structure.

## 5. Discussion

The analysis presented in the preceding sections highlights the complex interaction between technological modernization, export expansion and labour



transformation within the coir industry. Traditionally, the coir sector in Kerala functioned as a labour-intensive industry closely integrated with the socio-economic life of coastal communities. The production structure relied heavily on manual processes such as retting, fibre extraction, spinning and weaving, which enabled the industry to generate widespread employment opportunities. Over time, however, technological innovations and changing market conditions have gradually transformed the organisational structure of the industry.

The export trends presented in Table 2 indicate that the growth of the coir industry has increasingly been driven by value addition and technological upgrading rather than by export volume alone. Between 2017–18 and 2024–25, export quantity increased from 1,018,167 metric tonnes to approximately 1,240,000 metric tonnes, representing a moderate growth of about 21.8 percent. In contrast, export earnings increased much more sharply from ₹2,532 crores to approximately ₹4,720 crores during the same period, recording a cumulative increase of nearly 86.4 percent. The substantially higher growth in export value compared to export quantity suggests a structural shift from the export of raw fibre and low-value products toward technologically processed and higher value-added coir products. The increase in average export realization per metric tonne further supports this interpretation, indicating improvements in product quality, diversification and market competitiveness. The sharp rise in export earnings from ₹2,757 crores in 2019–20 to ₹3,778 crores in 2020–21 despite global economic disruptions also reflects the resilience of export-oriented coir production and the growing international demand for eco-friendly coir-based products. These findings suggest that technological modernization, improved processing techniques and product diversification have played a significant role in strengthening the export performance and global market position of the coir industry. The findings are consistent with earlier studies that emphasize the role of technological innovation and value-added production in sustaining the competitiveness of traditional industries (Florence & Padath, 2024; Kulkarni, 2019).

Another important dimension emerging from the analysis concerns the transformation of labour structures within the industry. The gradual introduction of mechanised technologies has altered the labour-intensive character that historically defined coir production. Mechanisation has improved production efficiency and reduced the time required for fibre processing and yarn production. At the same time, however, it has reduced the demand for certain categories of manual labour traditionally engaged in spinning and fibre extraction. The employment trends presented in the study indicate a gradual decline in the number of workers directly involved in the industry over recent years. This finding corresponds with earlier research highlighting the challenges faced by labour-intensive traditional industries in adapting to technological change (Pratheesh, 2021; Pratheesh & Nair, 2022).

The socio-economic implications of these transformations are particularly visible in regions historically associated with coir production. Communities in districts such as Alappuzha have long depended on the industry as a primary source of livelihood. Changes in production technology and labour demand have therefore influenced not



only employment patterns but also the broader socio-economic structure of these communities. Younger generations are increasingly seeking alternative employment opportunities in other sectors, while traditional occupational practices associated with coir production are gradually declining in certain areas. At the same time, new employment opportunities have emerged in technologically advanced segments of the industry, including product design, machine operation and export-oriented activities.

Another important observation emerging from the study is that technological modernization within the coir industry has occurred in a gradual and uneven manner. Although mechanised technologies have expanded significantly, traditional production systems continue to coexist with modern industrial processes in many regions. Small-scale units and cooperative societies remain important components of the industry, particularly in rural areas where labour-intensive production methods still persist. This coexistence of traditional and modern production systems indicates that the transformation of the coir industry is not characterised by abrupt technological replacement but rather by a gradual process of structural adjustment.

Overall, the findings of this study suggest that technological change within the coir industry has produced a dual process of transformation. On the one hand, modernization has enhanced industrial productivity, strengthened export performance and expanded the range of coir-based products in international markets. On the other hand, these developments have introduced significant adjustments in labour organisation and socio-economic structures associated with the industry. Understanding this dual dynamic is essential for developing policy strategies that promote technological advancement while ensuring sustainable employment opportunities and socio-economic stability for communities historically dependent on the coir sector.

## **6. Conclusion**

The coir industry has historically been a key component of Kerala's coastal economy, providing employment and supporting the socio-economic life of communities in regions such as Alappuzha. This study examined how technological modernization has influenced the structural transformation of the industry, particularly in relation to export performance, labour organisation and production systems. The analysis indicates that technological improvements in fibre extraction, spinning and product processing have enhanced productivity and enabled the development of diversified, value-added coir products. As reflected in the export trends up to 2025, the industry has experienced significant growth in export value, indicating a shift from raw fibre exports to higher-value processed products and stronger integration with global markets.

At the same time, the findings show that technological modernization has gradually altered the labour-intensive character of the industry. Mechanisation has reduced the reliance on manual production processes while increasing the importance of skilled labour associated with machine operation and industrial processing. These changes have contributed to a gradual restructuring of employment patterns and occupational roles within traditional coir-producing communities. So, the study demonstrates that the transformation of the coir industry represents a dual process in



which technological advancement strengthens industrial competitiveness while simultaneously reshaping labour structures and local socio-economic conditions. In this context, policy initiatives should focus on promoting technological innovation alongside skill development, labour protection and sustainable employment strategies to ensure balanced and inclusive growth within the coir sector.

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