

The Coir Industry of Kerala: An Economic History of Industrial Transition, Trade Expansion, and Labour Displacement

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Abstract: The coir industry of Kerala represents one of South Asia's oldest agro-based export industries, historically concentrated in the port town of Alappuzha and deeply embedded in the region's coastal economy. Despite its longevity and global market presence, the industry exhibits a paradoxical development trajectory characterised by export growth alongside declining labour absorption. This paper examines the coir industry from an economic history perspective, tracing its transition from a labour-intensive, water-based production system to a mechanised, export-oriented industrial structure. Using secondary empirical evidence drawn from export statistics, historical industrial records, and sectoral studies, the paper analyses three interlinked processes: trade expansion under post-liberalisation regimes, productivity gains through mechanisation, and structural changes in employment. The findings show that while trade reforms and product diversification have enhanced export competitiveness, mechanisation has weakened the industry's capacity to generate decent employment, particularly for women workers historically central to coir production. Environmental and occupational constraints further function as economic limits rather than ecological concerns, shaping regulatory intervention and production geography. The paper contributes to development economics by situating the coir industry within debates on SDG 8, demonstrating how traditional industries in the Global South can achieve growth without proportional employment expansion. By foregrounding historical path dependence and structural transformation, the study offers insights relevant to regional industrial policy and labour-inclusive development strategies.

Key Words: Coir Industry; Economic History; Industrialisation; Labour Displacement; Exports; Kerala

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1. INTRODUCTION

Traditional agro-based industries have played a foundational role in the economic development of coastal South India, linking rural production systems to global trade networks well before the onset of formal industrialisation. Among these industries, the coir sector of Kerala occupies a distinctive historical and economic position. Drawing on the region's extensive coconut cultivation and access to inland waterways and maritime routes, coir manufacturing emerged as an export-oriented activity during the nineteenth century, with the port town of Alappuzha evolving into the principal centre of production, processing, and trade. By the early twentieth century, coir had become one of the most important foreign exchange-earning industries in the region, structurally embedded in Kerala's coastal economy and labour markets [Raseena, 2018; Pratheesh and Florence, 2024].

Historically, the coir industry functioned as a labour-intensive sector characterised by dispersed household production, cooperative organisation, and heavy reliance on female labour. Employment generation, rather than productivity maximisation, defined the economic logic of the industry for much of the post-independence period. State intervention through cooperatives, welfare measures, and price support mechanisms reinforced this employment-oriented structure, allowing coir to absorb surplus labour

even in periods of low capital investment and technological stagnation [Raseena, 2018; Pratheesh, 2021].

In recent decades, however, the development trajectory of the coir industry has undergone a significant structural shift. Trade liberalisation, export diversification, and technological modernisation have reoriented production toward mechanised processing and value-added products such as coir pith, mats, and geotextiles. While these changes have strengthened export performance and global competitiveness, they have simultaneously weakened the industry's capacity to generate employment at historical levels. Empirical studies document a persistent decline in labour absorption, particularly among women workers, alongside rising output and export value, indicating a decoupling of growth from employment [Pratheesh and Florence, 2024; Raseena, 2018].

This structural transformation has also been shaped by economic constraints associated with production externalities. Traditional retting practices generated severe water pollution, imposing social and regulatory costs that limited the spatial expansion of production, while mechanised units introduced new energy and occupational health costs that altered the cost structure of the industry [Beevi et al., 2012; Ambika Devi, 1988]. These constraints operate not merely as environmental concerns but as economic limits influencing technological choice, regulatory intervention, and production geography.

This paper examines the coir industry of Kerala from an economic history perspective, analysing how successive policy regimes, technological choices, and labour arrangements have shaped its contemporary development outcomes. Rather than treating coir as a residual traditional sector, the study situates it within broader processes of structural change, focusing on three interrelated questions: (i) how export performance evolved across different trade and policy regimes; (ii) how mechanisation altered productivity and employment relations; and (iii) how environmental and occupational constraints functioned as economic limits to expansion. By foregrounding historical path dependence and long-term structural transformation, the paper contributes to debates on industrialisation, labour displacement, and the pursuit of decent work within traditional industries in the Global South, directly engaging with the concerns of SDG 8.

2. COIR INDUSTRY IN KERALA: AN ECONOMIC HISTORY OF INDUSTRIAL FORMATION AND TRANSITION

The coir industry of Kerala constitutes one of the earliest export-oriented agro-based industrial systems in South India, with its historical evolution closely linked to coastal ecology, colonial trade networks, and regional labour regimes. Economic historians have long noted that Alappuzha emerged as the spatial core of this industry due to its locational advantages—proximity to coconut-growing hinterlands, access to navigable backwaters for retting, and early port connectivity facilitating overseas trade [Balaji, 1989; Padath, 2025a]. By the mid-nineteenth century, coir had become a significant component of Kerala's export economy, supplying rope, yarn, and mats to European markets integrated into colonial shipping and plantation systems [Raseena, 2020; Franke & Chasin, 1989].

Prior to factory production, coir manufacturing functioned largely as a dispersed household activity embedded in coastal agrarian livelihoods. Production relied on family labour, caste- and gender-segmented tasks, and low-capital techniques, allowing the industry to absorb surplus labour without formal wage contracts [Isaac, 1990; Raseena, 2020]. Women played a central economic role, particularly in spinning and weaving, making coir one of the most feminised industrial occupations in Kerala's pre-industrial economy [CDS, 1985; Pratheesh & Nair, 2022]. This labour-intensive structure ensured income diffusion but imposed inherent limits on productivity growth.

The establishment of mechanised coir factories in Alappuzha from 1859 onwards marked a turning point in production organisation. European-owned firms introduced factory discipline, wage labour, and export-standard processing, transforming coir from a household craft into a port-based industrial activity [Padath, 2025a; Pratheesh & Gopakumaran Nair, 2021]. However, unlike plantation or mining sectors, coir industrialisation remained technologically shallow, retaining a heavy dependence on

manual processes and cheap labour well into the twentieth century [Balaji, 1989; Raseena, 2020]. This hybrid structure—export-oriented yet labour-intensive—became a defining characteristic of the industry.

Following Independence, the withdrawal of foreign capital and the decline of large export firms led to a reorganisation of the coir economy under state-led and cooperative frameworks. Kerala's development strategy in the 1950s–1970s prioritised employment generation and income security, particularly in traditional industries with high labour absorption capacity [K. N. Raj, 1968; Isaac & Franke, 1992]. Coir production was institutionalised through cooperatives, welfare boards, and price-support mechanisms, reinforcing small-scale production and limiting capital concentration [Raseena, 2020; KILE, 2016]. From an economic perspective, this phase represented a deliberate trade-off between productivity and employment.

While cooperative expansion stabilised livelihoods, it also entrenched technological stagnation. Studies from the Centre for Development Studies consistently documented declining productivity, rising unit costs, and weakening export competitiveness by the late 1970s [CDS, 1985; Isaac, 1990]. Trade unions and labour institutions, though effective in protecting wages and working conditions, resisted mechanisation due to its displacement effects, thereby constraining technological adaptation [Franke & Chasin, 1989; Pratheesh, 2021b]. Raseena [2020] characterises this period as one of "employment-oriented equilibrium", in which social objectives outweighed efficiency considerations.

A decisive structural shift occurred from the late 1980s onward, accelerated by India's trade liberalisation policies after 1991. Exposure to global competition, declining demand for traditional handloom products, and the emergence of synthetic substitutes compelled the coir industry to adopt mechanised production and diversify its export basket [Balaji, 1989; Raseena, 2020]. Mechanisation in defibering, spinning, and weaving improved labour productivity and reduced unit costs, enabling expansion into higher-value products such as tufted mats, rubberised coir, and coir pith [Florence & Padath, 2024a; Pratheesh, 2025a].

However, this productivity-led growth generated significant labour displacement. Empirical studies document a sharp decline in employment, particularly among women workers previously engaged in household units [Pratheesh & Nair, 2022; Pratheesh et al., 2024]. Output growth increasingly decoupled from labour absorption, indicating a structural transition from labour-intensive to capital-intensive production [Raseena, 2020]. Moreover, rising labour costs and regulatory constraints in Kerala encouraged the spatial relocation of mechanised units to neighbouring states, weakening the historical industrial base of Alappuzha [Pratheesh, 2024].

Environmental constraints further shaped the economic trajectory of the industry. Traditional retting generated severe water pollution, imposing health costs and regulatory

pressures that restricted production expansion [Ambika Devi, 1988; Beevi et al., 2012]. While technological alternatives mitigated some environmental externalities, they raised capital requirements and entry barriers, reinforcing structural exclusion within the industry [Florence & Padath, 2024a; Raseena, 2020]. These factors functioned as economic constraints rather than purely ecological concerns.

In sum, the economic history of Kerala's coir industry reveals a path-dependent process of industrial transition shaped by colonial trade integration, post-independence labour-oriented policy regimes, and post-liberalisation competitiveness pressures. Growth has been achieved through mechanisation and export diversification, but at the cost of declining employment and regional displacement. This historical perspective provides the analytical foundation for examining trade performance, productivity change, and labour outcomes in subsequent sections.

3. DATA AND METHOD

3.1 Data sources

This study adopts a historical-empirical approach grounded entirely in secondary data sources, consistent with established practices in economic history and development economics. Given the long temporal span of the coir industry's evolution and the absence of consistent firm-level microdata for earlier periods, secondary evidence provides the most reliable basis for analysing structural change, productivity trends, and labour outcomes [Raj, 1968; Isaac, 1990].

The primary data sources used in the analysis include four categories. First, official export statistics published by the Coir Board of India are employed to examine long-run trends in export value, export volume, and product composition. These series are widely used in empirical studies of India's traditional export industries and provide the most consistent indicators of trade performance over time [Balaji, 1989; Raseena, 2020]. Where possible, export data are triangulated with industry-level summaries produced by export associations and government agencies to ensure consistency.

Second, sectoral employment, mechanisation, and productivity evidence is drawn from doctoral research and peer-reviewed studies focusing on Kerala's coir industry, particularly those examining labour displacement, technological adoption, and regional restructuring [Raseena, 2020; Florence and Padath, 2024a; Pratheesh and Nair, 2022]. These studies provide empirically grounded estimates of changes in workforce size, gender composition, and production organisation that are not captured in aggregate national datasets.

Third, institutional and policy-oriented sources are used to contextualise production and employment outcomes. These include diagnostic reports prepared by state agencies and research institutions, which document cooperative

performance, welfare mechanisms, and the impact of policy interventions in traditional industries [Centre for Development Studies, 1985; KILE, 2016]. Such sources are essential for understanding how policy regimes shaped incentives for mechanisation, capital investment, and labour retention.

Fourth, historical and economic literature on Kerala's development trajectory is used to situate the coir industry within broader processes of industrialisation, labour mobilisation, and trade integration. This includes classic development economics contributions and regional studies that provide the analytical framework for interpreting structural change over time [Raj, 1968; Franke and Chasin, 1989; Isaac and Franke, 1992].

3.2 Analytical approach

The analysis proceeds through a structured historical-empirical synthesis rather than formal econometric modelling. This approach is appropriate given the study's focus on long-term structural transformation and the qualitative nature of several key variables, such as production organisation, labour regimes, and institutional arrangements [Isaac, 1990; Raseena, 2020].

The first stage of analysis examines export performance as an indicator of industrial growth and competitiveness. Trends in export value and volume are analysed across major policy regimes—colonial export integration, post-independence protection, and post-liberalisation expansion—to identify shifts in growth dynamics and product composition [Balaji, 1989; Raseena, 2020]. These indicators form the empirical basis for assessing trade-led structural change in the coir industry.

The second stage focuses on mechanisation and productivity change. Evidence on the adoption of mechanised defibering, spinning, and weaving is analysed in relation to changes in labour productivity and employment elasticity. Rather than estimating productivity statistically, the study relies on documented output-employment relationships reported in sectoral studies to identify patterns of labour-output decoupling [Florence and Padath, 2024a; Pratheesh, 2024].

The third stage examines labour outcomes, with particular attention to gendered employment effects and the decline of household production units. Employment trends are interpreted through the lens of structural transformation, drawing on empirical findings from micro-level studies that document workforce contraction and skill displacement in mechanised segments [Pratheesh and Nair, 2022; Pratheesh et al., 2024].

Finally, environmental and occupational constraints are incorporated as economic externalities influencing production costs and regulatory intervention. Rather than treating environmental degradation as an ecological issue, the analysis interprets pollution, health risks, and compliance requirements as factors shaping technological

choice and spatial reorganisation of production [Ambika Devi, 1988; Beevi et al., 2012].

3.3 Validity, triangulation, and limitations

To strengthen analytical validity, the study triangulates findings across multiple data types and sources. Export trends are cross-checked against institutional reports and secondary analyses, while employment and mechanisation patterns are corroborated across independent empirical studies. Consistency of findings across different authors and methodological approaches is treated as evidence of structural robustness rather than coincidence [Raseena, 2020; Florence and Padath, 2024a].

The study is subject to certain limitations. The absence of long-run firm-level panel data restricts the use of econometric techniques, and employment estimates rely on secondary studies rather than original surveys. However, these constraints are common in historical analyses of traditional industries and do not undermine the study's capacity to identify broad structural patterns [Raj, 1968; Isaac, 1990]. By integrating multiple empirical sources within a coherent historical framework, the paper offers a reliable account of the coir industry's economic transformation.

4. TRADE, EXPORT GROWTH, AND STRUCTURAL CHANGE IN THE COIR INDUSTRY

4.1 Historical evolution of coir exports

Trade has been the central axis around which the coir industry's economic trajectory has evolved. From the late nineteenth century, coir products—primarily yarn, rope, and mats—were integrated into colonial export circuits servicing maritime transport, plantation economies, and European domestic markets. Alappuzha's emergence as a port-industrial town was closely linked to this export orientation, with production, storage, and shipment organised around overseas demand rather than domestic consumption.

In the post-independence period, export performance stagnated despite rising global demand for natural fibres. Protectionist trade policies, foreign exchange controls, and institutional emphasis on employment preservation constrained product diversification and technological upgrading. As documented in the economic literature, coir exports during this phase were characterised by low unit values and limited responsiveness to international price signals, reflecting an inward-looking industrial strategy prioritising labour absorption over competitiveness.

A decisive shift occurred with the gradual liberalisation of India's trade regime from the late 1980s, accelerating after 1991. Reduced quantitative restrictions, export incentives, and improved access to global markets altered the incentive structure facing coir producers. Export statistics compiled by the Coir Board indicate a sustained increase in export value from the early 2000s onward, coinciding with diversification

into higher-value coir products. Table 1 summarises the long-run growth of India's coir exports and the associated structural shift in product composition across major policy phases.

Table 1. Growth of India's Coir Exports and Structural Shift in Product Composition

Period	Export value (US\$ million)	Export quantity (million tonnes)	Dominant export products
1990–91	90	0.40	Yarn, rope
2000–01	160	0.62	Yarn, mats
2010–11	270	0.82	Mats, fibre
2020–21	588	1.23	Coir pith, tufted mats, geotextiles

Source: Compiled from Coir Board of India export statistics; Raseena (2020); Pratheesh (2025a).

The table demonstrates a clear acceleration in export performance following trade liberalisation. Between 1990–91 and 2020–21, export value increased more than six-fold, while export quantity rose by approximately three times, indicating that export growth was driven not merely by volume expansion but by rising unit values. The post-2010 period is particularly significant: export quantity shows moderate growth, whereas export value increases sharply, reflecting a transition toward value-added, application-specific products rather than traditional yarn and rope. This divergence between value and quantity signals a qualitative restructuring of the export regime, consistent with a shift from labour-intensive commodity exports to productivity- and processing-based competitiveness.

4.2 Liberalisation, export expansion, and product diversification

This expansion was driven not merely by aggregate growth but by structural changes in the export basket. Empirical studies consistently note a transition from low-value, labour-intensive products to diversified, application-specific outputs such as coir pith (coco peat), tufted mats, rubberised coir, and geotextiles. Coir pith, in particular, benefited from rising global demand in horticulture and climate-resilient agriculture, enabling exporters to capture higher unit values without proportional increases in raw fibre use.

From an economic standpoint, this diversification marked a qualitative shift in the industry's growth regime. Export competitiveness increasingly depended on processing

capability, quality standardisation, and compliance with phytosanitary and packaging norms, rather than on the availability of cheap labour alone.

4.3 Regional concentration and uneven export integration

Despite India's overall export growth, Kerala's relative dominance in coir exports has weakened over time. While the state retains institutional and historical centrality, mechanised production and export-oriented units have increasingly relocated to neighbouring states with lower labour costs and fewer regulatory constraints. This spatial reconfiguration reflects a classic outcome of trade-led industrial restructuring, where regions with strong labour protections face competitive pressures under liberalised trade regimes.

Export growth, therefore, has been unevenly distributed within the coir industrial system. Large firms and mechanised units have captured a disproportionate share of export earnings, while household-based and cooperative units—historically concentrated in Kerala—have been marginalised from high-value export segments.

4.4 Trade growth and employment decoupling

One of the most significant economic outcomes of export expansion has been the decoupling of trade growth from employment generation. Empirical studies show that periods of rapid export growth coincided with declining employment in traditional production segments, particularly spinning and handloom weaving. From a development economics perspective, this pattern indicates a shift from labour-intensive comparative advantage to productivity-driven competitiveness, with important implications for decent work outcomes. Table 2 places this divergence between export growth and employment change in quantitative perspective.

Table 2. Export Growth and Employment Change in Kerala's Coir Industry

Period	Export value index (1990–91 = 100)	Estimated coir employment in Kerala (lakh workers)	Employment index (1990–91 = 100)
1990–91	100	7.2	100
2000–01	178	6.5	90
2010–11	300	5.1	71
2020–	653	3.8	53

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Source: Compiled from Coir Board export data; CDS employment studies; Raseena (2020); Pratheesh and Nair (2022).

The data reveal a pronounced divergence between export performance and labour absorption. While export value increased more than sixfold over three decades, employment in Kerala's coir industry declined by nearly half, with the employment index falling from 100 to 53. The most rapid divergence occurs after 2000–01, coinciding with intensified mechanisation and export diversification. This confirms that recent growth in the coir sector has been increasingly productivity-driven, weakening its historical role as a major employment generator in Kerala's coastal economy.

4.5 Trade restructuring in historical perspective

Viewed through an economic history lens, the restructuring of coir exports reflects cumulative structural change rather than abrupt transformation. Colonial export integration established trade dependence; post-independence policies institutionalised labour-intensive production; and liberalisation reoriented the industry toward competitiveness and diversification. The contemporary export regime—characterised by higher value realisation and reduced labour absorption—represents the logical outcome of this historical trajectory and sets the context for analysing mechanisation and labour displacement in the following section. This export-led restructuring altered the technological and organisational basis of production, setting in motion the mechanisation and productivity changes analysed in the following section.

5. MECHANISATION, PRODUCTIVITY CHANGE, AND LABOUR DISPLACEMENT IN THE COIR INDUSTRY

5.1 Mechanisation as a structural response to export restructuring

The restructuring of coir exports documented in the previous section was accompanied by a progressive transformation of production processes within the industry. Mechanisation emerged not as an isolated technological choice but as a structural response to rising quality requirements, standardisation norms, and cost pressures associated with export-oriented growth. Traditional hand-operated processes in defibering, spinning, and weaving proved inadequate for meeting large orders, uniform specifications, and delivery timelines demanded by global markets, particularly after the expansion of value-added coir products.

Empirical studies consistently show that mechanisation was adopted unevenly across segments and regions. Export-oriented firms and larger production units integrated mechanised technologies more rapidly, while household-

based and cooperative units—historically dominant in Kerala—faced financial and institutional constraints in adopting capital-intensive machinery. This uneven diffusion of technology reshaped the internal structure of the coir industry, altering productivity levels and labour demand. Table 3 presents the changing composition of production units in Kerala's coir industry, distinguishing between mechanised units and traditional household or cooperative units.

Table 3. Changing Structure of Coir Production Units in Kerala

Period	Mechanised units (%)	Household/cooperative units (%)
1990–91	15	85
2000–01	28	72
2010–11	45	55
2020–21	62	38

Source: Compiled from CDS sectoral studies; Raseena (2020); Florence and Padath (2024a).

The table indicates a steady increase in the share of mechanised production units over time. Between 1990–91 and 2020–21, mechanised units expanded from approximately 15 per cent to over 60 per cent of total production units, while household and cooperative units declined correspondingly. This shift reflects a structural reorganisation of production rather than incremental technological upgrading, marking a decisive move away from labour-intensive production systems that historically characterised Kerala's coir economy.

5.2 Productivity gains and labour-output decoupling

Mechanisation generated measurable gains in labour productivity, enabling higher output levels with fewer workers. Output per worker increased as mechanised defibering and spinning reduced processing time, material wastage, and dependence on manual labour. However, these productivity gains were accompanied by a weakening of the employment–output relationship that had sustained the industry for decades.

To illustrate this transformation, Table 4 juxtaposes trends in output growth and employment change, highlighting the decoupling of productivity from labour absorption.

Table 4. Productivity Growth and Employment Decline in Kerala's Coir Industry

Period	Output (1990–91 = 100)	index	Employment (1990–91 = 100)	index
1990–91	100		100	
2000–01	165		90	
2010–11	285		71	
2020–21	610		53	

Source: Compiled from Coir Board production data; CDS employment estimates; Raseena (2020); Pratheesh and Nair (2022).

The table reveals a pronounced divergence between output expansion and labour absorption. While output increased more than sixfold between 1990–91 and 2020–21, employment declined by nearly half during the same period. The employment index fell from 100 to 53, confirming that productivity growth in the coir industry has been achieved largely through labour displacement rather than labour augmentation. This decoupling intensified after 2000–01, coinciding with accelerated mechanisation and export diversification.

5.3 Gendered labour displacement and the decline of household production

The employment effects of mechanisation were not evenly distributed across the workforce. Women workers, who historically constituted the core labour force in spinning and weaving, were disproportionately affected by the contraction of household-based production units. Mechanised units demanded different skill sets, spatial mobility, and work rhythms, reducing the compatibility of factory-based employment with the socio-economic conditions of women workers embedded in coastal households.

Empirical studies document a sharp decline in female participation rates within the coir workforce, particularly in regions where household units collapsed following mechanisation. The erosion of home-based employment weakened income security for women workers and disrupted long-standing patterns of livelihood diversification within coastal communities. While mechanisation improved aggregate productivity, it simultaneously narrowed access to employment, reinforcing structural exclusion within the labour market. Available wage studies indicate that mechanised units offer higher nominal wages but employ fewer workers, while declining household units reduce aggregate wage income despite productivity gains.

5.4 Mechanisation, regional relocation, and structural vulnerability

Mechanisation also altered the spatial geography of the coir industry. Rising labour costs, environmental compliance requirements, and unionised labour markets in Kerala encouraged the relocation of mechanised units to neighbouring states with lower regulatory burdens. As a result, while Kerala retained institutional and symbolic centrality in the coir sector, a growing share of production capacity shifted outside the state.

This spatial relocation weakened the historical industrial base of Alappuzha and other coastal centres, amplifying employment decline without proportionate compensation through alternative industrial activities. Mechanisation thus functioned as a dual-edged process: enhancing competitiveness at the national level while intensifying regional vulnerability within Kerala.

6. ENVIRONMENTAL AND OCCUPATIONAL CONSTRAINTS AS ECONOMIC EXTERNALITIES

Environmental degradation associated with traditional retting practices has long constituted a structural constraint on the expansion of the coir industry in Kerala. Retting, which involves soaking coconut husks in backwaters to loosen fibres, generates significant water pollution through the release of organic matter, sulphides, and tannins. While historically treated as an ecological concern, economic studies increasingly recognise retting-related pollution as a negative production externality, imposing social and regulatory costs on the industry.

Empirical assessments document that pollution from retting adversely affected fisheries, potable water sources, and public health in coir-producing regions, leading to heightened regulatory scrutiny and production restrictions [Ambika Devi, 1988; Beevi et al., 2012; Raseena, 2020]. These costs did not enter firm-level accounting but were borne collectively by coastal communities and local governments, creating a divergence between private production costs and social costs.

This divergence can be expressed in standard welfare-economic terms as:

$$MSC = MPC + MEC$$

where

MSC denotes marginal social cost,

MPC marginal private cost, and

MEC marginal external cost associated with pollution and health impacts.

The persistence of retting pollution therefore increased the effective social cost of coir production, constraining the spatial expansion of traditional units even in the absence of market-based penalties. Table 5 summarises key indicators of environmental and occupational externalities associated with traditional coir production.

Table 5. Environmental and Occupational Externalities in Traditional Coir Production

Externality type	Manifestation	Economic implication
Water pollution from retting	Degradation of backwaters and fisheries	Increased regulatory and compliance costs
Occupational health risks	Skin diseases, respiratory ailments	Productivity loss, medical expenditure
Spatial constraints	Restrictions on retting zones	Limits to scale expansion
Community conflict	Opposition from non-coir users	Institutional pressure on production

Source: Ambika Devi (1988); Beevi et al. (2012); Raseena (2020).

The table indicates that environmental and occupational externalities functioned as binding constraints on production, raising the social cost of traditional retting-based systems. Regulatory responses—such as zoning restrictions and pollution control mandates—further limited the viability of labour-intensive household units, accelerating the shift toward mechanised alternatives.

6.1 Mechanised alternatives and cost internalisation

The introduction of mechanised retting and fibre extraction technologies partially internalised environmental externalities by reducing water pollution and health risks. However, these technologies entailed higher fixed capital costs and energy requirements, altering the industry's cost structure. As a result, environmental cost internalisation occurred through capital intensification, rather than through labour-augmenting innovation.

This trade-off can be expressed through a simplified cost comparison:

$$AC_m > AC_t \text{ but } MSC_m < MSC_t$$

where

AC_m = average private cost of mechanised production,

AC_t = average private cost of traditional production,

MSC_m = marginal social cost under mechanisation,

MSC_t = marginal social cost under traditional retting.

While mechanised systems reduced social costs by mitigating pollution, they increased private costs, particularly for small producers. Consequently, only larger

firms with access to capital were able to adopt environmentally compliant technologies, reinforcing structural concentration within the industry.

6.2 Occupational health costs and labour displacement

Occupational hazards associated with traditional coir production—such as prolonged exposure to polluted water, repetitive strain, and respiratory issues—generated hidden economic costs in the form of reduced labour productivity and increased health expenditure. Studies indicate that these health burdens disproportionately affected women workers engaged in spinning and retting activities, contributing to declining labour participation over time [Ambika Devi, 1988; Pratheesh, 2021b; Raseena, 2020].

From an economic perspective, declining effective labour supply can be expressed as:

$$L_e = L - L_h$$

where

L_e is effective labour supply,

L total labour employed, and

L_h labour withdrawn due to health-related incapacity.

As occupational health risks intensified and alternative employment opportunities emerged, effective labour supply in traditional coir units contracted, reinforcing the employment decline documented in earlier sections.

6.3 Externalities, regulation, and structural transition

The interaction between environmental externalities, regulatory intervention, and technological change played a decisive role in shaping the industry's structural transition. Pollution controls and occupational safety concerns increased compliance costs, reducing the competitiveness of traditional production systems. Mechanisation emerged as a response to these constraints, but at the cost of labour displacement and regional relocation.

Thus, environmental and occupational externalities did not merely accompany industrial transition; they actively restructured the industry's development path. By increasing the social cost of labour-intensive production and favouring capital-intensive alternatives, these externalities reinforced the decoupling of growth from employment and contributed to the spatial reorganisation of the coir industry beyond Kerala. The quantitative indicators presented in this section are descriptive and compiled from multiple secondary sources. While they do not permit causal inference, their consistency across datasets strengthens the robustness of the observed structural patterns.

7. DISCUSSION

The findings of this study reveal a fundamental paradox at the heart of the coir industry's contemporary development trajectory. On the one hand, the industry has achieved sustained export growth, rising productivity, and enhanced global competitiveness. On the other hand, these gains have been accompanied by employment contraction, labour displacement, and heightened regional vulnerability within Kerala's traditional coir districts. This duality reflects a broader tension within development processes in labour-intensive industries undergoing market-driven structural transformation.

From an economic history perspective, this outcome is not anomalous. The coir industry's evolution has been shaped by successive regimes of accumulation: colonial export integration, post-independence labour-absorbing protectionism, and post-liberalisation competitiveness-oriented restructuring. Each regime redefined the relationship between trade, technology, and labour. The current phase represents a decisive shift away from employment-centred industrial organisation toward productivity-driven growth, consistent with patterns observed in other traditional export sectors in the Global South.

The export-led restructuring documented in Section 4 demonstrates that growth in the coir industry is increasingly value-driven rather than volume-driven. Rising unit values, product diversification, and the expansion of application-specific eco-products indicate a successful transition toward higher-value market segments. However, this transition has weakened the historical employment elasticity of output, as confirmed by the widening divergence between export growth and labour absorption. In development economics terms, the industry has moved from a labour-intensive comparative advantage to a productivity-based competitive advantage, with significant distributional consequences.

Mechanisation, analysed in Section 5, emerges as the central mediating mechanism in this transition. While technological upgrading improved efficiency and enabled compliance with export standards, it also reconfigured production away from household-based and cooperative units toward capital-intensive, firm-led systems. The resulting productivity gains were achieved primarily through labour displacement rather than skill upgrading or employment expansion. This pattern challenges optimistic assumptions that technological modernisation in traditional industries will automatically generate inclusive growth.

Environmental and occupational constraints, examined in Section 6, further complicate the development narrative. Pollution from traditional retting practices and occupational health risks functioned as negative externalities that raised the social cost of labour-intensive production. Regulatory responses and environmental compliance pressures incentivised mechanisation, thereby internalising externalities at the cost of employment. The coir industry's structural transition thus reflects not only market forces but

also the economic consequences of environmental regulation and public health concerns.

Taken together, these dynamics illuminate a critical tension within the Sustainable Development Goal 8 framework. While the coir industry contributes to economic growth through exports and productivity gains, it simultaneously undermines the goal of decent and inclusive employment. Growth and employment, which historically moved together in the coir economy, have become increasingly decoupled. This decoupling highlights the limitations of growth-centric development strategies when applied to traditional, labour-absorbing industries embedded in fragile regional economies.

Importantly, the findings caution against interpreting the coir industry's transformation as either success or failure in isolation. Instead, the transition represents a redistribution of economic benefits across space, firms, and labour categories. While export competitiveness has improved at the national level, the costs of adjustment have been disproportionately borne by women workers, household producers, and coastal regions such as Alappuzha. This uneven distribution underscores the need for development frameworks that integrate productivity growth with labour protection and regional resilience.

The discussion also reinforces the value of an economic-history approach to development analysis. By situating contemporary outcomes within long-run structural trajectories, the study demonstrates that current employment and environmental challenges are not merely transitional frictions but the cumulative result of historical policy choices, institutional arrangements, and market integration patterns. Understanding these trajectories is essential for designing policy interventions that balance growth with social sustainability.

7.1 Limitations and Directions for Future Research

This study is based on secondary data and descriptive quantitative indicators compiled from multiple sources. While this approach enables a long-run, structural analysis, it does not permit causal estimation or firm-level productivity measurement. Future research could extend this work through micro-level studies of wage dynamics, skill transitions, and inter-regional relocation patterns within the coir industry. Comparative analyses across traditional industries facing similar transitions would also deepen understanding of how growth–employment trade-offs unfold in different institutional and regional contexts.

8. CONCLUSION AND POLICY IMPLICATIONS

This study examined the long-run transformation of Kerala's coir industry—historically centred in Alappuzha—through an economic history and development economics lens. By integrating export trends, production restructuring, labour outcomes, and environmental constraints, the analysis demonstrated that the industry's contemporary growth

trajectory is characterised by a structural decoupling of economic expansion from employment generation. Export-led competitiveness, mechanisation, and environmental cost internalisation have together reshaped the coir economy in ways that challenge conventional assumptions about inclusive growth in traditional industries.

The findings show that export growth has increasingly been driven by value addition and product diversification rather than by expansion of labour-intensive production. Mechanisation enabled productivity gains and compliance with global market requirements but simultaneously reduced labour absorption, particularly within household-based and cooperative production systems. Environmental and occupational externalities further reinforced this transition by raising the social cost of traditional production methods and incentivising capital-intensive alternatives. These dynamics collectively explain why the coir industry now exhibits strong performance in trade and output indicators while experiencing sustained employment contraction.

From a development perspective, the coir industry's trajectory highlights the limits of growth-centred strategies when applied to historically labour-absorbing sectors. While the industry contributes to foreign exchange earnings and ecological product markets, it no longer functions as a broad-based employment generator for Kerala's coastal economy. This outcome underscores a central tension within the pursuit of Sustainable Development Goal 8: economic growth and decent work do not automatically reinforce one another, particularly in sectors undergoing market-driven structural transformation.

The analysis suggests that policy interventions aimed solely at enhancing export competitiveness or technological upgrading are insufficient to address the distributive consequences of industrial transition. Without complementary measures to support labour re-skilling, income security, and the viability of smaller production units, productivity-driven growth risks deepening regional and social inequalities. At the same time, environmental sustainability remains a non-negotiable constraint, implying that any employment-oriented interventions must operate within stricter ecological and occupational standards.

By situating these outcomes within a long-run economic history framework, the study demonstrates that the challenges facing the coir industry are not transitory adjustment costs but the cumulative result of historical trade integration, institutional arrangements, and policy choices. Recognising this historical embeddedness is essential for designing development strategies that reconcile competitiveness with social sustainability in traditional industries.

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