

SUSTAINABILITY PRACTICES AND THEIR IMPACT ON OPERATIONAL EFFICIENCY: A STUDY OF WET GRINDER MANUFACTURING UNITS

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ABSTRACT

The current modern manufacturing has brought about the concept of sustainability, because of the global worries on resource depletion, environmental degradation, and increase in the cost of operations. Sustainable practices that are being embraced by industries include energy conservation, minimization of wastes and water conservation to meet the environmental stipulation as well as enhance competitiveness. When applied in the context of manufacturing, sustainability can be viewed as an ethical concern as well as a strategy aimed at improving productivity and reducing costs. Wet grinder manufacturing industry is a prosperous industry with associated challenges in terms of utilizing resources and efficiency in its operations. The conventional production methods usually consume a large amount of energy and waste of materials which may cause high cost and environmental implications. The proposed sustainability practices in the sector have the potential to overcome these difficulties through maximum utilization of resources, minimization of waste, and increased performance in operations. Nonetheless, there is weak empirical evidence on the effectiveness of such practices in this industry.

Keywords: Sustainability Practices, Operational Efficiency, Wet Grinder Manufacturing, Energy Conservation, Waste Reduction, Water Management, Cost Efficiency, Resource Utilization.

INTRODUCTION

The issue of sustainability has become a very important consideration in the contemporary production due to the present international concern of the dwindling of resources, environmental damage, and increased company expenses. The adoption of sustainable practices like energy efficiency, reduction of waste, and water conservation is on the rise among industries in a bid to meet the environmental requirements and enhance competitiveness. Sustainability in relation to the manufacturing process is not a mere corporate obligation but a further business strategy to improve productivity and minimize expenses.

The wet grinder manufacturing business is a big industry in Tamil Nadu and has problems to do with the utilization of resources and efficiency of its operation. Conventional production processes may be characterized by a lot of energy use and wastage of materials that may result in higher costs and environmental effects. The challenges can be mitigated through the realization of sustainability in this industry to ensure there is maximization of resource utilization, minimization of wastes, and enhancement of the overall performance of the operations. Nonetheless, there is little empirical data concerning the effectiveness of such practices in this industry.

This paper has reviewed how sustainability practices influence operational efficiency in wet grinder manufacturing plants. The study aimed to identify whether the use of sustainable actions results in the measurable advances in cost-efficiency and the use of resources by analyzing the data of 150 units. The results will offer useful information to manufacturers, policymakers and stakeholders in supporting sustainable production methods that lead to economic and environmental objectives.

STATEMENT OF THE PROBLEM

The wet grinder production business is critical in addressing both domestic and commercial demands but suffers major challenges as pertaining to resource exploitation, escalating production cost, and environmental influence. Conventional methods of manufacturing usually consume a lot of energy, pollute water, and waste a lot of material thus not only raising the cost of operations but also appearing in the sustainability issue. The application of sustainability practices, including energy-saving behavior, waste management and water saving, is one of the widely debated topics in manufacturing industries throughout the world, but its application and performance in the wet grinder industry has not been studied extensively. It has no empirical evidence on whether these practices result in quantifiable gains on operational efficiency in terms of cost of production and resource utilization. This knowledge gap generates confusion among the manufacturers and policy makers in the adoption of sustainable strategies. Thus, it is necessary to explore how far the sustainability practices can affect the efficiency of operations in the wet grinder manufacturing units.

SCOPE OF THE STUDY

- ❖ The research was limited to wet grinder production facilities with the aim of examining how sustainability issues like energy saving, waste, and water management affect the operational efficiency indicators, which include the cost of production, cycle time, and the use of resources.
- ❖ The study also sought to get a general approach on sustainability adoption in varying scales of operations. The analysis was conducted on the internal operational areas, excluding the external forces like the sustainability of the supply chains or customer attitudes.
- ❖ The results are to give practical information to the manufacturers and other stakeholders on how to improve the efficiency of the sector through sustainable manufacturing in the wet grinder sector.

REVIEW OF LITERATURE

Kishore, K., Sinha, M. K., et.al., (2022) examined the historical background, modern trends, and outlook of the grinding process focusing on the aspects of sustainability and technological innovations. The systematic literature review approach was taken. Relevant references were located, classified, and discussed to learn the history of the grinding technology, the present trends which include cryogenic cooling, hybrid lubrication, and textured grinding wheels, as well as the future. The findings showed that there was very little research that had been conducted to record the historical and futuristic features of grinding. The existing studies focused on the methods of ecology, including minimum quantity lubrication and cryogenic cooling, whereas the full-scale technologies, including ultrasonic grinding, 3D-printed grinding tools, and AI use, presented the opportunities. Also recycling of grinding swarf into composite materials was found to be an important area of research in the future.

Elrayah, M., and Keong, O. C. (2023) investigated how sustainable operational practices affect sustainable operational performance, and they took into consideration that there is a moderating effect of green technology adoption in the Saudi Arabian textile industry. A sample of 250 employees in the textile companies in Saudi Arabia was used to collect data with the help of the self-administered questionnaire. The research design used was a cross-sectional study with a quantitative approach. The relationships were tested with the help of PLS-SEM and statistical analysis. The findings indicated that operational performance was positively influenced by internal lean practices, quality management, customer and supplier integration as well as internal business processes and were statistically significant. Additionally, the use of green technology served as a substantive moderator, which enhanced the effect of sustainable practices on operational performance.

Nwamekwe, C. O., et.al., (2025) researched the implementation of green manufacturing and its effect on sustainable industrial development in Anambra State, Nigeria. The study targeted the local businesses and how they have incorporated sustainable production practices such as the use of renewable energy, lean production, waste minimization, and the use of environmentally friendly materials. The research adopted an exploratory strategy. The findings showed that the big companies had gone a long way installing solar panels, streamlining processes and meeting export-oriented eco-media. Small and medium-sized enterprises (SMEs) on the other hand were hit by high capital requirements, poor technical skills, old technology, and ineffective enforcement of policies. Nevertheless, it was demonstrated that green practices provide significant benefits, such as the reduction of greenhouse gas emissions and material waste up to 1520, the decrease of energy costs, the possibility of entering the green product markets, and the new working places in waste management, renewable energy, and environmental consulting.

Alinda, K., et.al., (2022) examined the opportunities and challenges on the adoption of sustainability practices (SPs) by manufacturing companies in Uganda. The research was founded on the analysis of the existing scientific, technical, and government policy papers. The research design used was qualitative, based on a review approach to analyse available literature and policy documents. The findings showed that the implementation of the existing environmental legislation and policies, awareness to customers, technology advancement, organizational values, and stringent governance were found to be succinic motivating factors to the adoption of SPs in Uganda. Nevertheless, poor laws and implementation in certain cases, insufficient resources to invest in new technologies, expensive funds to finance, organizational culture, and even poor awareness were the primary challenges. Policy implications were also given to help alleviate these challenges especially in a least developed country.

OBJECTIVES OF THE STUDY

- ❖ To understand the sustainability practices that are used by manufacturing units of wet grinders.
- ❖ To evaluate the effect of sustainability programs on overall business performance of wet grinder units.
- ❖ To study the barriers to adopting sustainable practices by manufacturers.

RESEARCH METHODOLOGY

Research Type: Descriptive research.

Data Collection

Primary Data: The data was collected in wet grinder manufacturing units directly through a structured questionnaire.

Secondary Data: Published journals, industry reports, government publications, and online sources devoted to sustainable manufacturing and efficiency.

Type of Sampling: Convenience Sampling.

Sampling Universe: The sampling universe comprised of all wet grinder manufacturing units that have embraced sustainability practice in their operations or contemplated the practices.

Sample Size: 150 respondents.

Statistical Tests: Percentage Analysis, Descriptive Statistics, ANOVA.

LIMITATIONS OF THE STUDY

- ❖ The research was also limited to wet grinder production units alone and not other related industries.
- ❖ The study concentrated on internal operational efficiency alone.
- ❖ The analysis did not incorporate external elements like market conditions, government policies, and technological progress.

DATA ANALYSIS AND INTERPRETATION

Demographic Profile of the Respondents

Demographic Profile	Particulars	Frequency	Percent
Gender	Male	85	56.7
	Female	65	43.3
Age Group	Below 25 years	47	31.3
	25–34 years	18	12.0
	35–44 years	24	16.0
	45–54 years	35	23.3
	More Than 55 years	26	17.3
Highest Educational Qualification	Higher Secondary	18	12.0
	Diploma / ITI	38	25.3
	UG	35	23.3
	PG	36	24.0
	Professional / Technical	23	15.3
Designation in the firm	Owner / Proprietor	26	17.3
	Partner / Director	21	14.0
	General Manager / Factory Manager	48	32.0
	Production / Operations Manager	29	19.3
	Other	26	17.3
Experience in the Wet Grinder Industry	Less than 5 years	47	31.3
	5–10 years	18	12.0
	11–15 years	24	16.0
	16–20 years	35	23.3
	More than 20 years	26	17.3
	Total	150	100.0

Out of the 150 respondents 56.7% were males and 43.3% were females. Regarding the age, 31.3% were under the age of 25 years, 12% were between 25 and 34 years, 16% were between 35 and 44 years, 23.3% were between 45 to 54 years and 17.3% were over 55 years. In terms of education, 12% had higher secondary education, 25.3% had diploma or ITI certificate, 23.3% had a UG degree, 24% had a PG degree and 15.3% had professional or technical qualification.

With regard to organizational positions, 17.3% were owners or proprietors, 14% were partners or directors, 32% were general or factory manager, 19.3% were production or operations manager and 17.3% occupied other positions. The experience of the respondents in the wet grinder industry was a mixed experience as 31.3% had less than 5 years of experience, 12% had experience of 5 years -10 years, 16% had 11-15 years, 23.3% had 16-20 years and 17.3% experience of over 20 years.

Firm-Level Profile of the Respondents

Firm-Level Profile	Particulars	Frequency	Percent
Type of Ownership	Proprietorship	26	17.3
	Partnership	24	16.0
	Private limited company	36	24.0
	Public limited company	35	23.3
	Others	29	19.3
Nature of Business	Manufacturer (complete units)	15	10.0
	Manufacturer–cum–assembler	30	20.0
	Component / parts manufacturer	21	14.0
	Job work / subcontractor	53	35.3
	OEM supplier to other brands	31	20.7
Number of Employees	Up to 10 (micro)	26	17.3

	11–50 (small)	37	24.7
	51–250 (medium)	52	34.7
	More than 250 (large)	35	23.3
Quality and environmental certifications held by the firm	ISO 9001 (Quality Management)	39	26.0
	ISO 14001 (Environmental Management)	29	19.3
	ISO 45001 / OHSAS 18001 (Health & Safety)	13	8.7
	Other certifications	40	26.7
	No formal certification	29	19.3
	Total	150	100.0

Among the 150 respondents surveyed in the wet grinder industry reveal types of ownership structures, with private limited companies (24%), public limited companies (23.3%), proprietorships (17.3%), partnerships (16.0%), and others (19.3%). Regarding the nature of business activities, 35.3% of firms are engaged in job work or subcontracting, 20.7% are OEM suppliers, 20% operate as manufacturer-cum-assemblers, 14% manufacture components or parts, and 10% are complete unit manufacturers.

The scale of firms shows that medium-sized firms (51–250 employees) at 34.7%, large firms (more than 250 employees) at 23.3%, small firms (11–50 employees) at 24.7%, and micro firms (up to 10 employees) at 17.3%. Quality and environmental certifications were held with ISO 9001 (Quality Management) certification observed in 26% of firms, other certifications in 26.7%, ISO 14001 (Environmental Management) in 19.3%, ISO 45001 or OHSAS 18001 (Health and Safety) in 8.7%. and 19.3% of firms reported having no formal certification.

Descriptive Statistics for the Sustainability Practices adopted by the Wet Grinder Manufacturing Units

Particulars	N	Mean	SD
Energy Efficiency			
Energy-efficient motors and machinery are used in the unit.	150	3.37	1.287
Regular energy audits are conducted to reduce power consumption.	150	3.23	1.434
Renewable energy sources (e.g., solar) are integrated into operations.	150	2.91	1.348
Waste Management			
Metal scraps and defective parts are recycled.	150	3.28	1.471
Granite stones and packaging materials are reused or disposed of responsibly.	150	2.81	1.449
Waste reduction practices have improved production efficiency.	150	2.89	1.412
Water Conservation			
Water recycling systems are implemented in processes.	150	3.21	1.333
Rainwater harvesting is practiced in the unit.	150	2.93	1.238
Water conservation measures have reduced operational costs.	150	2.94	1.254
Compliance & Standards			
The unit complies with ISO 14001 or similar environmental standards.	150	2.96	1.225
Local pollution control norms are strictly followed.	150	2.99	1.258
Sustainability compliance has enhanced brand image.	150	2.94	1.512
Valid N (list wise)	150		

The above table indicates that the respondents disagree with the renewable energy sources are integrated into operations (2.91), granite stones and packaging materials are reused or disposed of responsibly (2.81), waste reduction practices have improved production efficiency (2.89), water conservation measures have reduced operational costs (2.94), unit complies with iso 14001 or similar environmental standards (2.96), local pollution control

norms are strictly followed (2.99) and sustainability compliance has enhanced brand image (2.94). The respondents agree with energy-efficient motors and machinery are used in the unit (3.37), regular energy audits are conducted to reduce power consumption (3.23), metal scraps and defective parts are recycled (3.28) and water recycling systems are implemented in processes (3.21).

Descriptive Statistics for the Sustainability Practices adopted by the Wet Grinder Manufacturing Units

Particulars	N	Mean	SD
Sustainability practices have reduced production costs and improved product quality.	150	2.49	1.299
Adoption of sustainability practices has increased customer trust and sales.	150	2.85	1.276
Sustainability practices have improved compliance with regulatory requirements.	150	3.12	1.247
Adoption of sustainability has opened new business opportunities (e.g., exports, certifications).	150	3.02	1.234
Sustainability initiatives have strengthened relationships with suppliers and stakeholders.	150	2.91	1.290
Sustainability practices have positively influenced financial performance.	150	3.07	1.280
Valid N (list wise)	150		

The above table indicates that the respondents disagree with the sustainability practices have reduced production costs and improved product quality (2.49), adoption of sustainability practices has increased customer trust and sales (2.85) and sustainability initiatives have strengthened relationships with suppliers and stakeholders (2.91). The respondents agree with sustainability practices have improved compliance with regulatory requirements (3.12), adoption of sustainability has opened new business opportunities (3.02) and sustainability practices have positively influenced financial performance (3.07).

Descriptive Statistics for the Challenges in adopting Sustainable Practices among Wet Grinder Manufacturing Units

Particulars	N	Mean	SD
High initial investment costs prevent us from adopting sustainable practices.	150	2.93	1.238
Lack of financial incentives or subsidies discourages sustainability efforts.	150	2.91	1.220
Lack of awareness about sustainable manufacturing practices among staff.	150	2.99	1.212
Government regulations on sustainability are unclear or difficult to comply with.	150	2.99	1.198
Lack of enforcement of sustainability standards reduces motivation.	150	3.07	1.278
Collaboration with supply chain partners for sustainability is difficult.	150	2.93	1.238
Valid N (list wise)	150		

The above table indicates that the respondents disagree with the high initial investment costs prevent us from adopting sustainable practices (2.93), lack of financial incentives or subsidies discourages sustainability efforts (2.91), lack of awareness about sustainable manufacturing practices among staff (2.99) and government regulations on sustainability are unclear or difficult to comply with them. The respondents agree with the lack of enforcement of sustainability standards reduces motivation (3.07).

Comparison between the Demographic Profile (Designation in the firm) of the Respondents and Various Dimensions

H₀₁: There is a substantial link between the demographic profile (designation in the firm) of the respondents and various dimensions.

Dimensions	Designation in the firm	N	Mean	SD	F	Sig
Energy Efficiency	Owner / Proprietor	26	2.94	1.033	9.824	0.000
	Partner / Director	21	2.29	0.805		
	General Manager / Factory Manager	48	3.24	1.060		
	Production / Operations Manager	29	3.94	0.667		
	Other	26	3.10	1.023		
	Total	150	3.17	1.057		
Waste Management	Owner / Proprietor	26	3.37	0.886	2.525	0.043
	Partner / Director	21	2.63	0.722		
	General Manager / Factory Manager	48	3.00	0.862		
	Production / Operations Manager	29	3.13	1.033		
	Other	26	2.74	1.060		
	Total	150	2.99	0.939		
Water Conservation	Owner / Proprietor	26	2.76	0.830	1.753	0.141
	Partner / Director	21	2.92	0.698		
	General Manager / Factory Manager	48	3.06	0.696		
	Production / Operations Manager	29	3.08	0.640		
	Other	26	3.26	0.744		
	Total	150	3.02	0.727		
Compliance & Standards	Owner / Proprietor	26	2.99	0.733	1.704	0.152
	Partner / Director	21	2.71	0.694		
	General Manager / Factory Manager	48	3.02	0.719		
	Production / Operations Manager	29	3.20	0.789		
	Other	26	2.77	0.908		
	Total	150	2.96	0.775		
Impact of Sustainability Initiatives on Overall Business Performance of Wet Grinder Units	Owner / Proprietor	26	3.04	0.463	1.385	0.242
	Partner / Director	21	2.79	0.460		
	General Manager / Factory Manager	48	2.93	0.496		
	Production / Operations Manager	29	2.79	0.519		
	Other	26	2.99	0.551		
	Total	150	2.91	0.503		
Challenges in adopting Sustainable Practices among	Owner / Proprietor	26	2.99	0.448	0.308	0.872
	Partner / Director	21	2.95	0.483		
	General Manager / Factory Manager	48	3.02	0.479		

Wet Grinder Manufacturing Units	Production / Operations Manager	29	2.92	0.438		
	Other	26	3.03	0.516		
	Total	150	2.99	0.469		

There is a substantial link between water conservation (0.141), compliance & standards (0.152), impact of sustainability initiatives on overall business performance of wet grinder units (0.242), challenges in adopting sustainable practices among wet grinder manufacturing units (0.872) and the designation of the respondents. There is no substantial link between energy efficiency (0.000), waste management (0.043) and the designation of the respondents.

Energy Efficiency

The results indicated that production/operations managers (3.94) agreed most strongly with energy efficiency practices, partners/directors (2.29) showed the least agreement. overall, the total mean (3.17) indicates a neutral to slightly positive perception of energy efficiency across respondents.

Waste Management

The analysis revealed that the highest agreement was observed among owners/proprietors (3.37), indicating moderate agreement, partners/directors (2.63) reported the lowest agreement. the overall mean (2.99) reflects a neutral stance toward waste management practices.

Comparison between the Firm-Level Profile (Nature of Business) of the Respondents and Various Dimensions

Ho2: There is a substantial link between the firm-level profile (nature of business) of the respondents and various dimensions.

Dimensions	Nature of Business	N	Mean	SD	F	Sig
Energy Efficiency	Manufacturer (complete units)	15	2.20	0.602	60.519	0.000
	Manufacturer-cum-assembler	30	1.84	0.566		
	Component / parts manufacturer	21	3.08	0.614		
	Job work / subcontractor	53	3.87	0.481		
	OEM supplier to other brands	31	3.76	0.974		
	Total	150	3.17	1.057		
Waste Management	Manufacturer (complete units)	15	3.42	0.938	3.389	0.011
	Manufacturer-cum-assembler	30	2.59	0.834		
	Component / parts manufacturer	21	2.83	0.417		
	Job work / subcontractor	53	3.22	0.920		
	OEM supplier to other brands	31	2.90	1.159		
	Total	150	2.99	0.939		
Water Conservation	Manufacturer (complete units)	15	2.84	0.785	0.253	0.907
	Manufacturer-cum-assembler	30	3.04	0.677		
	Component / parts manufacturer	21	3.03	0.706		
	Job work / subcontractor	53	3.04	0.832		
	OEM supplier to other brands	31	3.05	0.584		
	Total	150	3.02	0.727		
Compliance & Standards	Manufacturer (complete units)	15	2.78	0.783	4.264	0.003
	Manufacturer-cum-assembler	30	2.70	0.583		
	Component / parts manufacturer	21	2.83	0.807		

	Job work / subcontractor	53	3.30	0.747		
	OEM supplier to other brands	31	2.83	0.807		
	Total	150	2.96	0.775		
Impact of Sustainability Initiatives on Overall Business Performance of Wet Grinder Units	Manufacturer (complete units)	15	2.86	0.338	0.153	0.961
	Manufacturer-cum-assembler	30	2.88	0.613		
	Component / parts manufacturer	21	2.90	0.374		
	Job work / subcontractor	53	2.92	0.470		
	OEM supplier to other brands	31	2.96	0.598		
	Total	150	2.91	0.503		
Challenges in adopting Sustainable Practices among Wet Grinder Manufacturing Units	Manufacturer (complete units)	15	3.04	0.429	0.330	0.857
	Manufacturer-cum-assembler	30	3.04	0.512		
	Component / parts manufacturer	21	3.03	0.529		
	Job work / subcontractor	53	2.97	0.427		
	OEM supplier to other brands	31	2.93	0.492		
	Total	150	2.99	0.469		

There is a substantial link between water conservation (0.907), impact of sustainability initiatives on overall business performance of wet grinder units (0.961), challenges in adopting sustainable practices among wet grinder manufacturing units (0.857) and the designation of the respondents. There is no substantial link between energy efficiency (0.000), waste management (0.011), compliance & standards (0.003) and the designation of the respondents.

Energy Efficiency

There was a statistically significant difference in energy efficiency perceptions among business types, Job work/subcontractors (3.87) and OEM suppliers (3.76) reported higher agreement with energy efficiency practices, manufacturer-cum-assemblers (1.84) and complete unit manufacturers (2.20) showed disagreement, indicating lower adoption of such practices.

Waste Management

A significant difference was found in waste management practices across business types, Complete unit manufacturers (3.42) agreed most strongly, manufacturer-cum-assemblers (2.59) disagreed. The other groups were neutral implying that they were moderately involved in the waste management efforts.

Compliance & Standards

The compliance and standards were also very different between the types of businesses with Job work/subcontractors (3.30) being more inclined to agreement and hence able to adhere more to compliance norms, whilst the other groups like manufacturer-cum-assemblers (2.70) and complete unit manufacturers (2.78) were disagree.

FINDINGS

Demographic profile of the Respondents

Majority of the respondents were males and under the age of 25 years. Majority of the respondents had Diploma/ITI qualification. Majority of the respondents were General Managers or Factory Managers. The majority of the respondents were within the 5 years' experience in the wet grinder industry.

Firm-Level Variables of the Respondents

Majority of the respondents were job work/subcontractors. The largest percentage of the respondents was medium-sized consisting of 51-250 staff. The majority of the respondents were the companies which are privately limited. A majority of the respondents were ISO 9001

or other quality certified. The majority of the respondents observed the fundamental environmental requirements but were not fully certified to be sustainable.

SUGGESTIONS

- ❖ Manufacturers can embrace use of energy-efficient motors and equipment's to minimize use of electricity.
- ❖ Solar panels could be implemented as renewable sources of energy to reduce carbon emissions.
- ❖ Firms can use systematic recycling of metal scrap and defect parts to reduce wastes.
- ❖ In order to save water resources, the water recycling systems can be implemented in the manufacturing processes.
- ❖ Harvesting of rainwater may also be taken in to meet water demand and save money.
- ❖ Companies can organize training courses to their staff members that would generate awareness on sustainable manufacturing processes.
- ❖ Governmental institutions may provide subsidies or monetary rewards to promote the implementation of sustainability.
- ❖ Manufacturers can adhere to ISO 14001 and other environmental regulations to enhance their credibility and accessibility to the market.
- ❖ The cooperation with suppliers could assist in the exchange of sustainability best practices and resources.
- ❖ Companies can come up with gradual implementation strategies to defeat the challenge of heavy initial capital outlay.
- ❖ The marketing strategies could be connected with sustainability programs to develop brand image and gain customers.
- ❖ Producers can consider the use of green certifications in order to get new markets and export possibilities.
- ❖ The industry associations can hold workshops and seminars about sustainable manufacturing to popularize it.
- ❖ Companies could implement the use of digital surveillance to monitor energy and water consumption.
- ❖ Reliable sustainability solutions could be developed by manufacturers working with research institutions.
- ❖ Government regulations can be explicated and implemented to make sure that the regulations are followed in the entire industry.

CONCLUSION

The research article showed that the sustainability practices can be measured with reference to the operational efficiency within wet grinder manufacturing units. Companies that implemented energy efficient technologies, waste management systems and water conservation practices recorded reduction in cost and resource use. The practices also played a role in adherence to environmental standards, which made the firms to have greater credibility in the market.

Although those are positive, the study found that a number of challenges prevent the widespread implementation of sustainability programs. The biggest barriers were high startup costs, absence of financial motivation, and the ignorance of the employees. Also, the small companies did not experience a lack of necessity to adopt more sophisticated technologies and comply with the regulations, indicating the necessity of special assistance and capacity-building interventions.

Generally, the results underscore the fact that sustainability is not simply an environmental requirement but a business instrument of enhancing operational performance and competitiveness. The co-operative action between manufacturers, industry associations, and policymakers can assist in the elimination of the current challenges by providing financial

assistance, training and regulatory clarity. The wet grinder industry can help enhance economic growth in the long term by adopting sustainable practices that can lead to the conservation of the environment.

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