SUSTAINABLE E-GROCERY IN INDIA: CONSUMER BEHAVIOR AND STRATEGIC IMPERATIVES

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Abstract

This study explores the integration of sustainability practices within India's rapidly growing online grocery (e-grocery) sector, analyzing how companies are leveraging green initiatives to attract and retain customers, thereby influencing consumer behavior and strategic decision-making. Through a comprehensive literature review and bibliometric analysis of Scopus databases, the research identifies key areas such as packaging, delivery, and sourcing where firms implement eco-friendly practices. The findings highlight that sustainability significantly influences consumer purchasing decisions, acting as a crucial competitive differentiator and enhancing brand loyalty. This research further underscores the need for retailers to expand sustainability efforts, leading to lower environmental impact, stronger customer loyalty, and more resilient supply chains. Drawing parallels with similar trends in Thailand's e-commerce and food delivery sectors, this study emphasizes the broader significance of sustainable practices across Asia's emerging economies. By connecting findings in India with research in Thailand, a regional perspective is offered, showing how digital platforms and consumer behavior are evolving to support sustainability. While acknowledging the limitations of its India-centric focus, the study recommends further research to evaluate the long-term effectiveness of these initiatives and assess their scalability to other emerging markets. This research provides valuable insights for businesses, policymakers, and academics seeking to promote sustainable practices within the e-grocery sector in India and across the dynamic landscape of Asia's emerging economies.
Keywords: E-Grocery, Sustainability, Consumer Behavior, Green Marketing, India

Introduction

India's digital economy is on an exciting growth trajectory, projected to reach $1 trillion by 2025, largely fueled by an e-commerce boom. With over 700 million internet users, nearly half now engage in digital transactions, with online grocery shopping leading this change, experiencing a major surge during the COVID-19 pandemic. The Indian online grocery market, valued at $2.9 billion in 2020, is expected to skyrocket to $38.9 billion by 2028, boasting a compound annual growth rate (CAGR) of 37.1%. This growth is driven by increasing internet access, smartphone adoption, a rising middle class, and demand for convenience and variety. Despite typically low profit margins, this sector holds enormous long-term potential, prompting fierce competition and driving companies to improve customer experiences with better deals, personalized services, and AI-enhanced supply chain management. Major players are also aggressively expanding into Tier-II and semi-urban areas, often partnering with local kirana stores to provide wider product ranges and quicker delivery.

However, sustainability is becoming a key consideration in India's growing e-grocery scene, influencing both consumer shopping habits and business operations. Even though traditional unorganized retail persists, the surge in organized formats and e-commerce, especially during the pandemic, has pushed consumers toward online grocery shopping. Young consumers are particularly influenced by eco-labeling (Hallez et al., 2021), and digital nudging encourages more sustainable choices (Berger et al., 2020), though the impact of green certifications can differ across cultures (Wang, 2022). Operational innovations, such as optimized delivery routes, can reduce emissions (Astashkina et al., 2019), demonstrating that sustainability can be good business.

Despite this, challenges remain, including balancing price sensitivity with eco-friendly options (Klepek & Bauerová, 2020), improving supply chain transparency with technologies like blockchain, and tackling misinformation surrounding sustainable products (Güsken et al., 2019). Therefore, future studies should explore generational perspectives on sustainability, the long-term effects of eco-initiatives, and the development of solid environmental impact metrics.

To address these challenges and gain deeper insights, this research dives into five key aspects of sustainability within India's e-grocery sector: (1) evaluating sustainable packaging solutions and strategies to cut down on waste; (2) assessing green logistics through electric vehicle adoption, optimized delivery routes, and improved last-mile delivery models; (3) investigating ethical sourcing practices through partnerships between farmers and kirana stores; (4) examining consumer behavior and reactions to digital nudges for sustainability; and (5) aiming to create a circular economy framework tailored to India's unique market conditions. This study employs a mixed-methods approach, starting with a comprehensive review of relevant literature to identify key themes and research gaps. This is followed by a bibliometric analysis using the Scopus database to examine existing research trends in the e-grocery sector, including keyword co-occurrence analysis with VOSviewer. By addressing these key areas, this analysis aims to offer valuable insights for transforming the sector sustainably.

Literature Review

Sustainability is rapidly becoming a defining force in India's burgeoning e-grocery sector, influencing both consumer behavior and business strategies. While traditional, unorganized retail still holds a presence, the surge in organized formats and e-commerce, accelerated by the COVID-19 pandemic, has driven consumers towards online grocery platforms. Young consumers are particularly responsive to eco-labeling (Hallez et al., 2021), and digital nudging is proving effective in encouraging sustainable choices (Berger et al., 2020), though cultural variations influence the impact of green certifications (Wang, 2022). Operational innovations

like optimized delivery routes offer emission reductions of 8-41% (Astashkina et al., 2019), highlighting the potential for sustainability to drive business value.

However, e-grocery businesses face numerous challenges in balancing sustainability with affordability, as price sensitivity remains a significant factor among Indian consumers (Klepek & Bauerová, 2020). Enhancing supply chain transparency through technologies like blockchain and combating misinformation about sustainable products are also critical (Güsken et al., 2019). Existing literature suggests a need to explore generational differences in perceptions of sustainability, assess the long-term effects of eco-initiatives, and develop robust metrics for measuring environmental impact.

Several theoretical frameworks offer valuable lenses for examining sustainability in this context. Stakeholder theory (Freeman, 1984) emphasizes the importance of considering the needs of all stakeholders, while the Triple Bottom Line (Mirabella & Kässi, 2017) framework advocates for balancing social, environmental, and economic outcomes. Systems thinking (Meadows, 2008) and circular economy principles (Bocken et al., 2016) further stress the importance of reducing waste and promoting recycling. Life cycle assessment (Lee et al., 2018) provides a comprehensive approach for evaluating environmental impacts from sourcing to delivery. In addition, the shared economy theory (Gulati et al., 2021) promotes resource efficiency, aligning with sustainable supply chain management principles (McManus & Seville, 2019). Social innovation theory (Murray et al., 2010) inspires groundbreaking solutions, while behavior change theories (Ajzen, 1991; Prochaska & Velicer, 1997) play a role in encouraging consumers to adopt sustainable practices. Finally, resilience theory (Walker et al., 2004) promotes adaptive strategies.

This research looks at how Indian online grocery services are adapting global sustainability ideas to fit local realities. Instead of solely focusing on profit, as often seen in Western companies, Indian businesses prioritize societal well-being. They often collaborate with local small stores, even if it means lower profits. Moreover, recycling efforts in India often rely on informal waste collectors, reducing the need for complex, formal recycling systems. Initiatives like Big Basket's collaboration with farmers demonstrate how digital platforms can build fairer supply chains, prioritizing the interests of all stakeholders. While Indian shoppers value sustainability, their price sensitivity and the dispersion of supply chains necessitate affordable, innovative solutions, such as digital receipts. Given partnerships with local stores and regulatory gaps, the private sector is taking the lead in sustainability. This suggests that global sustainability plans must adapt to local contexts, emphasizing people alongside profit and planet. Recycling efforts should include the informal sector, and consumer behavior strategies should consider the desire for cost savings. Further studies are needed to assess the applicability of these ideas in other growing markets.

To truly grasp the nuances of sustainability in online grocery businesses, we adopt a multi-theoretical lens. Figure 1 presents a model that links sustainability practices (packaging, delivery, sourcing) to consumer behavior (loyalty, willingness-to-pay, repurchase intent) and business outcomes (cost efficiency, brand equity, regulatory compliance). This model showcases vital connections, such as partnerships with farmers highlighting Stakeholder Theory, challenges of EV adoption emphasizing the need for Circular Economy models, and the growing consumer preference for reusable packaging. These connections underscore a cultural emphasis on frugality, tying back to Behavioral Theory. These interconnections call for solutions specifically tailored to balance economic, environmental, and cultural factors.
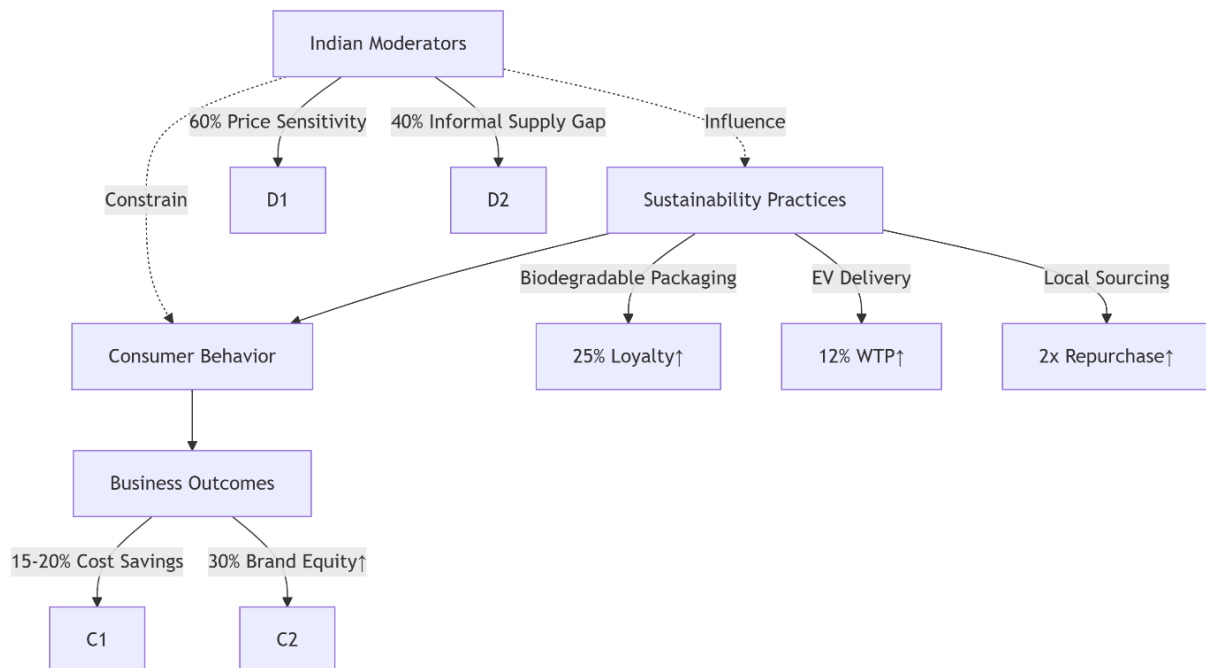
Figure 1 Conceptual Model of Sustainability Drivers in the Indian E-Grocery Sector

Research Results

We conducted a thorough bibliographic analysis using Scopus, focusing on English-language journal articles and conference papers published between 2000 and 2023. Our search centered on keywords related to sustainability and online grocery retail, resulting in a total of 127 documents. After carefully screening for relevance and reviewing the full texts, we narrowed it down to 63 articles that specifically address empirical or theoretical contributions to sustainability in the e-grocery sector. We then performed a co-occurrence analysis with VOSviewer, examining author keywords that appeared at least five times. This analysis utilized normalized association strength and was validated through a manual content review to ensure over 80% alignment.

To keep our findings precise, we filtered out generic terms using stop-word filtering. However, we acknowledge some limitations, such as potential Western bias, the exclusion of non-English studies, and possible indexing delays. This meticulous and transparent approach emphasizes research focused on sustainability within grocery contexts and aims to support replicability. A bibliographic study was conducted using Scopus databases. 63 articles were extracted with the keywords "sustainability AND online retail". The article CSV file was downloaded to conduct Vos viewer analysis. Further, the authors conducted co-occurrence and co-authorship analyses to gain better insights into the online grocery business.

Co-Occurrence Analysis

To identify the prominent themes and their interrelationships within the existing literature, a co-occurrence analysis of author keywords was conducted using VOSviewer. The resulting network (Figure 2) visualizes the key concepts and their connections, providing valuable insights into the intellectual landscape of sustainability research in the e-grocery sector.
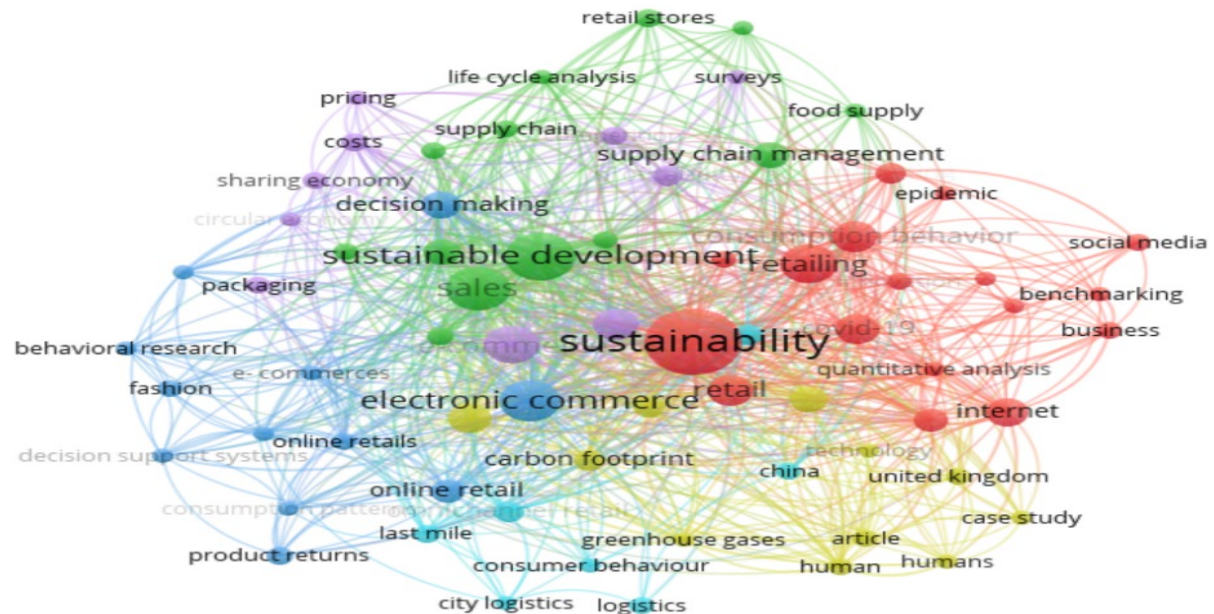

Figure 2 Output from Vos Viewer

The co-occurrence analysis reveals four distinct clusters of interconnected keywords, each representing a unique facet of sustainability in the online grocery context (Table 1). These clusters highlight the following key areas: (1) the role of product design in promoting sustainable consumption, (2) the growing awareness and impact of sustainability issues, (3) the importance of sustainable supply chain management, and (4) the financial implications of sustainability practices. These findings underscore the multifaceted nature of sustainability in the e-grocery sector, requiring a holistic approach that integrates environmental, social, and economic considerations.

Table 1 Co-occurrence Analysis

Cluster	Keywords	Inference
1	Packaging, fashion, and product returns.	Product design plays a significant role in online grocery sustainability.
2	Sustainability, benchmarking, analysis, epidemic, social media	The epidemic and social media brought sustainability issues into the limelight for the online grocery market.
3	Lifecycle, supply chain, and food supply	Sustainability is crucial for the success of the online grocery supply chain.
4	Cost, sales, pricing, and sharing.	Financial analysis of organizational practices impacts sustainability in the online grocery market.

Documents by Year

The bibliographic analysis of documents by year has shown a steady level of interest in the research. This validates the selection of topics by researchers and the growing interest in academic research in the field of online grocery retail. The graph tracks annual document

publications from 2001 to 2023, showing fluctuating but overall growth, with peaks around 2011, 2017, and 2021 (reaching ~35 documents). However, numbers drop sharply by 2023 (near zero), possibly due to incomplete data or declining output. While early years (e.g., 2001) had minimal activity (<5 documents), later years (e.g., 2019) sustained higher volumes (~30), indicating long-term expansion despite yearly variability.
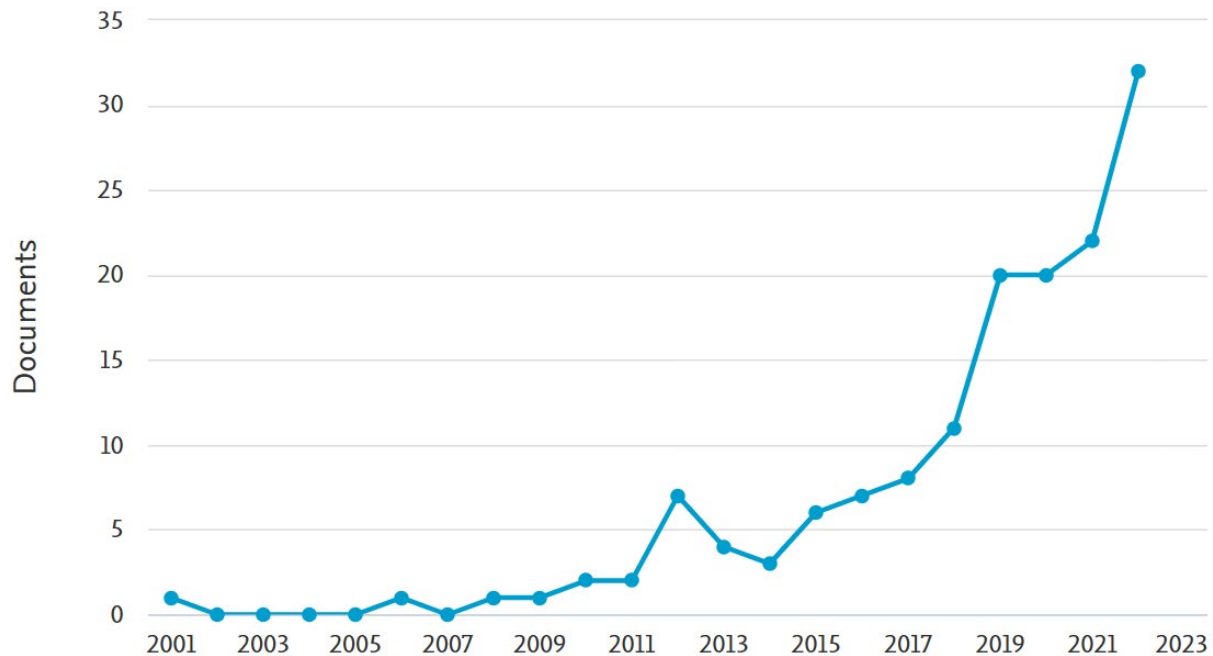

Figure 3 Documents by Year

Germany tops the list in academic research involving sustainability initiatives in the online grocery sector. The UK, China, the USA, and India follow this. The Scopus database analysis showed that there are 10 documents in the combined domain analysis of online groceries and sustainability. Thus, the researchers' selection of the topic stands validated.

The word cloud analysis (Figure 4) of Indian companies' sustainability practices highlighted the following keywords. The list includes paperless options, compostable packaging, delivery vehicles, and electric vehicles. This indicates that these are the areas where online grocery players are focusing their sustainability initiatives to attract a greater share of the consumer's wallet. There is also immense scope to explore innovative mechanisms to improve the sustainability footprint of online grocery businesses in India. Such initiatives are expected to reinforce consumers' intention to repurchase groceries from such user-friendly shopping interfaces.

Word Cloud Analysis

Amazon Fresh, Big Basket, and JioMart often use recyclable packaging and digital receipts. Many are also switching to electric vehicles. Quick delivery services like Zepto (10 minutes) and Swiggy Instamart (15 minutes) focus on speed, so they do not always use EVs or partner with local stores. Stores like Nature's Basket and Farm2Kitchen stick to practices that help the environment, but their delivery times are longer. Right now, no company offers fast delivery, uses EV fleets, and works with local stores. This shows how hard it is to balance being green, being fast, and teaming up with local businesses in India's online grocery market.

In India, new e-grocery startups are leading the way in disruptive sustainability by designing their operations to be ecologically sound. For instance, Zypp Electric promises a carbon-free last-mile delivery system with its electric scooters, saving carbon emissions for Big Basket and Flipkart. Newly launched startup Karma joins surplus grocery store food with consumers at

reduced prices, cutting food waste. Others, such as Zepto and Blinkit, are testing biodegradable packaging and dark store logistics optimization to reduce their carbon footprint, balancing convenience with environmentally friendly practices in the fast-growing quick commerce segment.
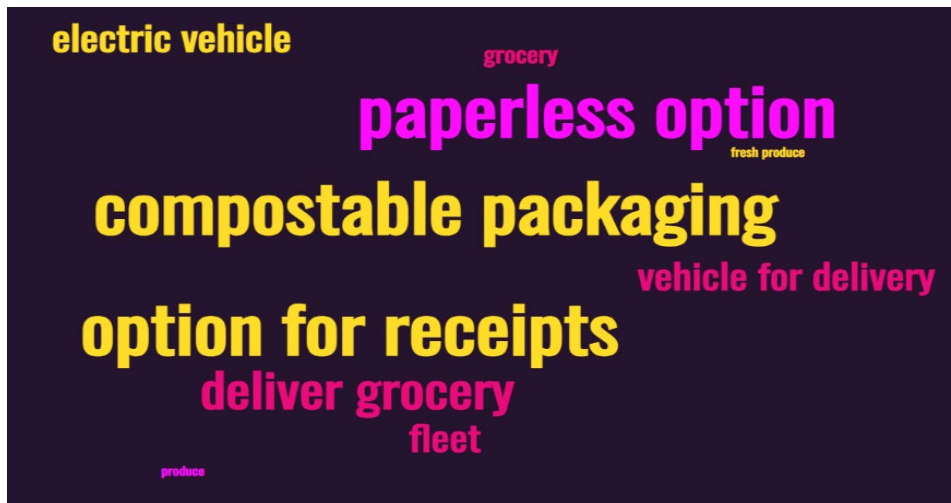

Figure 4 Word Cloud Analysis

Discussion

India's e-grocery sector is grappling with sustainability issues as the demand for rapid delivery models drives up emissions and costs. Consumers might only see a 5-7% increase in their bills for greener options, but challenges like pricey electric vehicles, limited charging stations, and inadequate composting facilities still loom large. There are some exciting innovations on the horizon—think solar-powered hubs, AI-driven routing, and reusable packaging—that hold great potential, but they need to be scaled up. While policy support like EV incentives and plastic bans is beneficial, adapting to regional needs is crucial. Striking a balance between speedy service and eco-friendly goals will require partnerships with local kirana stores, phased sustainability standards, and tech-enhanced efficiency. By fostering transparent reporting and collaborating with farmers, we can boost our impact and align environmental objectives with market demands for lasting success.

Interestingly, similar challenges and opportunities are evident in Thailand's food delivery sector. Singhdong & Weerapong (2024) highlighted the importance of effective supply chain management and customer satisfaction for food delivery businesses in Thailand, mirroring the need for efficient and sustainable practices in India's e-grocery sector. Moreover, Paenchan & Kookkaew (2022) found that technology acceptance significantly influences purchase decisions for food delivery via mobile apps in Thailand, which aligns with the increasing reliance on digital platforms for grocery shopping in India.

Future research aimed at greening India's e-grocery sector should embrace a Triple Bottom Line (TBL) approach. This means looking at the social, environmental, and economic impacts of initiatives like Zypp Electric's electric vehicle deliveries or Blinkit's biodegradable packaging. These efforts not only enhance community health (people) but also help cut down emissions (planet) and improve cost-efficiency (profit). It is also crucial to consider external factors such as economic conditions (like inflation), marketing budgets, and consumer loyalty, which can be explored through surveys focusing on eco-preferences (think sustainable packaging and low-emission deliveries).

In Thailand, Schüler & Tapachai (2025) explored factors affecting online purchase intention via social media among young consumers, providing insights into the role of social influence

and digital marketing in promoting sustainable e-grocery options. Furthermore, Kanchanatanee (2024) examined the acceptance of artificial intelligence (AI) in electronic commerce, highlighting the potential for AI-driven solutions to optimize delivery routes, reduce food waste, and enhance supply chain efficiency in both India and Thailand. This aligns with Thamma et al.'s (2024) findings on the transformative effect of AI on purchase decisions and customer happiness in e-commerce, suggesting that AI can play a vital role in driving sustainable practices and enhancing customer satisfaction in the e-grocery sector.

To make a real impact, actionable strategies could include AI-optimized delivery routes, compostable packaging, and sustainable sourcing practices. Innovations such as refill stations, IoT dispensers, and partnerships for urban composting can help reduce costs, while solar-powered dark stores can significantly lower energy consumption. Examining global benchmarks, such as Ocado's renewable warehouses and Instacart's logistics, can provide scalable and valuable insights. Additionally, analyzing policies (like EV incentives and plastic bans) and implementing green loyalty programs can help improve customer retention. Building direct partnerships with farmers could also reduce emissions and promote organic produce. By combining TBL analysis, consumer insights, cost-effective technology, and global best practices, e-grocers in India can achieve sustainable growth, striking a balance between profitability and social as well as environmental objectives in this ever-evolving market.

Conclusion

This study illuminates the critical role of sustainability in India's rapidly evolving online grocery market, where companies are increasingly embracing eco-friendly practices such as sustainable packaging, electric vehicle deliveries, and ethical sourcing. While progress is evident, significant opportunities for improvement remain, requiring collaborative efforts from businesses, policymakers, and consumers.

This research makes several novel contributions. Firstly, it provides a comprehensive bibliometric analysis of sustainability in the Indian e-grocery sector, offering valuable insights into research trends and key themes. Secondly, it highlights the importance of adapting global sustainability principles to local contexts, emphasizing the need for affordable, accessible, and culturally relevant solutions. Thirdly, it demonstrates the potential for public-private partnerships to drive sustainable innovation in this sector.

Moreover, the study's findings resonate beyond India, offering valuable lessons for other emerging markets in Asia. In Thailand, for example, research has shown the growing influence of social media on online purchase intentions (Schüler & Tapachai, 2025) and the transformative potential of artificial intelligence in e-commerce (Thamma et al., 2024; Kanchanatanee, 2024). These insights align with the need for innovative and sustainable solutions in the e-grocery sector, where consumer preferences, technological advancements, and supply chain efficiencies play a crucial role. Furthermore, studies on food delivery businesses in Thailand (Singhdong & Weerapong, 2024; Paenchan & Kookkaew, 2022) underscore the importance of technology acceptance and effective supply chain management, reflecting the broader trend of digitalization and sustainability across the region.

Moving forward, online grocery companies should prioritize investing in scalable reverse logistics systems, collaborating with local farmers and suppliers, leveraging AI for route optimization, and incentivizing sustainable choices. Policymakers should establish clear sustainability standards, provide incentives for green technologies, and launch public awareness campaigns. Consumers can support retailers committed to sustainability, choose products with minimal packaging, and actively participate in recycling programs.

By addressing the limitations of this study, such as relying on secondary data and focusing on the Indian market, future research should explore consumer behavior through direct data

collection, assess the long-term effectiveness of sustainability practices, and conduct comparative studies across markets and policy interventions.

In conclusion, the sustainability of online grocery retailing extends beyond environmental benefits, impacting supply chain resilience, customer retention, and alignment with evolving consumer ethics. By bridging research gaps and adopting proactive initiatives, stakeholders can collectively steer the industry toward a more sustainable and accessible future, not only in India but across the dynamic landscape of Asia's emerging economies.

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