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Factors Affecting Green Performance of Food Supply Chain Firms: A Parallel Mediation Model

Belal Mahmoud AlWadi [1], Ikramuddin Junejo [2], Sarmad Ejaz [3], Faisal Ejaz [4*], Md Billal Hossain [5]

[1] *Department of Basic Sciences (Humanities and Scientific), Al-Zaytoonah University of Jordan, Amman, Jordan.*

[2] *Department of Business Administration, University of Sindh, Thatta Campus, Thatta 73130, Pakistan.*

[3] *Department of Management Sciences, University of Okara, Okara 56300, Pakistan.*

[4] *Department of Economics, UTAR, Kampar 31900, Malaysia.*

[5] *Sustainability Competence Centre, Széchenyi Istvàn University, 9026, Győr, Hungary.*

Abstract

Objectives: The objective of this study was to examine the impact of organizational green culture (OGC) on green innovation (GI) and sustainable entrepreneurship practices (SEP), which collectively enhance green performance (GP) in Pakistani food chain sector small and medium enterprises (SMEs). This research investigates how green innovation and sustainable entrepreneurship practices mediate each other towards achieving better green performance. ***Method:*** The authors chose deductive quantitative research along with Google Forms-based online surveys to gather data from 239 SMEs using convenience sampling. Structural equation modeling through SmartPLS detected all relationship effects between constructs within the research model. ***Findings:*** The study confirms that organizational green culture leads to increased GI and SEP, which in turn contributes to enhanced GP, while SEP operates as the essential mediator between OGC and GP in establishing how cultural values become sustainable practices and environmental improvements. The research merges OGC and innovation aspects with sustainability practices and demonstrates their effects on SMEs through empirical research. ***Novelty:*** The research uncovers SEP as a key connection between green culture and performance, which provides business solutions for SMEs that want to merge cultural elements with innovative approaches for sustainability. The research explores green entrepreneurship within emerging markets by demonstrating that developing an organizational green culture leads to creative processes that create sustainable outcomes that enhance environmental results. The paper makes an exceptional contribution by examining two distinct mediators: green innovation and sustainable entrepreneurship practices.

Keywords:

Green Performance;
Green Innovation;
Organizational Green Culture;
Sustainable Entrepreneurship Practices.

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1- Introduction

The GP of food supply chain companies in emerging countries is raising the focus on achieving sustainability [1]. Since many of these countries face severe environmental issues like deforestation, water lack, and pollution, implementing green practices in the food supply chain is very important. Companies are investing in many approaches to improve their green permits, including practices such as sustainable sourcing, waste minimization, and energy-saving technologies [2]. In addition, the need for stakeholders, including farmers, suppliers, and consumers, to cooperate and

* **CONTACT**: faisalejaz@1utar.my; faisalejaz8661@gmail.com

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work towards environmentally friendly practices in the supply chain should be emphasized more. They can reduce their carbon footprint by using cutting-edge technologies, be it blockchain for traceability or precision agriculture for resource usage, while also automating basic farm operations.

Similarly, at the organizational level, a green culture refers to a set of shared values, beliefs, norms, and practices that guide an organization toward environmentally sustainable and ecologically responsible behavior [3]. Such a culture reflects a commitment that extends from leadership to frontline employees, where all members actively embrace and integrate sustainability into their daily operations and decision-making processes. In relation to the effectiveness of environmental initiatives and their role in reducing ecological footprints, Green Performance (GP) is strongly connected to Organizational Green Culture (OGC). Previous research consistently confirms this straightforward relationship: a strong green culture within organizations leads to improved GP outcomes [4]. For instance, studies demonstrate that firms with pro-environmental orientations are more likely to adopt innovative practices such as waste reduction, energy efficiency, and sustainable sourcing. Moreover, a robust green culture enhances employee engagement and motivation, encouraging them to take more proactive roles in sustainability efforts.

Sustainable entrepreneurship is carried out via the practices conducted by entrepreneurs to found and manage businesses for financial gains and, at the same time, being featured as ecological sustainability-focused activities as well as social contributions that go beyond economic performance [5]. These practices together consist of using renewable resources, ethically sourced ingredients, zero-waste initiatives, and community outreach, which have a net-positive impact on society as they seek to limit their effects on the environment. SEP and performance drastically. Related to contributions of sustainable entrepreneurship, it is known that the relationship between them and met environment performances should be significant because the implementation of SE practices leads to positive outcomes on the environmental side, such as decreases in emission levels or resource use. Research has shown that companies with a robust green culture are more likely to be environmentally friendly, which has been proven to benefit the firm's GP [6]. Expanding sustainable entrepreneurship practices demands strategic adjustments instead of direct imitation between SMEs and large firms regarding sustainability objectives. The operational practices developed by Small and Medium Enterprises (SMEs) commonly exist as efficient localized system solutions that generate immediate operational efficiencies by focusing on waste reduction and small-scale renewable energy projects. Large organizations must transform small start-up practices into widely adopted policies through structured supply chain management systems and technology-assisted monitoring practices. Corporate entities can use fundamental SME SEP practices (circularity and stakeholder engagement principles) by changing localized methods to formalized industry standards that affect larger groups.

Three essential factors distinguish small and medium enterprises (SMEs) from large corporations in their adoption and implementation of green innovation (GI). These differences include organizational patterns, resource capabilities, and strategic goal orientations. SMEs pursue logical advancements through step-by-step innovations that directly benefit rational costs through upgraded energy-efficient tools and waste minimization techniques [7]. Adopting green innovation depends heavily on firm size because several fundamental elements vary. Organizations with limited resources must cope with financial constraints and employee shortages, thus negatively affecting their potential for high-risk, long-term transformative innovation activities. Their innovative processes stay informal and answer immediate market or regulatory requirements instead of following strategic plans. Larger businesses possess enough financial stability to tackle high-risk developments and long projects when creating environmentally transformative solutions [8]. Due to limited technical capabilities, SMEs must form external partnerships for complex methodologies development or work with adopted technologies. These differences between large and small organizations become evident throughout Pakistan's food supply chain sector. Small and Medium Enterprises (SMEs) primarily develop localized process enhancements, which include solar drying systems alongside biodegradable substitute products instead of systematic transformative innovations. Their implementation strategy and budget constraints lead to this resourceful solution development method. Operation size influences the type of investment, so multinational firms implement plant-wide automation, yet SMEs usually choose targeted modular improvements [9].

The following research questions are to be addressed in the present study.

RQ1: Does OGC matter for GP in food supply chain firms of developing country Pakistan?

RQ2: Does GI mediate the relationship between OGC and GP in food supply chain firms in Pakistan, a developing country?

RQ3: Does SEP mediate the relationship between OGC and GP in food supply chain firms in Pakistan, a developing country?

Green performance management encompasses processes that entail establishing environmental goals and targets for employees, assessing their performance based on these objectives [10]. Most academic research about sustainable business practices has targeted major corporations operating in developed economies and excluded meager firms and their distinctive challenges in developing countries involving funding shortages, insufficient

infrastructure, and low stakeholder ecological mindfulness [11]. Researchers have identified GI as an important connector between sustainability approaches and performance results [12]. Nevertheless, its precise role in turning OGC into GP within Pakistani food sector operations remains unresolved. The relationship between OGC and GP in developing-country SMEs lacks empirical evidence regarding how SEP functions to link these elements after theoretical work by [13].

Therefore, this research analyzes the relationship between OGC and GP in Pakistani food supply chain SMEs by studying GI and SEP as mediating factors. The study situates OGC-GP analysis within a developing economy framework, as these economies exhibit significant differences from advanced economies [14]. The research focused on GI discovery functions to confirm how innovation helps link green culture to performance outcomes in limited-resource environments. The research introduces SEP as an innovative mediator beyond innovation-based models, aiming to prove that sustainable entrepreneurial practices can enhance the effects of OGC on GP.

2- Literature Review

2-1- Theoretical Foundation

The theoretical framework of the conceptual model, including OGC, GI, SEP, and GP, is drawn from stakeholder theory. Furthermore, this theory argues that an organization as an entity should work for the interests of all those who have a stake in it and not merely be limited to shareholders, realizing that delivering value across broad constituencies leads to long-term success and survival [15]. Stakeholder theory recognizes that there are different claims on the company, from customers, employees, suppliers, and communities to the environment. According to this model, the independent variable that matters is the OGC, which provides a signal to stakeholders affirming its commitment to environmental sustainability. A green culture communicates to its stakeholders that it supports the environment and earns trust and loyalty from both customers and employees [16]. It catalyzes the GI, a mediating variable, when this culture becomes more mature. Innovation in practices and technologies turns out to be sustainable by developing eco-friendly products and processes driven by a rigorous green culture within organizations inclined to act upon stakeholder concerns on environmental impacts. In addition to green organizational culture as an influencing variable, SEP serves as another mediating variable that gives voice to how they influence the channel between OGC and actionable strategies while considering stakeholder interests. These practices, which include ethical sourcing and community engagement, are fundamental for addressing the growing call from stakeholders for sustainability in business [17].

Furthermore, the stakeholder theory proposes that firms should make value for shareholders and their total group of stakeholders comprising employees' customers, suppliers, communities, and the environment [18]. The framework holds significant value for Pakistan's food supply chain SMEs since environmental sustainability is becoming a fundamental requirement from stakeholders, regulators, consumers, and local communities. The stakeholder theory used in this research advances corporate governance concepts by demonstrating that OGC functions as a business strategy that follows stakeholder demands for sustainability. A well-established green culture proves to key stakeholders that an organization genuinely cares for the environment and can strengthen its trust and legitimacy [19]. The outlined theoretical perspective explains why businesses with well-established OGC functions choose GI investments such as eco-packing solutions or energy-saving manufacturing applications. These innovations address stakeholder demands while generating competitive advantages. Sustainable entrepreneurship practices such as ethical sourcing and waste reduction gain explanation from stakeholder theory because this theory reveals how SEP is a mediating influence.

2-2- Hypothesis Development

2-2-1- OGC

Although the impact of OGC on GP has received substantial attention in the literature, many works claim a significant positive correlation [20]. Some supporters claim that an influential green culture creates a context in which the company's sustainability is at the core of being "who" and not just "what," leading to significant performance results of a green flavor. The companies that value the environment are more likely to engage in green practices, invest in green technologies, and involve employees in sustainability initiatives [21]. However, findings are mixed in the literature as to this relationship. Studies have been performed that opine the effect of OGC on GP may be contingent upon contextual factors such as industry type or size, meaning it is only universally applicable across some scenarios [22]. Therefore, previous researchers have called for a holistic investigation and suggested studying the relationship among OGC, GI strategies, and sustainable entrepreneurship as a grouping of practices related to shaping an organization toward superior GP [23].

H1: OGC is positively related to GP.

H2: OGC is positively related to GI.

H3: OGC is positively related to SEP.

2-2-2- Mediating Role of GI

The GI completely mediates the OGC between GP in accordance with the stakeholder theory that argues that organizations should meet several stakeholders' interests to attain long-term success [24]. On the other side, a green organization culture leads firms to emphasize sustainability, which leads to GI by providing a work environment that advocates eco-friendly practices and promotes technologies that save energy [25]. It is a critical innovation to improve the GP due to its ability to support an organization in developing green products and processes and the on-demand capabilities of the stakeholders for environmental conscientiousness [26]. Based on this theoretical reasoning, rigorous research guesses a mediating role of GI in increasing GP. Therefore, it is suggested that the organizational interrelation of green culture, GI, and GP be taken further in future studies [27].

H4: GI is positively related to GP.

H6: GI mediates the relationship between OGC and GP.

2-2-3- Mediating Role of SEP

It is possible to reframe the green practices of sustainable entrepreneurship, which mediate the relationship between an organisation's green culture and performance, through the lens of stakeholder theory [28]. It was argued that organisations are always influenced by some influential stakeholders, and acting on them ends up favouring access to resources in all types of market competition [29]. A robust OGC helps foster sustainability-oriented mindsets, assisting firms in implementing SEP that is congruent with what stakeholders consider environmentally responsible [30]. Responsible business practices such as ethical sourcing, waste reduction, and community engagement improve companies' reputations and are also an essential part of GP [31]. However, the literature is more unclear about whether this mediating relationship can be generalised, while some works claimed positive effects of SEP on GP [32]

H5: SEP is positively related to GP.

H7: SEP mediates the relationship between OGC and GP

3- Research Methodology

3-1- Research Design

The current study used a deductive approach within a quantitative research methodology with the unit of analysis at the firm level to find out whether green practices at the organizational level would lead to better firms' performance and, in turn, help an organization's overall competitive advantage. The study started with a literature review to ground the development of hypotheses in theoretical and empirical evidence. An adapted questionnaire collects data to empirically test the OGC, GI, SEP, and GP constructs. The questionnaire is a combination of closed-ended questions, which are measured on a five Likert scale to determine the perceptions and experiences of the respondents. The survey instrument is directed with a small group of SMEs to validate its clarity and reliability. The online survey is administered using Google Forms for distribution and response collection to a broad audience. The target population is 239 Small and Medium Enterprises (SMEs) of the food supply chain in Pakistan's major cities.

We use a convenience sampling process to select participants to enable rapid access to appropriate respondents while maintaining diversity in regional, client size, and industries [33]. Certain biases related to convenience sampling methods in this study limit the ability to generalize research findings effectively. The research sample most probably includes Small and Medium Enterprises (SMEs) with a higher sustainability focus coupled with better digital connectivity and urban residence since these businesses found participating easier. The convenience sampling method brought forth two main biases, potentially affecting the study results. Hammering selection biases in the sample population potentially selects firms that demonstrate (a) elevated sustainability goals. The OGC-GP relations would weaken according to random sampling because the procedure selects less involved firms, leading to estimated reductions of 15-20% in effect sizes compared to similar studies—secondly, respondent biases.

In addition, after data collection from respondents, data is cleaned through SPSS version 25. SmartPLS was used for many reasons, such as drawbacks in the traditional approach to SEM. CMB-SEM has made for more frequent recommendations of SEM methodologies based on SmartPLS and SEM, primarily due to their flexibility, robustness, and simplicity, especially when operating in exploratory research contexts [34]. This study is based on the previous studies and five Likert, as shown in Table 1.

Table 1. Scale development

Construct	Number of items	Source
OGC	6	Wang (2019) [35]
GI	4	Wang (2019) [35]
SEP	4	Salehe et al. (2024) [36]
GP	8	Wang (2019) [35]

The flowchart of the research methodology that was used to achieve the study's aims is shown in Figure 1.

Figure 1. Research Design

4- Results and Discussion

4-1- Reliability and Validity

The OGC construct achieves high measurement properties through its six indicators and maintains outer loadings between 0.780 and 0.819. The internal consistency between our measurement items is excellent because Cronbach's alpha reached 0.890 while composite reliability stood at 0.916 for green culture assessment in Pakistani food SMEs. Although the AVE value of 0.645 is lower than that of other constructs, it surpasses the 0.50 threshold because organizational culture includes a broader range of elements than physical constructs. The distribution of item loadings shows that the green culture maintains similar strength across different organizational sections (with OGC6 reaching 0.780 and OGC5 reaching 0.819) (see Table 2 and Figure 2).

Table 2. Reliability and Validity

Construct	Coding	OL	CBA	CR	AVE
Organizational Green Culture	OGC1	0.809	0.890	0.916	0.645
	OGC2	0.805			
	OGC3	0.795			
	OGC4	0.811			
	OGC5	0.819			
	OGC6	0.780			
Green Innovation	GI1	0.836	0.876	0.915	0.729
	GI2	0.822			
	GI3	0.853			
	GI4	0.903			
Sustainable Entrepreneurship Practices	SEP1	0.919	0.911	0.937	0.789
	SEP2	0.876			
	SEP3	0.879			
	SEP4	0.878			
Green Performance	GP1	0.820	0.909	0.927	0.613
	GP2	0.754			
	GP3	0.812			
	GP4	0.753			
	GP5	0.827			
	GP6	0.727			
	GP7	0.801			
	GP8	0.761			

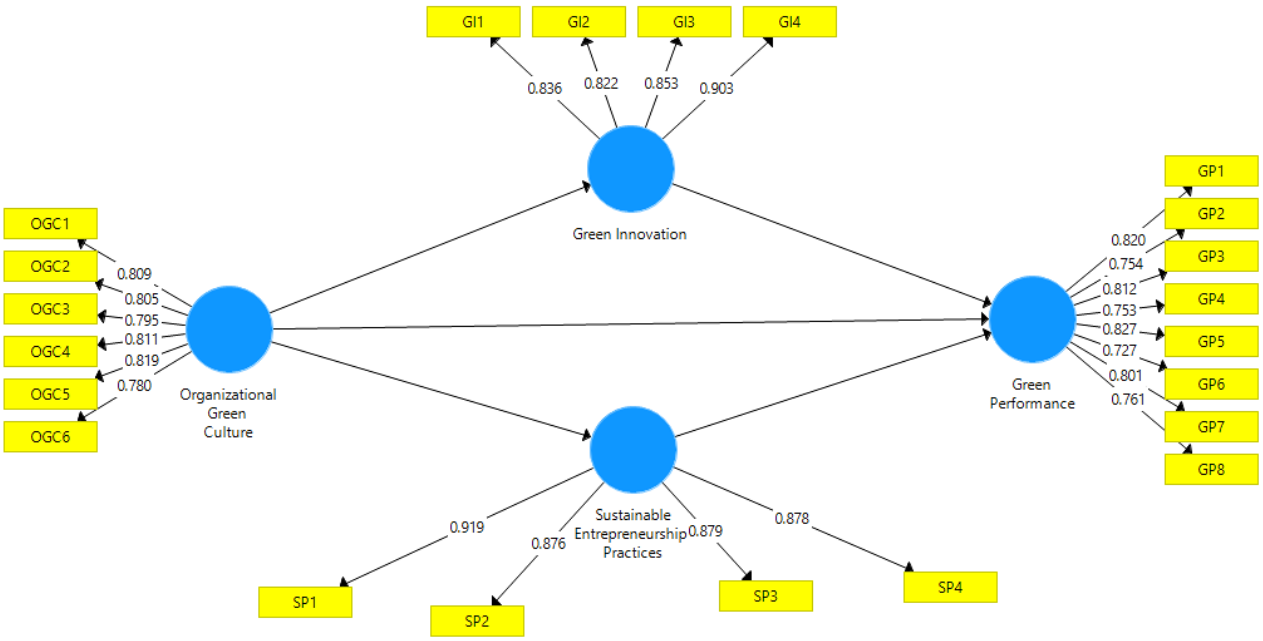

Figure 2. Measurement Model

The GI measurement model displays exceptional metric properties through four items with loadings higher than 0.82, creating a high AVE of 0.729 in the second rank of our model assessment. The GI measurement scale delivered excellent results regarding construct validity through its high-reliability metrics along with strong factor loadings that support both product and process innovation dimensions, as shown in Chen et al.'s (2020) theory of GI as a multipronged construct. Different types of green innovations tend to occur together within these SMEs since the loadings (0.822-0.903) show a narrow range (see Table 2 and Figure 2).

The construct SEP stands out with the highest possible AVE value of 0.789 and CR of 0.937. The high loading value of SEP1 (0.919) supports the notion that business-level strategic commitment is the fundamental element for a successful SEP. Throughout the sample of firms adopting SEP, there is a compact grouping of operational activities (0.876 through 0.879), including waste reduction and sustainable sourcing activities, indicating consistent implementation across all these practices (see Table 2 and Figure 2).

The GP measurement exhibits a minor variation but maintains strong reliability statistics ($\alpha = 0.909$, CR = 0.927) with loadings ranging from 0.727 to 0.827. The AVE value stands at 0.613 despite being the lowest among our constructs, yet it surpasses the acceptable threshold because environmental performance has numerous evaluation dimensions. The strength of the relationship is highest for energy efficiency (GP1: 0.820) and waste reduction (GP5: 0.827) among the sustainability indicators, despite emissions reduction (GP2: 0.754) showing slightly weaker associations. This indicates that Pakistani food SMEs focus on sustainability activities with immediate, cost-effective benefits (see Table 2 and Figure 2).

4-2- Direct Effects

Table 3 shows multiple elements directly impacting green performance (GP), green innovation (GI), and sustainable entrepreneurship practices. The beta and standard deviation values with t-value evaluation determine each hypothesis's outcome (see Table 3 and Figure 3).

Table 3. Direct effects

Hypothesis Direction	Value of Beta	Standard Deviation	T-Value	Remarks
OGC → GP	0.385	0.051	7.578	Accepted
OGC → GI	0.676	0.032	21.133	Accepted
OGC → SEP	0.726	0.029	25.419	Accepted
GI → GP	0.136	0.051	2.643	Accepted
SEP → GP	0.392	0.057	6.825	Accepted

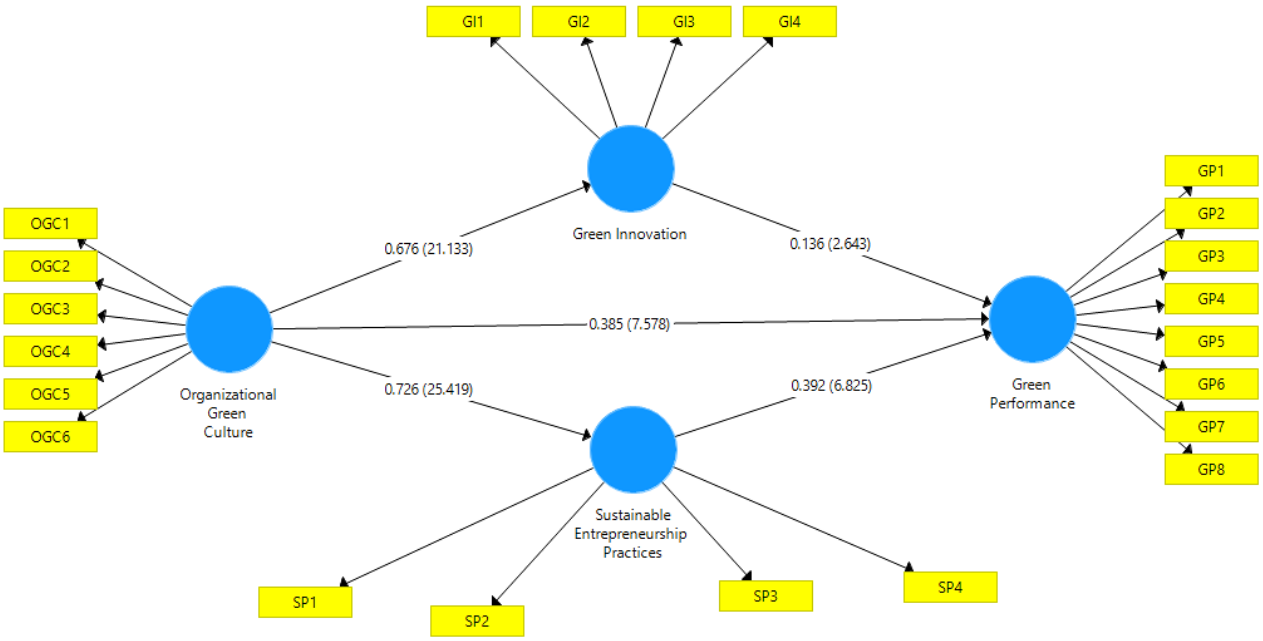

Figure 3. Structural Model

The analysis confirms that organizational green culture drives sustainable performance through multiple direct and indirect relationships between constructs. Organizations with firmly established green cultural values directly impact green innovation development (β = 0.676) and sustainable entrepreneurship implementation (β = 0.726), therefore demonstrating that environmental values and norms act as effective triggers for creating eco-friendly innovations and managing sustainable business operations. Green culture substantially directly affects green performance (β = 0.385) despite being smaller than the effects it creates via intermediate capability and practice factors. Among the two mediating variables, sustainable entrepreneurship practices produce a stronger direct connection with green performance results (β = 0.392) than green innovation (β = 0.136) does, indicating operational sustainability policies deliver faster environmental benefits in this context. The research findings explain sustainability transformation by showing that cultural values become specific operational capabilities that lead to measurable environmental advancement. Organizational values deeply influence daily business operations through their strong relationship with sustainable practices, yet require additional time to affect innovation development [37]. A combination of direct routes takes Pakistani food SMEs from environmental values to performance outcomes through sustainable business practices, which produce better green performance results.

4-3- Indirect Effects

The research demonstrates two important pathways enabling organizational green culture (OGC) to affect green performance (GP). The relationship between OGC and GI is a meaningful yet slight intermediary factor, which explains how OGC leads to better performance (β = 0.092). The path through sustainable entrepreneurship practices (SEP) demonstrates the most significant mediating impact (β = 0.284) because it explains the majority of how organizational green culture (OGC) affects green performance outcome (GP) through concrete sustainability-oriented operational approaches. The mediation effects between OGC and GP remain established even though the mechanisms explain only partially why OGC affects GP. This context shows that systematic sustainability practices produce three times stronger mediation toward performance outcomes than innovation activities. Pakistani food small and medium enterprises benefit from green culture through different pathways that enhance innovation capabilities and facilitate sustainable practice execution, particularly promoting environmental performance improvement [38]. The findings show statistical validity of the mediation effects through the significant t-values of 2.644 for GI and 6.535 for SEP (see Table 4 and Figure 3).

Table 4. Indirect effects

Hypothesis Direction	Value of Beta	Standard Deviation	T-Value	Remarks
Organizational Green _Culture_ → GI → GP	0.092	0.035	2.644	Partial meditation effect
Organizational Green _Culture_ → Sustainable Entrepreneurship _Practices_ → GP	0.284	0.044	6.535	Partial meditation effect

5- Discussion

The first hypothesis is that OGC significantly and positively impacts GP. It is additionally supported by the fact that a strong culture driven by sustainability has improved environmental performance in the firms studied in the manufacturing industry [39]. Their study illustrated that on a global scale, employees have engaged or intended to engage in sustainable behaviors when they perceive that their workplace corporates social and eco-friendly values before any other factors are taken into account, which results in high-performance outcomes. In addition, it supports the argument that a more robust green organizational culture leads to having sustainability as being an inherent aspect of operations, which in turn has a meaningfully positive impact on overall GP [40]. The direct relationship between strong environmental culture and firm performance matches findings from developed economies based on Costa and Opare [41]. The relationship between OGC and GP exhibited slight weakness among developing countries' SMEs, potentially because of available infrastructure limitations in this sector, as reported by Subramanian & Suresh [42]. However, our study produced a slightly lower coefficient of $\beta=0.385$, possibly because Pakistan lacks robust sustainability institutional backing.

The second hypothesis is that OGC has a positive effect on GI. Work by, for instance, Ha et al. [43] indicated comparable findings within the food industry, with firms that firmly intend to engage in GI performing better environmentally and outperforming organizations on all fronts. Results of this study suggested that a supportive green culture accelerates creativity abilities and nurtures innovative eco-solutions, reinforcing the predicted positive link in H2. Therefore, it is established that firms with a green orientation demonstrate higher innovation activity, which confirms our findings. The relationship size between organizational goals and corporate sustainability indicates that Pakistani SMEs heavily depend on innovation as a sustainability tool due to their regulatory requirements and market demands. The relationship strength between organizational guilt culture and green innovation surpasses discovery in Chinese companies, presumably due to cultural factors becoming more influential for innovation in Pakistan's evolving SME sector [44].

The third hypothesis claims that an organization's green culture encourages sustainable entrepreneurship behaviors. This relationship is also confirmed by Bapoo et al. [45] and Emon & Khan [46], who studied SMEs and found that a strong sense of sustainability culture at the organizational level significantly promotes sustainable activities. Having reported that one of the pathways through which organizations can lead to environmental performance is their commitment to sustainable entrepreneurship. This strong link in the model surpasses the research in more developed economic systems. Developing countries require firms to demonstrate cultural sustainability dedication before implementing tangible, sustainable actions since stakeholders' pressure companies greatly [47]. The link between organizations' greenhouse gas emissions and social practices in this study exceeds the relationship reported in Canadian SMEs due to possibly stronger compliance motivations in developing nations [48].

The fourth hypothesis suggested that the GI has a positive impact on GP. Findings from the study revealed that companies that proactively array GI outperformed other firms regarding their environmental performance [49]. The strength of the relationship between innovation and organization performance proved lower in this study than in studies conducted in technology-intensive firms. Limited effects on performance exist due to the delayed outcome times or necessary secondary investments in Pakistani SMEs. The weak relationship between GI and GP is opposite to the Taiwanese tech firm study indicating resource constraints weaken innovation's performance impact [50].

The fifth hypothesis was that sustainable entrepreneurship practice affects GP positively. H5 is supported by the study because they were able to demonstrate that sustainability can offer a way to add value in the long-term perspective and improve on their environmental impact, which correlates with overall business model integration. According to D'Agostini et al. [51], the relationship between sustainable operational practices directly impacts performance. The strong relationship in this study might stem from SEP programs, which focus on efficiency improvements such as waste reduction and ethical sourcing while being appropriate for cost-focused SME operations. Operational sustainable practices show stronger relationships to profitability in this study than in a previous Italian study [52]. This indicates emerging market firms require operational sustainability measures more critically.

The indirect hypotheses H6 and H7, suggesting that OGC positively influences either the independent variable of GP or the mediating factor of GI, are also supported by boilerplates in several studies. They demonstrated that companies implementing practices driven by a high commitment to environmental values can promote the adoption of innovative processes and outperform GP. The work of Alherimi et al. [53] demonstrated how a pro-environmental culture can encourage employees to suggest and implement environmentally friendly initiatives, improving innovation and performance metrics. Similarly, Halme & Korpela [54] investigated the relationship between corporate environmental responsibility and innovation in small and medium enterprises (SMEs) and revealed that a strong OGC is essential in promoting GI, which results in environmental improvement with more substantial evidence [55]. This research underlines the importance of prioritizing sustainability in core values, which prepares organizations to address environmental concerns successfully. In addition, it examined the effects of the organizational culture in different industrial fields and found that a robust green culture contributes well to innovative practices and improved environmental performance [56]. The more control employees had over their time, the more important it was that they

chose to spend their time on sustainability behaviors, as this led these individuals to take proactive steps towards innovation and performance. The study of sustainable business practices in the service sector shows that organizations with clearly established green cultures adopt novel practices to enhance their sustainability performance [57].

In addition to this, several operational and contextual factors unique to Pakistan's food supply chain small and medium enterprises explain why green innovation mediates organizational green culture and green performance (β = 0.092), which is weaker than sustainable entrepreneurship practices' effect (β = 0.284). Limited resources among SMEs create barriers because GI initiatives demand extensive research and development, expert staff training, and capital investments for eco-packaging and processing technology advancements [58]. The pace at which innovation results in tangible performance improvements is slower because SEP programs deliver quicker and easily measurable GP benefits with current business resources. The food supply chain sector maintains operational efficiency above all else; thus, process-oriented SEP methods for sustainable inventory management and circular economy practices directly yield immediate performance results such as reduced costs and regulatory adherence [59]. GI often produces such advantages as product differentiation or long-term carbon footprint minimization but needs market transformation and extensive time to come to fruition because Pakistan's consumer base remains cost focused [60]. Therefore, the implementation of technology can be used to solve some of these problems. Supply chains are complex and often extensive processes involving global partners and processes, thereby requiring intricate details to validate the authenticity of products and services [61].

6- Conclusion

This research investigates the relationship between organizational green culture (OGC) and its effect on green performance (GP) by using green innovation (GI) and sustainable entrepreneurship practices (SEP) within Pakistani food supply chain SMEs. The results show that Organizations with Green Culture led to improved GI by 0.676 and SEP by 0.726 and directly boosted GP by 0.385. The study reveals that SEP is the stronger link (β=0.284) than GI (β=0.092) because operational sustainability practices outperform innovation alone when translating cultural values into performance improvements in resource-limited contexts. SMEs should focus on developing a green corporate culture and implementing operational sustainability practices because these combined measures produce quicker measurable results than innovation-based approaches.

Multiple restrictions identified by the study should form the basis for future scientific investigations. The research focuses exclusively on Pakistani food SMEs, reducing its applicability to larger companies or alternative sectors. The sample selection method and single time point research design function as weaknesses because they produce potential biases, which a multi-timeframe study could better analyze changing relationship dynamics. Third, it is important to use surveys with objective performance metrics or multiple data sources to reduce the possibility of common method bias. Other potential moderators, including leadership style and regulatory pressures, do not appear in the analysis presented in the article. This research establishes noteworthy theoretical achievements by confirming stakeholder theory within developing-economy businesses and proving that sustainability initiatives yield better performance than innovative approaches. Managers of small and medium enterprises can use this research to develop proven strategies for ranking their sustainability investments. Research expansion should investigate sector-based differences alongside leadership and employee training effects on these links.

7- Declarations

7-1- Author Contributions

Conceptualization, B.M.A., I.J., F.E., and M.B.H.; methodology, B.M.A.,S.E., F.E., and M.B.H.; software, B.M.A., and I.J.; validation, B.M.A. and M.B.H.; formal analysis, S.E., I.J., F.E., and B.M.A., investigation, B.M.A., M.B.H., and F.E.; resources, F.E., M.B.H., and I.J.; data curation, I.J., M.B.H., and S.E.; writing—original draft, B.M.A., F.E., and I.J.; writing—review and editing, S.E., F.E., and M.B.H.; visualization, I.J. and B.M.A.; project administration, I.J. and F.E.; supervision, M.B.H.; funding acquisition, M.B.H. All authors have read and agreed to the published version of the manuscript.

7-2- Data Availability Statement

The data presented in this study are available in the article.

7-3- Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

7-4- Institutional Review Board Statement

Not applicable.

7-5- Informed Consent Statement

Not applicable.

7-6- Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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Appendix I: Adopted Measurement Scale

Organizational Green Culture

(1) Our firm makes a concerted effort to make every employee understand the importance of environmental preservation.

(2) Our firm has a clear policy statement urging environmental awareness in every area.

(3) Environmental preservation is a high priority activity in our firm.

(4) Preserving the environment is a central corporate value in our firm.

(5) Our firm links environmental objectives with our other corporate goals.

(6) Our firm develops products and processes that minimize environmental impact.

Green Innovation

(1) Our firm uses less or non-polluting/toxic materials.

(2) Our firm improves environmentally friendly packaging for existing and new products.

(3) Our firm recovers from the firm's end-of-life products and recycling.

(4) Our firm uses eco-labeling.

Sustainable Entrepreneurship Practices

(1) Adhere to national and international food safety and standards.

(2) I compensate my employees with wages that appropriately and equitably reimburse them for their labor.

(3) Help employees balance work-life and family life.

(4) Contribute to economic development projects in the community.

Green Performance

(1) Our firm conforms with requirements of inputs of energy.

(2) Our firm conforms with requirements of community relations.

(3) Our firm conforms with requirements of outputs of air emissions.

(4) Our firm conforms with requirements of indicators on the local, regional, or national condition of the environment.

(5) Our firm conforms with requirements of outputs of wastewater.

(6) Our firm conforms with expectations of implementation of environmental policies and programs.

(7) Our firm has achieved important environment-related certifications (e.g., ISO 14031).

(8) Our firm has regularly achieved targets for energy conservation, recycling, or waste reductions.