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Investigating the relationship between top management commitment, supply chain collaboration, and sustainable firm performance in the agro-processing supply chain

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Abstract
This study aims to assess the relationships between top management commitment (TMC), supply chain collaboration (SCC), and sustainable firm performance (SFP) regarding agro-processing supply chains in Bangladesh. SFP includes environmental performance (EP), economic performance (Ec.P), and social performance (SP). We collected data from 211 managers and executives of agro-processing enterprises through a questionnaire survey under the random sampling method. We used the structural equation modelling (SEM) approach to analyze data. The results display that TMC and SCC positively influence EP and SP. EP and SP are positively related to Ec.P. Besides, SCC mediates the two relationships: TMC and EP; and TMC and SP. This research contributes to operations and supply chain management literature by showing the relationship between TMC, SCC, and SFP. This study extended the acknowledgement of two operations and supply chain management areas, such as TMC and SCC, and their interaction for SFP. This study highlights how TMC and SCC individually and jointly positively influence SFP. The mediating role of SCC also reveals the indirect impact of TMC in enhancing SFP. Besides, this study offers managerial implications for corporate success through SFP by unveiling the importance of connecting TMC and SCC.

Keywords Top management commitment · Supply chain collaboration · Sustainable firm performance · Agro-processing supply chain · Bangladesh

1 Introduction

Firm performance has received much interest in operations and performance-oriented researches for an extended period. Still, the sustainable performance of an agro-processing supply chain (SC) in an emerging economy has attained little research interest. Existing studies on the agro-processing SC focused on several issues such as gender inequalities in the small and large firms (Maertens and Swinnen 2012), product quality (Banks and Bristow 1999), the impact of financialization (Isakson 2014), challenges and opportunities (Francesconi et al. 2010), governance structure and quality enforcement (Raynaud et al. 2005), environmental and sustainability (Paolotti et al. 2017), etc. In Bangladesh, no initiative has been directed to explore the sustainable firm performance (SFP) of the agro-processing SC. Some researchers investigated different issues like development and growth in agro-industry (Islam 2008; Latif et al. 2016), value-based SC in shrimp aquaculture (Karim and Biswas 2016) food quality value chain in the rice industry (Minten et al. 2013), integrated value chain and medicinal plant production (Shahidullah and Haque 2010) maize products marketing (Akhter and Hafiz 2015).

Supply chain management (SCM) is an integrated effort to link major business functions within and across the boundary of firms to satisfy customers' needs. SCM is more concerned with the manufacturing of products and services and with little attention to agriculture (Routroy and Behera 2017). Agriculture supply chain management (ASCM) has distinct features over generic SCM such as climate changes, agriculture methods, seed quality, perishability etc. Long lead time in producing agricultural products is another

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challenge of ASCM that cannot be adjusted when the environment changes. Thus, more commitment and collaboration between agriculture SC members is required to reduce the obstacles and enhance SFP. Since having positive firm performance is essential for the success of several supply networks, including the agro-processing SC, it would be well to recognize the components of SFP and their interactions in the agro-processing SC. SFP includes environmental performance (EP), economic performance (Ec.P), and social performance (SP). Nowadays, the top managers' role has become essential for successfully enacting SCM initiatives. Proper enactment of SCM initiatives fosters enhancement of firm performance. Committed managers perform their activities towards attaining SC goals that ensure SFP. Several studies related to top management commitment (TMC) in the SC perspective (e.g., Burki et al. 2019; Lintukangas et al. 2019; Saeed and Kersten 2019; Sandberg and Abrahamsson 2010; Tzempelikos 2015; Yuan et al. 2018) focused on effective management, relationship management, and firm performance, but have ignored the relation between TMC and supply chain collaboration (SCC), and the influence of TMC on SFP.

Meanwhile, SCC has been proved an essential antecedent for firm performance in the SC perspective (Choi and Hwang 2015; Liao and Kuo 2014; Shin et al. 2019). The collaborative behavior of SC partners facilitates SFP by achieving ecological, economic, and societal sustainability. The benefits of SCC depends on the magnitude of collaboration of in-house and outside operations and the magnitude of collaboration in the SC set-up (Holweg et al. 2005). Nevertheless, some academics have found the mediating role of SCC in the association between SC partnership and enterprise performance (Burki et al. 2019; Hui et al. 2015). Yet, Pakdeechoho and Sukhotu (2018) found an insignificant association between SCC and the firm's environmental performance in the supply network. Similarly, Laari et al. (2016) stated no significant connection between ecological collaboration and firm performance. Thus, the mixed findings demand a further investigation to find the direct and mediating role of SCC.

From the previous discussion, we pointed out the following research gaps: first, SFP in the agro-processing supply network has received little research interest. Second, investigations on the effect of TMC on SFP have focused on different sectors but not on the agro-processing enterprises. Third, no study explored the combined impact of TMC and SCC on the SFP of the agro-processing SC. Finally, none of the prior studies has investigated the SFP of the agro-processing SC and its antecedents in the Bangladesh perspective. It is essential to see how TMC and SCC jointly affect the SFP of the agro-processing SC in Bangladesh. It is necessary also to see the mediation effect of SCC on the association concerning TMC and SFP. In light of the situation, this study investigates how TMC and SCC influence environmental, economic, and social performance. The resulting research questions are discoursed: (1) how do TMC and SCC jointly affect environmental, economic, and social performance? (2) does SCC mediate the influence linkage between TMC and environmental, economic, and social performance?

This study has recognized the relationship between TMC, SCC, and SFP. This study proposes several vital contributions to the operations and SCM literature. The practical examination of the association between TMC and SCC and its effects on environmental, economic, and social performance indicates an identical influence on theory and practice, carrying a new perspective on the topic. This study advances the recognition of two areas, such as TMC and SCC, and their relationship for environmental, economic, and social performance. It adds to prior literature on the link between TMC, SCC, and SFP. It contributes to operations and SCM literature by deliberating SCM suggestions and combines topics from SCM and operations management. Besides, this study proposes managerial inferences for corporate bodies especially, agro-processors checking to enrich their performance by offering the importance of connecting TMC and SCC.

A generic agro-processing SC includes six parties: input supplier, producer, processor, wholesaler, retailer, and consumer. The agro-processing industry in Bangladesh is a fast-growing sector. This sector stands for the fourth position in terms of export earnings of Bangladesh. In the fiscal year 2017–2018, export earnings of the agro-processing industry were US$ 673.7 million that is 40.72 percent higher than the previous year export (Ovi 2019). The market for agro-processing products is increasing in local and foreign markets. This sector exports its products to one hundred forty-four countries worldwide (Ahmed 2018). The SCM activities were initiated in Bangladesh in the 1980s in the readymade garments industry (Uddin and Akhter 2019). Agro-processing supply chains in Bangladesh are facing challenges on their customer side, whose needs are changing rapidly. They also face challenges in operations and supply management practices with their suppliers. Top management of the firms are highly committed with their partners regarding joint efforts, joint decision making, information and knowledge sharing for fulfilling environmental and social expectations and customers' needs, which ultimately enhance their SFP. Thus, it is appropriate to survey the agro-processing supply chains in Bangladesh to answer our research questions.

The framework of the paper is as follows. The subsequent two segments briefly discuss the academic contextual and arguments leading to the hypotheses of the study. The next focus on a depiction of the sample, along with the methods applied in the study. The fifth section shows the analysis and results found from the empirical findings. The next section

consists of a discussion and conclusion. The last section presents limitations and suggestions for future research.

2 Literature review

2.1 Agriculture supply chain management (ASCM)

Agriculture supply chain management (ASCM) deals with the SCM of agricultural products. Agricultural products include fruits processing, meat processing, milk processing, fish processing, seed processing, bakery, spices, tea processing, rice, vegetables etc. ASCM comprises management issues like supply, production, and demand to fulfill customers' requirements through an agile distribution network (Chandrasekaran and Raghuram 2014). Sustainable agriculture and sustainable performance through costs reduction and carbon emissions are recent issues in ASCM (Kamble et al. 2020; Mukherjee et al. 2021; Zhou et al. 2021). Many scholars have concentrated on the importance of collaboration between SC partners in ASCM (Bezuidenhout et al. 2012; Kalaitzis et al. 2007; Routroy and Behera 2017). Cai et al. (2010) and Mikkola (2008) emphasized coordination between SC members for shared benefits. However, none of the researches has addressed the interaction among TMC, SCC, and SFP in ASCM. This issue is crucial and needs to be evaluated because ASCM requires more commitment and collaboration among SC partners to ensure SFP. Thus, this study has addressed that issue to contribute to the theoretical and practical realm of ASCM.

2.2 Top management commitment (TMC)

TMC exhibits the willingness to form and maintain a stable bonding with partners and empowers the partners to attain mutual goals. It expresses direct and indirect pledge of interactive stability and relational exchange between SC partners (Kwon and Suh 2004; Sandberg and Abrahamsson 2010; Yuan et al. 2018). TMC is vital for understanding supply chain partners' desires for collaboration and sustainability practices within the firm and through the supply network (Saeed and Kersten 2019). Top managers provide vision, goals, objectives, and strategies for their firms that lead to collaboration cultures and ultimately foster SFP (Fawcett et al. 2006; Mokhtar and Yusof 2010). They express their commitment to the quality perspective of product, service, and relationship within the supply chains and encourage sharing of knowledge and information. They also perform a crucial function in shaping organizational structure and extent of collaboration with partners (Burki et al. 2019), thereby ensuring required support to implement sustainability practices and achieve SFP (Wijethilake and Lama 2019). TMC is crucial to see whether firms express their real interest in collaborating with their partners. TMC to collaboration is a vital indicator that measures sustainability practices, which facilitate achieving SFP. Therefore, TMC to the partnership with SC partners appears to play a crucial role in attaining SFP.

2.3 Supply chain collaboration (SCC)

SCC is a joint plan and effort to execute activities for achieving shared benefits. It focuses on two concepts, process collaboration and relationship collaboration. Focusing on these two concepts, more than one firms work together in the SC to design and perform operations for achieving collective goals and shared paybacks (Cao and Zhang 2011; Uddin et al. 2020). In this study, we have included the interlinked components of SCC, such as goal alignment, timely information sharing, mutual communication, resource and knowledge sharing, and joint efforts. Goal alignment represents the extent of partners' goals (Cao and Zhang 2011; Yang and Lin 2020). Firms can give more efforts to execute operations when their goals are allied with supply chain goals, leading to enhanced SFP (Gualandris and Kalchschmidt 2014). Adequate, accurate, complete, on-time and relevant information represent timely information. Timely information is necessary for forecasting and strategic decision-making (Chen et al. 2018; Panahifar et al. 2018). Mutual communication among SC partners is also vital for SCC that enhance the informal relationship, cooperation, and multilevel communication. Resources include tangible assets, such as equipment, materials, logistics, and technology; knowledge has intangible assets like technological experts, operational experience. Resources and knowledge invested in the supply chain are shared with partners to power the SC's capabilities and assets (Feng et al. 2020; Liao and Kuo 2014). Joint efforts denote the magnitude to which SC members plan and execute better-integrated activities and respond to customer requirements. It also intensifies SCC and enhances SFP (Pakdeechoho and Sukhotu 2018).

2.4 Sustainable firm performance

SFP includes three perspectives of performance: environmental performance (EP), economic performance (Ec.P), and social performance (SP). Some studies have included operational performance with EP and SP (e.g. Das 2018; Green et al. 2012). Other researchers have emphasized competitive performance (e.g., Munir et al. 2020; Rao et al. 2009). In this study, we have argued for economic performance that has included operational and competitive performance dimensions. The economic dimension represents internal operational efficiency and external competitiveness through the fulfilment of customers' requirements. Thus, EP, Ec.P, and SP represent SFP and overall firm performance.

2.4.1 Environmental performance (EP)

EP represents the manufacturing plant's capability to lessen environmental contamination and the usage of toxic and hazardous materials. Environmentally concerned firms measure environmental performance (Das 2018). Several indices through which firms can measure EP, such as lessening of waste (solid and water), air emission, fuel & energy consumption, environmental accident, maintain environmental standards etc. (McIntyre et al. 1998; Rao et al. 2009; Sarkis et al. 2010). Björk et al. (2011) have proposed environmental KPIs to assess environmental benefits and costs. These KPIs identify and compare relevant costs and benefits of firms' activities related to environmental sustainability. Biodiversity protection can be another dimension to assess EP (Harms et al. 2013; Pullman et al. 2009).

2.4.2 Economic performance (Ec.P)

Ec.P represents the evaluation of an enterprise's policies and procedures in financial terms. It is allied to the business plant's capability to decrease production costs and deliver goods and services (Green et al. 2012). It expresses the degree of enhancement of firm performance regarding cost reduction and efficiency improvement (Das 2018). For measuring Ec.P firms uses some indicators such as reducing operational cost, sales growth, ROA, ROE, long-term financial position (Green et al. 2012; Pullman et al. 2009; Uddin and Hassan 2011; Wang and Dai 2018). Competitiveness in the market also shows the economic sustainability of a firm. Uniqueness in capability or product enhances competitiveness and is exposed through steady market share growth (Das 2018; Li et al. 2006).

2.4.3 Social performance (SP)

SP measures a firm's nature of social responsibility philosophies, social awareness practices, and apparent results as they link to the enterprise's societal associations (Wood 1991). Firms take initiatives for the betterment of employees and the community. Community, external stakeholders, regulatory bodies, and organizational culture motivate/pressure firms to take social initiatives for employees and the community (Mani and Gunasekaran 2018). These initiatives include employee focus social programs ad community focus social programs (Das 2018). Thus, firms involved in CSR activities increase their reputation, and that increase their SP. Several SP indices are equitable opportunities, health and safety programs for employees, community involvement, ensuring the quality of life, social reputation, corporate image etc. (Das 2018; Gimenez et al. 2012). Community focus initiatives like development of health and education of the public (Duarte et al. 2014), work opportunity for community/surrounding people, discounted price offer for community people increase the social image and lead to social sustainability.

3 Research hypotheses

3.1 Top management commitment, supply chain collaboration, and sustainable firm performance

The commitment represents the willingness to form stable relationships, the desire to relinquish temporary profits to realize enduring benefits, and the continuation of relationships (Yuan et al. 2018). TMC is reflected as a crucial enabler of effective SCC and can be a resource accomplished for attaining a rivalling advantage. SCC includes information exchange, joint working, strategic partnering, and resource exchange (Huo et al. 2015, 2021). Top managers are the decision-makers for involvement and investment in SCC. They support and formulate strategies that acknowledge SCC (Burki et al. 2019; Hoejmose et al. 2012). Sanction of resources to SCC and attitude to SCC of top managers also influence the behavior of mid and lower-level employees towards SCC (Alfalla-Luque et al. 2015; Sandberg and Abrahamsson 2010). For enhancing SCC success and proper implementation of SCM practices, top management support is highly required (Yen and Yen 2012). Thus, we suggest the subsequent hypothesis:

H1a: Top management commitment of SC partners is positively linked to supply chain collaboration.

The top management performs a crucial role in managing and applying environmental and sustainability issues (Burki et al. 2019). When top managements feel the advantages of adopting sustainability issues (e.g., enhancement of performance), they will desire to adopt environmentally supported systems and practices (Colwell and Joshi 2013; Latan et al. 2018; Spencer et al. 2013). Managers will be committed to implementing innovation activities such as product, process, and managerial innovations. These innovation practices are necessary for environmental practices leading to improved environmental performance (Burki et al. 2018). When top management commitment is high, individual firms and supply networks take initiatives that enhance environmental performances like waste reduction, decreasing ecological pollution, maintaining ecological standards etc. To get more environmental benefits, top managers are also concerned about environmental human resource practices (Mandip 2012). So. We offer the following hypothesis:

H1b: Top management commitment of SC partners is positively linked to environmental performance.

Top managers' dedication facilities communication among the partners in the SC. This facilitated communication improves coordination among the players in the network (Shin et al. 2019). Firms enjoy a trusted relationship that has an affirmative effect on economic performances, such as increased sales, higher profitability, and increased market share (Tzempelikos 2015). Committed managers are highly involved in joint operational activities like the innovation of process and innovation product that reduces transaction costs and increase economic performance (Patrucco et al. 2020). This involvement also includes middle management involvement, where they contribute to improved decision making and implementation of individual firm and supply chain strategies (Wooldridge and Floyd 1990). This total involvement enhances the economic or financial achievement of the firms in the SC. Sustainability facets of the whole SC are supported by top management (Colwell and Joshi 2013). All the sustainable initiatives positively influence the managerial and process activities and enhance the supply network's economic viability (Burki et al. 2018). Therefore, we recommend:

H1c: Top management commitment of SC partners is positively linked to economic performance.

Upper management may also be committed to business's social and ethical issues, though they are very much concerned about the financial and operational matters of business. In that case, they try to arrange a safe and congenial environment for the workers and express integrity and fairness to the stakeholders (Weaver et al. 1999). Commitment to society is an excellent power to doing the right things instead of higher salaries or incentives (Ioannou and Serafeim 2012; McGuire et al. 2003). Managers in a supply chain network take environment-friendly and innovative managerial processes that ultimately increase their representation and reputation to the public ((Burki et al. 2018). When firms take such innovative and sustainable initiatives, they get more attention from their stakeholders, especially from customers (Burki and Dahlstrom 2017). So we posit:

H1d: Top management commitment of SC partners is positively linked to social performance.

3.2 Supply chain collaboration and sustainable firm performance

In SCC, partners collaborate each with other to respond to market needs and attain a competitive advantage. Collaboration in respect of ecological managing practices has a powerful influence on ecological performance and competitiveness (Das 2018; Qin et al. 2021). Ecological management practices include in-house ecological management and ecological innovation practices (Burki et al. 2019; Micheli et al. 2020). Cooperation with customers and buyers is highly required to execute environmental or ecological management practices (Green et al. 2012; O'Connor et al. 2020). For proper communication and cooperation, firms share information for implementing joint environmental efforts, for instance, planning, goal setup, process implementation, performance evaluation etc. (Feng et al. 2020; Panahifar et al. 2018; Salam 2017). This environmental orientation of collaboration depends on the firms' supply chain strategies in the supply network (López and Ruiz-Benítez 2019). The extent of the relationship with partners, fairness in practices, and technology use are linked with SCC connected to better environmental performance (Wu and Chiu 2018). Thus, we posit:

H2a: Supply chain collaboration between SC partners is positively linked to environmental performance.

Several investigations have established a significant favorable connection between SCC and financial or economic outcomes and competitiveness of an enterprise (Chang et al. 2016; Das 2018; Feng et al. 2020; Green et al. 2012; Liao and Kuo 2014). Chang et al. (2016) proposed three SCC dimensions, such as in-house collaboration, vendor collaboration, and buyer collaboration. These dimensions directly and indirectly (through functional, interactive, and strategic performance) relate to economic performance. SCC enjoys some collaborative advantages (e.g., flexibility, innovation, quality of operation, synergic value, process efficiency), and those have direct control over the firm's economic outcome (Cao and Zhang 2011; Lee et al. 2014). Laari et al. (2016), Micheli et al. (2020), and Yang and Lin (2020) have provided similar findings. They stated that when the SCC is concerned about environmental and sustainability issues, it can improve the economic and ecological performances of that SCC. In the tie between SCC and Ec.P, managers should consider their partners' behavioral aspects (e.g., mutual trust, interdependency, information exchange, and unprincipled behavior) (Feng et al. 2020). Therefore, we recommend:

H2b: Supply chain collaboration between SC partners is positively linked to economic performance.

When firms are involved in value addition in the supply network, which develops SC capabilities. SC value addition and SC capabilities improve firms' operational and social performances through distinctive competency (Liao and Kuo 2014; Panahifar et al. 2018; Salam 2017). SCC includes joint workings and training sessions concerning social issues, such as health and security measures for employees and citizens. Employee oriented health, security and safety measures increase the morality and loyalty of workforces to the organization. Community-based practices enhance the enterprise's image and status and increase that

enterprise's acceptability to the stakeholders (Das 2018). Again, joint training and efforts improve the knowledge and skills of all parties involved in SCC. Firms can use improved knowledge for enhancing their capacity to improve safety and security measures. SCC has other benefits like supplier development, long-term customer relation, integrity, and fair practices (Chen et al. 2018; Wu and Chiu 2018). So, we offer the following hypothesis:

H2c: Supply chain collaboration between SC partners is positively linked to social performance.

3.3 Environmental, economic, and social performance

The extent of environment friendly (e.g., reduction of environmental pollution, decreasing trend of use of hazardous materials and equipment) activities of a firm are expressed through environmental performance (Stanwick and Stanwick 1998). Many scholars have proven a favorable association between EP and Ec.P (Horváthová 2010; Salama 2005; Sarumpaet 2005; Shen et al. 2019). Iwata and Okada (2011) conducted a study on Japanese manufacturing firms' connection between EP and Ec.P. They argued that EP could influence the financial indicators (e.g., ROA, ROE, ROI, ROS etc.). To enhance Ec.P, firms can implement eco-efficiency and ecological initiatives, which perform a role in the reduction of manufacturing costs and waste disposal (Ahmed et al. 2020; Rokhmawati et al. 2015). In that case, firms in a supply chain may follow a lean manufacturing process that ultimately positively affect economic performance through ecological managing practices and environmental performance. Firms should disclose more information-based environmental policy measures that positively impact the market economy (Nakao et al. 2007). Therefore, we posit:

H3: Environmental performance is positively linked to economic performance.

The SP includes health, security, and safety measures for workforces and citizens, reputation and corporate image, employee engagement and employee involvement in decision making. Employee engagement and participation increase their morale and productivity, which improve the EP of the enterprise (Das 2018; Stanwick and Stanwick 1998). Human rights, a decent work environment, product responsibility have a favorable influence on the Ec.P and financial outcomes (Chen et al. 2015). Poor working conditions and safety measures may increase absenteeism and labor turnover (Rokhmawati et al. 2015). Managers should focus on high-performance human resource practices that have an essential role in the association between SP and financial achievement (Chang et al. 2013). Several stakeholders have different expectations for the corporation. Customers and society as a whole have more expectations for social wellbeing (Sila and Cek 2017). Stockholders are also very much curious about economic and social performance (Ruf et al. 2001). Finally, social initiatives, corporate reputation, reputation management capability are vital for the association between SP and Ec.P (Neville et al. 2005). Thus, we propose:

H4: Social performance is positively linked to economic performance.

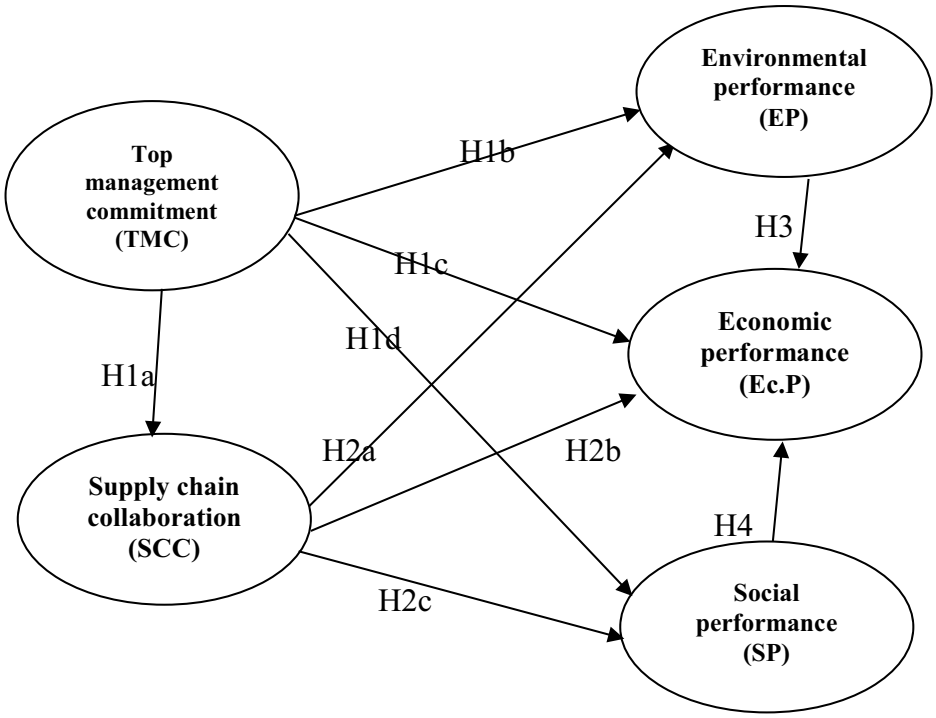
3.4 Mediation effects

Several studies have shown the mediating role of supply chain integration and SCC (e.g., Alzoubi et al. 2020; Feng et al. 2017; Jajja et al. 2018; Jimenez-Jimenez et al. 2019; Liu et al. 2021; Salam 2017). Trusted relationships between SC partners and technology play a strategic role in developing SCC that promotes superior SFP (Jimenez-Jimenez et al. 2019; Salam 2017). Similarly, Alzoubi et al. (2020) stated that firms collaborate with their SC partners through information sharing and SCC has a mediating role between supply chain strategies and SFP. The linkage between business model design, social network, and operational performance is also mediated by SC integration (Feng et al. 2017; Liu et al. 2021). The prior study suggests that TMC does not automatically direct enterprise performance, as enterprise performance depends on SCC is developed from top management's willingness (Alfalla-Luque et al. 2015). Managers should exhibit a commitment to collaborate regarding joint efforts, information and knowledge sharing, resource distribution, and joint decision-making to enhance SFP (Chu et al. 2017; Wu and Chiu 2018). Such commitment supported collaborations provide efficiency enhancements, effectiveness, and superior market position (Min et al. 2005). Trust and commitment jointly intensify collaboration, which ultimately improves operational performance (Salam 2017). Firms leverage their resources and knowledge with their supply chain partners to achieve greater SCC. Firms complement SCC's issues with each other through TMC and support, thereby progress the EP, Ec.p, and SP of each partnering firm (Cao and Zhang 2011). Therefore, SCC has a facilitating influence on the association between TMC and SFP (Fig. 1, Table 1). Accordingly, we offer the subsequent hypotheses:

H5a: Supply chain collaboration mediates the link between top management commitment and environmental performance.

H5b: Supply chain collaboration mediates the link between top management commitment and economic performance.

Fig. 1 Proposed research model



H5a: TMC	→	SCC	→ EP
H5b: TMC	→	SCC	→ Ec.P
H5c: TMC	→	SCC	→ SP

H5c: Supply chain collaboration mediates the link between top management commitment and social performance.

4 Research method

4.1 Sampling design and data collection

The sample of this study includes the active members of the Bangladesh Agro-Processors' Association (BAPA) and retailers of agro-products. Under the random sampling method, we sent a self-administered questionnaire to 250 firms. Respondents were from SCM and other related departments. We selected senior and mid-level employees, as they have adequate knowledge and experience about operations and SCM of their respective enterprises. There is no separate SCM department; we have chosen related departments (e.g., marketing, sales, HRM, engineering, management accounting etc.) that perform operations and SCM activities. We got back 218 questionnaires, but we excluded 7 questionnaires because of incomplete and inconsistent answers. Thus, we have used 211 completed questionnaires in the data analysis. We have received 128 responses within four weeks of sending the questionnaire and reaming 83 responses after sending a request letter. We have spent a total of three months completing data collection procedures. Our sample size is suitable for applying structural equation modelling (SEM). To ensure the suitability of SEM application minimum of 10 observations for each independent variable is needed (Bartlett et al. 2001); this study has 21 independent variables and 211 usable questionnaires. We have pretested the questionnaire by three academicians who are experts in SCM and operations management. We have piloted the questionnaire with 20 senior and mid-level employees of the operations and SCM departments of respective firms in the agro-processing industry. Their suggestions and comments were considered, and we partially modified the questionnaire to increase face validity. Table 2 shows the respondents' statistics.

4.2 Measures

We measured all the items using a seven-point Liter-type scale ordering from 1 (strongly disagree) to 7 (strongly agree). We adopted measurement items from the existing literature and modified them based on pretesting and piloting the questionnaire (Table 3). We have adopted the

Table 1 Summery of the hypotheses

Predictor variables	Criterion variables	References	Hypotheses
Top management commitment	Supply chain collaboration	Alfalla-Luque et al. (2015), Burki et al. (2019), Hoejmose et al. (2012), Sandberg and Abrahamsson (2010), Yen and Yen (2012), Yuan et al. (2018)	**H1a:** Top management commitment of SC partners is positively linked to supply chain collaboration
Top management commitment	Environmental performance	Burki et al. (2018, 2019), Colwell and Joshi (2013), Latan et al. (2018), Spencer et al. (2013)	**H1b:** Top management commitment of SC partners is positively linked to environmental performance
Top management commitment	Economic performance	Burki et al. (2018), Patrucco et al. (2020), Tzempelikos (2015), Wooldridge and Floyd (1990)	**H1c:** Top management commitment of SC partners is positively linked to economic performance
Top management commitment	Social performance	Burki and Dahlstrom (2017), Burki et al. (2018), Ioannou and Serafeim (2012), McGuire et al. (2003)	**H1d:** Top management commitment of SC partners is positively linked to social performance
Supply chain collaboration	Environmental performance	Burki et al. (2019), Das (2018), Green et al. (2012), Micheli et al. (2020), O'Connor et al. (2020), Qin et al. (2021)	**H2a** Supply chain collaboration between SC partners is positively linked to environmental performance
Supply chain collaboration	Economic performance	Cao and Zhang (2011), Chang et al. (2016), Das (2018), Feng et al. (2020), Green et al. (2012), Lee et al. (2014), Liao and Kuo (2014), Micheli et al. (2020), Yang and Lin (2020)	**H2b:** Supply chain collaboration between SC partners is positively linked to economic performance
Supply chain collaboration	Social performance	Das (2018), Liao and Kuo (2014), Panahifar et al. (2018), Salam (2017)	**H2c:** Supply chain collaboration between SC partners is positively linked to social performance
Environmental performance	Economic performance	Ahmed et al. (2020), Horváthová (2010), Iwata and Okada (2011), Rokhmawati et al. (2015), Salama (2005), Sarumpaet (2005), Shen et al. (2019)	**H3:** Environmental performance is positively linked to economic performance
Social performance	Economic performance	Chen et al. (2015), Das (2018), Neville et al. (2005), Sila and Cek (2017), Stanwick and Stanwick (1998)	**H4:** Social performance is positively linked to economic performance
Top management commitment	Environmental performance	Alfalla-Luque et al. (2015), Alzoubi et al. (2020), Chu et al. (2017), Jimenez-Jimenez et al. (2019), Min et al. (2005), Salam (2017), Wu and Chiu (2018)	**H5a:** Supply chain collaboration mediates the link between top management commitment and environmental performance
Supply chain collaboration	Economic performance		**H5b:** Supply chain collaboration mediates the link between top management commitment and economic performance
	Social performance		**H5c:** Supply chain collaboration mediates the link between top management commitment and social performance

Table 2 Sample descriptive

Characteristics (Sample size: n = 211)	Frequency	Percentage (%)
Length of service		
1–5 years	62	29.38
6–10 years	110	52.13
Above 10 years	39	18.48
Department		
Supply chain	61	28.91
Sales/Marketing	97	45.97
Management accounting/HRM	36	17.06
Engineering/Quality control	17	08.05
Education		
Bachelor	38	18.00
Master	161	76.30
Ph.D./Others	12	05.69
Scale of the firm (Number of employees)		
Small (< 200)	98	46.45
Medium (200 to 500)	70	33.16
Large (501 to 1000)	24	11.37
Extra-large (> 1000)	19	09.00
Nature of the firm		
Supplier	47	22.27
Manufacturer (buyer)	103	48.82
Distributor	35	16.59
Retailer	26	12.32

measurement items for TMC from Burki et al. (2018), Hoejmose et al. (2012), and Zhu and Sarkis (2004). We have modified the items to suit the study. According to the comments from pretesting, we operationalized four items under this construct. This construct focuses on top managers' willingness for SC integration, supports SFP and quality in operations and relationship management.

The measurement items for SCC were embraced from the previous researches (Cao and Zhang 2011; Haque and Islam 2018; Li et al. 2005; Singh and Power 2009). From the pilot-testing suggestions, we rephrased the wordings of the items of this construct to make it supply chain partners oriented rather than the only supplier or only buyer-oriented. Five items of this construct emphasize joint effort, coordinated decision making, trusted communication, sharing of information, and knowledge among supply chain members.

We adopted measurement items for SFP from existing studies. There are three components of SFP, such as EP, Ec.P, and SP. We measured four items of EP from Burki et al. (2018), Daily et al. (2007), Gimenez et al. (2012), Kassinis and Soteriou (2003), Wang and Dai (2018), and Zhu et al. (2005). This construct focuses on environmentally friendly initiatives and operations of firms. The measurement items of Ec.P were adopted from Burki et al. (2018), Uddin and Rahman (2015), and Wang and Dai (2018). We have included here the preliminary Ec.P indicators of a firm. The SP measurement items were taken from Burki et al. (2018), Daily et al. (2007), Gimenez et al. (2012), Kassinis and Soteriou (2003), Wu et al. (2017), and Zhu et al. (2005). This construct indicates how the firm social and citizen-friendly is.

We considered the size of the firm as a control variable in this study. We assessed the firm size through the number of staff in that firm. Another control variable is green innovations that might have an impact on firm performance of agro-processing supply chains. We have also used a seven-point Likert-type scale to operationalize this construct using non-polluting materials, eco-friendly production and packaging process, and recycling of used products (Asadi et al. 2020). The marker variable degree of competition was measured using the same rating scale as rivalry on cost, price, delivery promptness, customer needs satisfaction, and degree of rivalry within the supply chain (Munir et al. 2020).

Table 3 Sources of measurement items

Constructs	Definition	References
Top management commitment (TMC)	TMC represents enthusiasm for collaboration and ensuring quality and supports for SFP	Burki et al. (2018), Hoejmose et al. (2012), and Zhu and Sarkis (2004)
Supply chain collaboration (SCC)	SCC shows the extent to which firms collaborate with their partners in the supply network and manage intra and interfirm activities to achieve shared benefits	Cao and Zhang (2011), Haque and Islam (2018), Li et al. (2005), and Singh and Power (2009)
Environmental performance (EP)	EP represents environmental awareness and the capacity of the plant to reduce contamination and usage of toxic materials	Burki et al. (2018), Daily et al. (2007), Gimenez et al. (2012), Kassinis and Soteriou (2003), Wang and Dai (2018), and Zhu et al. (2005)
Economic performance (Ec.P)	Ec.P is allied to the firm's capability to decrease the cost of production and delivering goods and services promptly	Burki et al. (2018), Uddin and Rahman (2015), and Wang and Dai (2018)
Social performance (SP)	SP represents the social association, social responsibility, and social awareness of the firm	Burki et al. (2018), Daily et al. (2007), Gimenez et al. (2012), Kassinis and Soteriou (2003), Wu et al. (2017), and Zhu et al. (2005)

4.3 Common method bias

Common method bias (CMB) is an underlying obstacle in collaborative social research. Since we follow the single survey approach, we should assess CMB (Podsakoff et al. 2003). This study has taken four steps to lessen this bias. First, the questionnaire design was respondent supportive. We have separated the exogenous and endogenous variables in the questionnaire. Second, respondents were free from any bias, and they responded to whatever they liked. Autonomy and confidentiality of their responses were ensured. Third, Harman's single-factor test was applied. We performed this test by taking together all measurement items of exogenous and endogenous constructs. The outcome of this test showed a single factor accounted for 38.228 percent (less than 50 percent) of the total variance. This outcome indicated CMB is not material for the current study. Finally, we used a marker variable (MV) technique to probe the shared variance concerning the study's unobserved constructs and a marker variable (Lindell and Whitney 2001). The degree of competition within the agro-processing industry was the MV. This variable is theoretically not related to other of the study. The correlation coefficients between the MV and the unobserved constructs were not significant (less than 0.37). Thus, we can mention that there was no CMB.

According to the technique of Armstrong and Overton (1977), we have conducted a non-response bias (NRB) check in our research. We compared the number of respondents (early respondents versus late respondents) from agro-processing firms. We performed a t-test to check the variances. The results revealed no significant variance at the $p \leq 0.05$ level. So, we can argue that there was no NRB.

5 Analysis and results

5.1 Reliability and validity analysis

In the first analysis phase, we have run the principal component analysis with varimax rotation under exploratory factor analysis (EFA). EFA identified the unobserved factors of the measurement model indicators, as presented in Table 4. We conducted Bartlett's test of sphericity (approx. chi-square = 4064.64, df = 210, p = 000). These test results indicate that our variables were significantly correlated and appropriate for factor analysis. Again, the Kaiser–Meyer–Olkin (KMO)'s test shows a high value of 0.853 that designates the sample's appropriateness for factor analysis. The eigenvalues more than one in five factors suggests five factors to continue because their eigenvalues are more than one. Besides, The EFA presents the total variance explained to 78.30 percent. This result shows the five factors model describes 78 percent variability existence and because of error variance. The higher value variance explained indicates the power of the relationship among the factors. In factor loadings, each indicator achieves the criteria of factor loading standards higher than 0.6 (Hair et al. 2010) accept one indicator from TMC, and that indicator was removed from further investigation.

Next, we ran the confirmatory factor analysis (CFA) to evaluate the measurement model's characteristics. CFA exhibits a holistic description of the unobserved constructs of our study. We assessed the internal consistency (IC) and reliability of five constructs by calculating Cronbach's α and construct reliability (CR) (Braunscheidel and Suresh 2009; Chin 1998). All the values of CR and Cronbach's α surpassed the suggested cut-off point of 0.70 and indicated IC and reliability. Item reliability (IR) is represented by an individual item's variance within its construct. Standardized factor loadings (SFL) of CFA shows IR. Though SFLs higher than 0.50 are satisfactory, SFLs higher than 0.70 indicate good IR (Chin 1998; Hair et al. 2010). The SFLs of the measurement model ranged from 0.523 to 0.987 indicated acceptable IR. Table 4 shows latent constructs and their items' Cronbach's α, CR, average variance extracted (AVE), SFL, and t-statistics values. The estimation has shown satisfactory goodness-of-fit statistics for the measurement model. The goodness-of-fit statistics were $\chi 2$/degrees of freedom ($\chi 2$/df) ratio, the root-mean-square error of approximation (RMSEA), adjusted goodness-of-fit index (AGFI), normed fit index (NFI), comparative fit index (CFI), and incremental fit index (IFI). The measurement model's goodness-of-fit indices were: $\chi 2 = 291.53$; df = 170; p = .000; $\chi 2$/df = 1.715; RMSEA = .058; AGFI = .849; NFI = .931; CFI = .970; IFI = .970.

We assessed construct validity through convergent validity and discriminant validity. The convergent validity examines the degree of conjunction among the items of an individual construct. This study measured convergent validity through AVE and t-statistics values related to SFLs of CFA ((Fornell and Larcker 1981; Hair et al. 2010; Rao and Troshani 2007). AVE's threshold level is 0.50 and t-statistics values must be significant at the 0.01 level (Hair et al. 2010; Rao and Troshani 2007). Table 4 indicates that the AVE values ranged from 0.542 to 0.818, and t-statistics values for all items are significant at the 0.001 level. Both the results fulfill the criteria for convergent validity. Discriminant validity indicates the uniqueness of items within the constructs and the uniqueness of constructs within the measurement model. If the AVE values of constructs in each pair is higher than the squared inter-construct (SIC) correlation between all pairs of constructs it indicates discriminant validity (Churchill 1979). Table 5 presents the correlation coefficients (significant at $p < 0.01$ level) and SIC correlation coefficient and fulfill the discriminant validity requirement. For example, in SCC, the AVE value was 0.559, and SIC estimates were 0.029, 0.054, and 0.149 for EP, Ec.P, and SP, respectively, indicating discriminant validity.

Table 4 Results of EFA and CFA

Construct/items	EFA factor loadings	CFA standardized loadings	t-statistics
Top management commitment (Eigenvalue = 8.028 *Cronbach's α = 0.843, CR = 0.82, AVE = 0.542)*			
i. We maintain good relations and encourage sharing of information and knowledge among supply chain members	0.738	0.837	7.305***
ii. We support environmentally sustainable and social wellbeing practices	0.778	0.915	7.385***
iii. We focus on the firm's profitability and business growth	0.852	0.597	6.265***
iv. We emphasize quality for product, service, and relationship	0.838	0.523	5.649***
Supply chain collaboration (Eigenvalue = 3.3308, *Cronbach's α = 0.858, CR = 0.86, AVE = 0.559)*			
i. We have a goal alignment relationship with partners	0.839	0.901	16.093***
ii. We exchange timely information with our partners	0.863	0.891	15.802***
iii. We maintain mutual communication with our partners	0.777	0.650	10.183***
iv. We share resources and knowledge with our partners	0.746	0.631	9.794***
v. We have integrated activities across supply chains	0.689	0.590	9.000***
Environmental performance (Eigenvalue = 2.155, *Cronbach's α = 0.946, CR = 0.94, AVE = 0.818)*			
i. We have arrangements to reduce air emission/wastewater/solid waste	0.874	0.906	16.893***
ii. We are concerned to reduce energy consumption	0.867	0.924	17.488***
iii. Our firm complies with environmental standards	0.872	0.918	17.273***
iv. We have initiatives to improve the environmental situation of our firm	0.775	0.868	15.723***
Economic performance (Eigenvalue = 1.860, *Cronbach's α = 0.946, CR = 0.93, AVE = 0.775)*			
i. Our return on investment (ROI) and return on asset (ROA) is higher than other firms	0.858	0.741	12.525***
ii. We have a steady sales growth	0.843	0.793	13.783***
iii. We have a steady market share growth	0.777	0.987	19.799***
iv. We are a long-term profit-oriented firm	0.759	0.974	19.310***
Social performance (Eigenvalue = 1.091, *Cronbach's α = 0.928, CR = 0.92, AVE = 0.743)*			
i. We have arrangements to improve the occupational health and safety of employees	0.880	0.795	12.754***
ii. Our firm has a social reputation	0.885	0.856	14.127***
iii. Our firm has an image and position in society and customers	0.875	0.913	15.170***
iv. We maintain good relationships with our stakeholders	0.785	0.880	14.274***

Overall Cronbach's α = 0.915

AVE Average variance extracted, *CR* Construct reliability

*** Significant at < 0.001 level

5.2 Structural model analysis

We used AMOS 17.0 software to apply SEM. We used maximum likelihood as an estimation method to test the hypotheses of the conceptual model. Under SEM we linked the constructs: TMC, SCC, EP, Ec.P, and SP in the structural model. We found a satisfactory model fit and most of the goodness-of-fit statistics were higher than threshold level (Hair et al. 2010). The goodness-of-fit statistics were: χ^2 = 319.85.53; df = 171; p = .000; χ^2/df = 1.870; RMSEA = .064; AGFI = .840; NFI = .924; CFI = .963; IFI = .963.

Figure 2 presents the hypothesized structural model along with standardized path measurements for direct hypotheses. All the direct hypotheses were accepted except H1c and H2b, where TMC and SCC were not significantly linked to Ec.P. We have followed the procedures of Zhao et al. (2010) to examine the mediation effect of SCC on the association between TMC and SFP dimensions (environmental,

Table 5 Correlation matrix and (squared correlations) among constructs

Constructs	TMC	SCC	EP	Ec.P
Top management commitment (TMC)				
Supply chain collaboration (SCC)	0.317 (0.100)			
Environmental performance (EP)	0.254 (0.065)	0.169 (0.029)		
Economic performance (Ec.P)	0.295 (0.088)	0.233 (0.054)	0.705 (0.497)	
Social performance (SP)	0.328 (0.108)	0.386 (0.149)	0.450 (0.203)	0.547 (0.299)

economic, and social performance). This approach is easy to apply and has flexibility. We measured direct and indirect effects through specific structural paths.

5.3 Robustness test

This study has taken several initiatives to minimize possible biases and endorse the models and empirical outcomes. First, we have addressed CMB using statistical and practical initiates like questionnaire design, one-factor test, marker variable test etc. Second, we have used a statistical test (t-test) to address NRB. Third, we randomly selected 40 percent sample and applied SEM; we found the same mainstream analysis result. Fourth, we considered economic performance as the dependent variable. TMC, SCC, EP, and SP as independent variables, then conducted a regression analysis and found the same result as we saw in SEM. Fifth, we again considered TMC, SCC, EP, and SP as dependent variables and their interactions as the independent variables and performed regression analysis. The results gave the same indications as in SEM. Finally, we performed EFA and CFA to endorse SEM's strength, and their results were acceptable level.

6 Discussion and implications

6.1 Direct effects

The SEM analysis reveal several outcomes of hypotheses (please see Table 6). The empirical results support H1a, which display a direct, favorable, and significant effect of TMC ($\beta = 0.344$, $p \leq 0.001$) on SCC. This result indicates that SCC is a strategic issue that requires top management willingness, support, and commitment. Commitment to participate in the collaborative endeavor and perform the assigned duties and responsibilities. This conclusion is harmonious with Burki et al. (2019) that TMC is a prerequisite for attaining sustainable collaboration across the supply network. The outcome of this study implies that harmonization in commitment among the supply chain parties is a requirement for effective SCC.

As we proposed, the direct and positive effect findings designate a substantial impact of TMC ($\beta = 0.261$, $p \leq 0.01$) on EP, indicating support for H1b. This outcome shows TMC is a crucial antecedent of EP. Managers commit and perform more environmental practices to ensure sustainable performance benefits (Latan et al. 2018). Managerial initiatives like waste reduction, usage of quality materials, maintaining ecological standards enrich environmental practices that ultimately enhance EP. Thus, this study's findings established the positive effect of TMC on sustainable performance through environmental commitment, practices, and performance among supply network partners.

Although we found the direct effects of TMC on SCC and EP favorable and substantial, the direct effect of TMC on economic performance (Ec.P) was not significant ($\beta = 0.043$, not significant). Thus, H1c was not accepted. The probable cause for the insignificant relationship between TMC and Ec.P could be more managerial willingness and

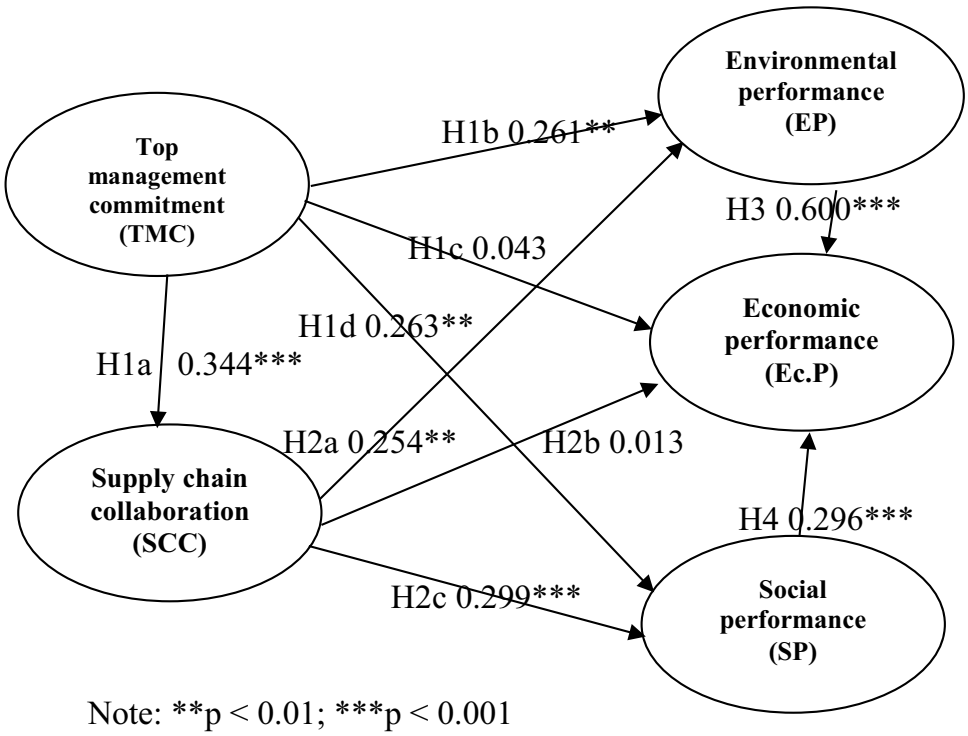


Fig. 2 Results of path analysis.
Note: **p < 0.01; ***p < 0.001

Table 6 Outcomes of hypotheses

Hypothesis	Result	Findings	Relevant literature
H1a: TMC → SCC	Accepted	TMC has a direct, favorable, and significant effect on SCC	Burki et al. (2019), Hoejmose et al. (2012), Yen and Yen (2012)
H1b: TMC → EP	Accepted	TMC has a substantial positive impact on EP	Burki et al. (2018), Burki et al. (2019), Latan et al. (2018)
H1c: TMC → Ec.P	Rejected	TMC has not a significant impact on Ec.P	
H1d: TMC → SP	Accepted	There is a significant positive link between TMC and SP	Burki and Dahlstrom (2017), Ioannou and Serafeim (2012)
H2a: SCC → EP	Accepted	SCC has a significant positive influence on EP	Feng et al. (2020), Panahifar et al. (2018)
H2b: SCC → Ec.P	Rejected	The direct impact of SCC on Ec.P was not significant	
H2c: SCC → SP	Accepted	SCC has a significant positive impact on SP	Das (2018), Panahifar et al. (2018)
H3: EP → Ec.P	Accepted	EP has a positive and significant influence of Ec.P	Ahmed et al. (2020), Rokhmawati et al. (2015)
H4: SP → Ec.P	Accepted	SP has a positive and significant influence of Ec.P	Chen et al. (2015), Das (2018), Rokhmawati et al. (2015)
H5a: TMC → SCC → EP	Accepted	SCC has mediated the relationship between TMC and EP	Alzoubi et al. (2020), Chu et al. (2017), Jimenez-Jimenez et al. (2019), Min et al. (2005), Salam (2017)
H5c TMC → SCC → SP	Accepted	SCC has mediated the relationship between TMC and SP	
H5b: TMC → SCC → Ec.P	Rejected	SCC did not mediate the relationship between TMC and Ec.P	

commitment for EP and social performance (SP) because EP and SP ultimately enhance Ec.P. However, the results support H1d and designate a favorable and substantial link between TMC and social performance ($\beta = 0.263$, $p \leq 0.01$). This result supports Ioannou and Serafeim (2012) argument that TMC is a requirement for social recognition and performance. Organizational commitment builds a positive atmosphere, where the perpetual relationship with stakeholders and citizen-oriented image can be created.

Supporting H2a, the findings display a favorable and significant influence of SCC ($\beta = 0.254$, $p \leq 0.01$) on EP. SCC can develop a view of belonging among the firms in the supply network and inspire joint working and decision making. Such a view of accommodation and collaboration encourage the firm to share information, knowledge and experience that are essential for implementing collaborative environmental efforts (Feng et al. 2020; Panahifar et al. 2018). By ensuring information, knowledge, experience, and sharing resources, SCC helps in implementing collaborative environmental efforts like planning, goal setting, process implementation, and performance measurement etc. By responding to the environmental issues, firms in the supply network ensure environmental awareness, environmental protection and environmental sustainability.

We have found the direct impact of SCC on the SFP dimension, EP positive and significant. Still, the direct impact of SCC on another dimension, EC.P (($\beta = 0.013$, not significant), was not significant. Therefore, H2b did not get support from empirical results. The probable reason behind the insignificant relationship between SCC and Ec.P could be more integration with SC partners regarding environmental and social issues, which enhance an enterprise's economic sustainability. Conversely, the empirical evidence provides support for H2c. We have found a direct impact of SCC on SP ($\beta = 0.299$, $p \leq 0.001$) and that was favorable and substantial. Initiatives for employees and society like heath safety improvement, a training program for youth and employees, community involvement enhance a firm's social acceptance (Das 2018). When such initiatives are taken jointly, the participating firms and society can benefit through shared knowledge and skills, building social awareness, and value creation for the society.

The impact of EP of Ec.P ($\beta = 0.600$, $p \leq 0.001$) and SP on Ec.P ($\beta = 0.296$, $p \leq 0.001$) were established positive and substantial. Accordingly, H3 and H4 were accepted. Environment-oriented firms become more environment-friendly, and they try to reduce environmental pollution, waste reduction and reduce hazardous materials. They implement ecological initiatives, eco-friendly plants and operations processes, ensuring manufacturing efficiency and lower waste disposal costs (Rokhmawati et al. 2015). Moreover, SP includes corporate social activities like health and safety measures of employees and citizen, youth development program, employee involvement in decision making. Such social activities build corporate reputation and image; and positively impact economic performance (Chen et al. 2015). Through these social activities firms can create social values for customers and other stakeholders that ultimately enhance economic sustainability. Thus, supporting previous literature (Das 2018; Rokhmawati et al. 2015), the current study designates a direct and significant impact of EP and SP on Ec.P.

6.2 Mediation effects

The mediation influence of SCC on the association between TMC and SFP (environmental, economic, and social) was evaluated by drawing the direct structural path and indirect structural path concurrently into the SEM (Iacobucci 2010; Zhao et al. 2010). The direct and substantial impact of TMC ($\beta = 0.344$, $p \leq 0.001$) on SCC and the impact of SCC ($\beta = 0.254$, $p \leq 0.01$) on EP show the mediation effect of SCC on the association between TMC and EP, supporting H5a. The indirect effect of TMC on EP was established to be positive and substantial ($\beta_{direct} = 0.261$, $p \leq 0.01$; $\beta_{indirect} = 0.087$, $p \leq 0.05$; $\beta_{total} = 0.348$, $p \leq 0.05$). The positive and substantial indirect impact of SCC on TMC and EP's relationship, the significant direct association between TMC and EP ($\beta = 0.261$, $p \leq 0.01$) designate a complementary mediation influence (Table 7). This mediation effect indicates that by helping SCC, TMC helps to enhance EP.

The direct and significant impact of TMC ($\beta = 0.344$, $p \leq 0.001$) on SCC and the effect of SCC ($\beta = 0.013$, not significant) on Ec.P indicate no mediation effect of SCC on the link between TMC and Ec.P, not supporting H5b. There was no significant direct link between TMC and Ec.P ($\beta = 0.043$, not significant). Thus, the results indicate no-effect mediation. This result implies that TMC does not directly impact Ec.P and no indirect impact through SCC.

Again, the direct and significant influence of TMC ($\beta = 0.344$, $p \leq 0.001$) on SCC and the influence of SCC ($\beta = 0.299$, $p \leq 0.001$) on SP display mediation effect of SCC on the association between TMC and SP, confirming H5c. The indirect influence of TMC on SP was recognized to be positive and substantial ($\beta_{direct} = 0.263$, $p \leq 0.01$; $\beta_{indirect} = 0.103$, $p \leq 0.05$; $\beta_{total} = 0.365$, $p \leq 0.05$). The positive and significant indirect influence of SCC on the association between TMC and SP, the significant direct association between TMC and SP ($\beta = 0.263$, $p \leq 0.01$) show a complementary mediation outcome. This mediation result designate that by helping SCC, TMC supports to improve SP.

6.3 Theoretical implications

This research has a contribution to the operations management and SCM literature and also has implications for the theatrical field. This study provides insight into operations and SCM theory by examining the modified outlines given by Burki et al. (2018) and Shin et al. (2019) that offered a link between TMC and firm performance across the moderating variable of innovation and managerial integration. This study also contributes to sustainable operations and SCM by including TCM, SCC, and SFP together. The literature of operations and SCM has been extended by incorporating supply chain focused TMC and empirically demonstrating the effects of this commitment on SCC and SFP dimensions. This study's results endorse prior work (Colwell and Joshi 2013) that has argued corporate responsiveness and performance is high when TMC is high.

This research also spreads Tzempelikos' (2015) research and endorse the mediating character of SCC on the link between TMC and SFP. TMC intensifies top management involvement and relationship reciprocity. Moreover, the current study supports the involvement of buyer and supplier in a dynamic collaboration platform. This study also explains how such a platform shares information and resources in the entire supply chain that TMC supports. Top management supported SCC can enhance SFP.

Finally, by recognizing the three particular sustainable performance dimensions (environmental, economic, and social) and evaluating their interactions in the SCM context, the study contributes to the sustainable performance literature. This study investigated the direct and indirect influence of TMC on SFP and suggested a more pragmatic study emphasizing the influence of TMC on the SFP dimension. Additionally, SCC has performed a direct and mediating character in the link between TMC and SFP and urges for more research on the direct and indirect character of SCC in SCM. Indeed, the incorporation of TMC, SCC, and SFP in a single model advocate the essential for operations and SCM researchers to give more focus on operational and sustainability factors and to explore for more suitable conceptual frameworks to describe the associations shown in the present study.

6.4 Managerial implications

This study offers various implications for the managers (see Fig. 3). First, this study proposes that operations and SC managers recognize TMC as a crucial factor in the strategic decision that may have a direct and indirect effect on

Table 7 Result of mediation effect test

Hypothesis & Path	Direct path coefficient			Indirect effect (a*b)	Total effect	Joint effect	Mediation type
	a	**b**	**c**				
H5a: TMC → SCC → EP	0.344	0.254	0.261	0.087	0.348	0.515	Complementary mediation
H5b: TMC → SCC → Ec.P	0.344	0.013	0.043	0.004	0.047	0.051	No-effect mediation
H5b: TMC → SCC → SP	0.344	0.299	0.263	0.103	0.365	0.607	Complementary mediation

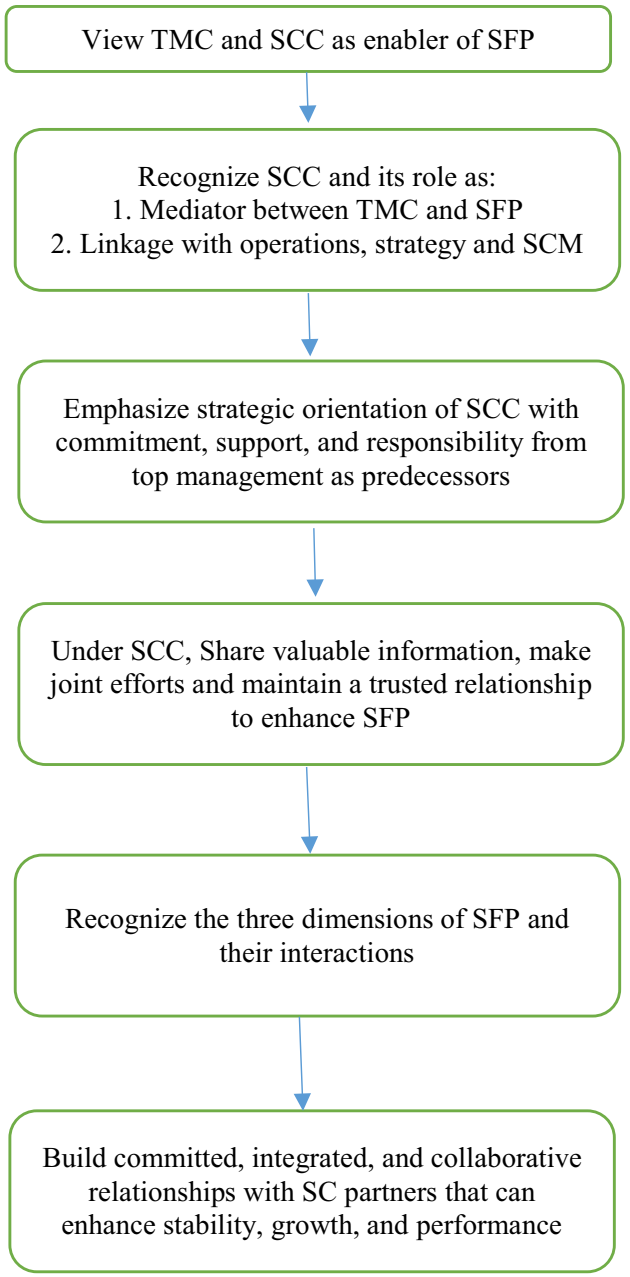


Fig. 3 A Process for exploiting TMC and SCC for SFP

SFP. Committed managers allow sharing resources, ensuring quality in a relationship, product, and service, which positively influences buyer–supplier integration and firm performance. Second, SCC is an agile aspect that mediates the association between TMC and SFP. The managers should consider SCC as a strategic issue. It has a multidimensional link with operations, strategy and SCM (Wiengarten et al. 2014).

Third, when managers can realize the strategic orientation of SCC that can maximize the benefits arising from collaborative endeavors supported by TMC. Thus, this study specifies the need for commitment, support, and responsibility from top managers before collaborating with supply chain partners. Fourth, in line with the exiting study on the SCM and operations management literature (Feng et al. 2020; Micheli et al. 2020; Panahifar et al. 2018), the current research identifies the requisite for managers to build integrative and collaboration relationships with SC members that will enhance SFP. Through the SCC, SC partners can share valuable information, make joint efforts and maintain a trusted relationship; all contribute to the enhancement of SFP. Finally, the study results signal that the managers should recognize the three SFP dimensions (environmental, economic, and social performance). These dimensions may interact with each other. TMC and SCC both have contributions to enhance SFP. Thus, committed, integrated, and collaborative relationships in a supply network can enhance stability, growth, and performance. Figure 3 delimits six guidelines for managers to exploiting TMC and SCC for SFP in managerial decision making.

7 Conclusion and limitations

This study demonstrated the link between TMC, SCC, and SFP with the agro-processing supply chain perspective in Bangladesh. First, the findings clearly show a direct and positive association between TMC and EP and SP. The findings indicated no substantial direct link between TMC and Ec.P. Second, the results establish a positive effect of TMC on SCC and that further stimulates environmental and social performance. SCC also did not have a significant linkage with economic performance. SCC is inadequate to play a mediating act between TMC and economic performance. Thus, the results demonstrate that TMC is not significantly linked (directly or indirectly) with Ec.P. Finally, the findings present that EP and SP have a favorable and substantial influence on Ec.P.

This investigation contains some limitations and potential extents for further research. This study has used cross-sectional data collected from a sole respondent of each firm. The extent of TMC and its impact on SCC could be tested through a longitudinal study (Cagliano et al. 2008). Further research can emphasize recognizing specific drivers for SCC and their effects on a different level of collaboration. We have investigated through survey data the impact of TMC and SCC on SFP in a single sector. Future research can examine the same model in other SC contexts at a different level of SC partnering. Moreover, the various aspects of top management role and SCC have been presented in the prior studies (Brun et al. 2020; Sandberg and Abrahamsson 2010), which was not suitable to include under one study's constructs. Future research can test the impact of TMC with

different top management roles on SCC having a different level of integration and other mediating/intervening factors that influence the association between TMC and SFP. The potential mediating factors would add new insights to the current study's complementary mediation effects to contribute to the contemporary theory's extension. There may be key differences between manufacturing and service firms on the development of SCC. The impact of top management strategy (cost reduction versus revenue generation) may also have different results. Thus, further study can address the association between TMC, SCC, and SFP in service organizations. SCC may differ across cultures, industries, product lines, and countries (Alfalla-Luque et al. 2015; Flynn et al. 2010). Comparative examinations among distinct cultures, product lines, sectors, and countries could enhance the conceptualization of the current study's results and model and improve global knowledge and management skills. SCM. Finally, this study considered equal weight for TMC and SCC and their impact on SFP, but assigning actual weight to influence factors and their inactions could give different results.

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