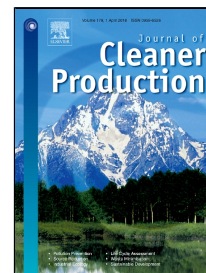


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Sustainable supply chain management: contributions of supplies markets

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collaboration
integration

information
flow



**SUSTAINABLE SUPPLY CHAIN MANAGEMENT: CONTRIBUTIONS OF
SUPPLIES MARKETS**

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Abstract

The current sustainability concern is causing the food supply chain to extend their focus beyond traditional economic goals to the triple bottom line approach. This paper argues for the implementation of a glocal sustainable supply chain (GSSC) in developing countries. The literature has identified antecedents and drivers for the adoption of sustainable supply chain management. However, there is relatively little research on methodological and empirical approaches that take into account the dynamic nature of developing countries and bridge the existing global/local divide. To address this gap, this paper first reviews the theoretical foundation and literature as well as the link between the sustainability of the supply chain and glocalisation; second, the supply chain is analysed and its performance according to sustainable indicators is outlined with regards to the relevance for developing economies, which proposes the GSSC model; third, the model is validated in the Dominican Republic supplies market chain and finally it illustrates the contributions of the supplies market chain to GSSC. Results show that the supplies market contributes to GSSC in multiple ways: i) with increasing flow of information and food safety; ii) by improving the coordination among supply chain members and eliminating intermediaries; and iii) by reducing food miles and closing the supply loop. This study develops a GSSC model for the sustainable management of the supply chain in developing countries and provides empirical research on the contribution of Santo Domingo supply market to GSSC. The paper contributes to a deeper theoretical and empirical research on the sustainable management of the supply chain in developing countries through the lens of glocalisation. This research encourages managers and policymakers to regulate the food supply chain performance without harming the environment while meeting social expectations. The paper concludes with limitations and further research directions within practical and theoretical implications.

Key words: value chain analysis, sustainability indicators, integration, information flows, fair consumption.

Abbreviations:

RQ Research Question

GSSC glocal sustainable supply chain

CAFTA DR Caribbean and America Free Trade Agreement Dominican Republic

1. Introduction

The current sustainability concern is causing food supply chains to extend their focus beyond traditional economic goals to the triple bottom line approach that considers the environmental, social and economic domains. The sustainable supply chain implies that the activities from farm-to-fork (Weiss, 2012) meet the needs of the stakeholders in the food chain while protecting, sustaining and enhancing the human and natural resources that will be needed in the future (Erol et al., 2009; Ortiz-Miranda and Moragues-Faus,

2015; Passel, 2013; Reefke and Sundaram, 2017). Many authors indicate that intermediary stakeholders' organisations in the supply chain play a key role in the development of a sustainable supply chain (Dubey et al., 2016; Trauger, 2014). Esfahbodi et al. (2016) emphasise the importance of inter-organisational links to promote trust, reduce risk and in turn increase innovation and profitability. Moreover, special attention is given to sustainable food supply chains in developing countries due to the urgency for improvement (Ras and Vermeulen, 2009) and the need for further research (Erol et al., 2009). While sustainable supply chain management has been largely researched by scholars (Rimington et al., 2006; Tseng and Chu, 2013; Zhu et al., 2008), little empirical research has been found concerning the contribution of the supplies market in developing countries to the sustainability of the value chain. In the current framework, the sustainable supply chain in developing countries must meet domestic expectations, and also permit competition in the global market (Esfahbodi et al., 2016). In this sense, we found that there is a lack of research about the sustainable development of the supplies market in developing countries from the theoretical lens of glocalisation. Beck (1999) indicated that the market is a glocal example in which global and local coexist. This theoretical lens was chosen for this study because Robertson (2005) marked out that developing countries are lacking protection for their identity.

This paper proposes the following research question: (RQ) Does the supplies market contribute to the sustainable development of the supply chain? To answer this proposed research question, this paper develops a glocal sustainable supply chain (GSSC) model. The proposed model was empirically approached in a developing country, the Dominican Republic. The country has recently launched a European-style supplies market, *Merca Santo Domingo*, and it is in transition to the recently entered into force Caribbean and America Free Trade Agreement Dominican Republic (CAFTA DR). This new social environment, similar to that of several developing countries, lacks deeper conceptual, theoretical and empirical research for sustainable development. This study contributes with a GSSC model for the sustainable management of the supply chain in developing countries and provides an empirical research of the contribution of the Santo Domingo supplies market to the sustainability of the glocal supply chain. The paper contributes to a deeper theoretical and empirical research for the sustainable management of the supply chain in developing countries, through the lens of glocalisation.

The remainder of this paper is structured as follows. The theoretical foundation and literature review is presented in the next section along with the linkage between the sustainable supply chain and glocalisation. Next, a value chain analysis and its performance according to sustainable indicators are outlined with respect to their relevance to developing economies which propose the GSSC model. Thereafter, the research methodology is presented in section 3. Section 4 reports the results of this study and the discussion. Lastly, the conclusions of this research investigation are addressed in section 5 along with the theoretical and managerial implications, and also limitations and future directions.

2. Literature Review

A sustainable supply chain analysis allows for the diagnosis of misalignment between resource allocation and consumer preference, as Soosay et al. (2012) examine through product flows, information flows and the management and control of the Australian wine value chain to the UK. The literature shows very little about sustainable food supply chains management in developing countries. Some studies analyse foodstuff's supply chains and focus on the sustainability of certain stages of the chain. In this sense, Ortiz-Miranda and Moragues-Faus (2015) analyse the sustainability of producers' organisations of fair-trade labeled coffee chains in Guatemala, and Ras and Vermeulen (2009) research the sustainable production of South African table grape producers. Both papers address the sustainability of the producers' stage in the exportation market, but little was found about a local and global sustainable development approach. Some consideration of the glocal was found in Vachon (2010) who analyses international manufacturers' decisions in supply management from the perspective of national culture. Vachon selects social and environmental sustainability practices and measures their impact in 55 manufacturers' countries. The retailer stage is studied by Erol et al. (2009) who reviews economic, social and environmental indicators in retailer industries for sustainable performance. The consumer stage is the most studied in the literature because many authors consider consumer decisions to move supply chain management to sustainable domains. Ritzer (2002) remarks upon consumers' concerns regarding health and the environment (Turner et al., 2007).

The literature expands upon the sustainable supply chain management. A more holistic and relational standpoint is that of the sustainable supply chain from green performance to a virtuous circle which addresses sustainability at all stages and interactions (Ashby et al., 2012). Many authors have created supply chain management models with respect to sustainable indicators engaging with empirical methods (Chin and Tat, 2015; Dam and Petkova, 2014; Ding et al., 2016). Esfahbodi et al. (2016) proposes a model for sustainable supply management in light of environmental and cost performance and which includes sustainable procurement, distribution, designs and investment recovery. Dubey et al. (2016) use a total interpretive structural modeling to extrapolate drivers of sustainable supply chain management and their relationships. The qualitative approach developed by Reefke and Sundaram (2017) shows a Delphi study to identify the planning, execution, coordination and collaboration of key themes for a sustainable supply chain management for future researches.

While globalisation is a general debate (Ras and Vermeulen, 2009; Vachon, 2010), the glocal approach has received limited address in the literature beyond a marketing tool used by multinational companies to enter into international markets (Chinomona and Sibanda, 2013). Reuter et al. (2010) analyses the complexity of distribution because of globalisation and the need to take advantage of the socio-economic conditions of the respective regions. Hopwood et al. (2005) map out approaches for sustainable development and argue that the economy should be run as if people mattered, with the implication that small and local is more sustainable than large and global. Vachon

(2010) empirically studies international operations and national culture and demonstrates that individualism and uncertainty avoidance can influence the degree of corporate sustainable development practices. Passel (2013) compares the environmental cost of apples from different procedures and supports the idea that the benefits associated with local food systems are evident, although globalisation over the long term will grow economic efficiency. Despite this, we are at an early stage of discovering the benefits associated with food trade from developing countries.

We also find little literature pertaining to an analysis of the Dominican Republic's food value chain and no signs about its sustainability. The United Nations has provided recommendations for the ecological footprint for foodstuffs exportations from the country (Frohman et al., 2012), while the First Lady's office has edited a guide for consumers to increase the consumption of fruits and vegetables in Dominican Republic (SESPAS, 2009). The Dominican agriculture ministry has developed a quantitative study of key crop chains in the country, defining the traditional intermediaries (IICA, 2009). Despite these studies providing insight into the complexities of the Dominican Republic's trade relations, they do not consider the Merca Santo Domingo supplies market and the lack of a presence in CAFTA DR.

The literature review concludes that social, economical and environmental factors should be considered in order to develop a GSSC model for developing countries. The model needs to address sustainability at all stages and interactions (Ashby et al., 2012) with respect to sustainable indicators and to further engage with empirical methods (Chin and Tat, 2015; Dam and Petkova, 2014; Ding et al., 2016). Additionally, the importance of empirical research is shown for the GSSC model in a developing country, such the Merca Santo Domingo supplies market chain that operates in the context of the CAFTA DR. This research aims to bridge the sustainability global/local gap in the management of supply chains in developing countries.

2.1. Sustainability Indicators and GSSC Model

In order to create a GSSC model we compiled sustainable chain indicators from the literature and organised them under the three pillars of sustainability (Table 1).

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From a social standpoint, the social function of the supply chain is to serve food from a point of origin to a point of consumption (Esfahbodi et al., 2016; Soosay et al., 2012). In this sense, a social GSSC model needs to meet the internal and external customers' expectations and satisfaction (Reefke and Sundaram, 2017). Nowadays, customers expect increasingly safe and healthy products (Ras and Vermeulen, 2009) coming from fair trading and for fair consumption. In this sense, the authors mark the importance of the equity performance of a social GSSC (Chin and Tat, 2015). This social order directly implies an upstream or downstream flow of information, products and services (Dam and Petkova, 2014; Dubey et al., 2016; Vachon, 2010). Dubey et al. (2016) remark on the need to consider working conditions and the health and well-being of the

chain workers. Rimmington et al. (2006) also indicate the social and ethical values that stakeholders contribute to a social sustainability of the supply chain by successful collaboration, ethical sourcing and purchasing. In this sense, Dubey et al. (2016) reclaim the need for commitment and social responsibility of the supply chain's stakeholders. Furthermore, Erol et al. (2009) emphasise the ability of a social GSSC to participate in local activities and to support local communities with transparency.

To direct the research, the following hypothesis was tested:

H₁: The development of the supplies market can contribute to GSSC model increasing food safety and flows of information.

Value chain firms are profit-driven in the pursuit of economic benefits which do not always correlate with the economic GSSC, which means long-term profitability for the chain without compromising resources for future generations. The literature enumerates the need for managerial skills with respect to organising, planning ahead and leadership (Ras and Vermeulen, 2009), as well as with respect to operational skills for administrating, financing and the logistic streamlining of the stakeholders to ensure an economically GSSC (Reefke and Sundaram, 2017). Nevertheless, the economic context is not static since it is contingent on technology, consumer preferences, the structure of production, logistics and distribution, and continuous improvement. Moreover, innovativeness and diversity are needed to economically sustain the supply chain (Dubey et al., 2016). Many authors highlight the importance of coordination and cooperation among supply chain members to maintain long-term commercial benefits (Ding et al., 2016). Dubey et al. (2016) argue that the collaboration of strategic members is essential for the success of a sustainable supply chain. They maintain that collaboration helps to commercialise and ensure easy access to innovative technologies for the local and lower-tier members of the supply chain. In this line, Reefke and Sundaram (2017) have pointed out that an increase in technical information will allow the supply chain to adapt its performance to economic, social and environmental challenges.

To direct the research, the following hypothesis was tested:

H₂: The development of the supplies market can contribute to the economic GSSC by the integration of local producers and the elimination of intermediaries.

The environmental sustainability of the supply chain is the most present topic in the literature. Ding et al. (2016) maintain that environmental GSSC is often motivated by governments, customers or stakeholders, and a vertical order can improve environmental performance (Erol et al., 2009). Reefke and Sundaram (2017) notice that regulations, customer interests, reputation and public pressures from global warming, resource limitations, emissions and health issues can press on the environmental performance of the chain. Furthermore, Ding et al. (2016) settle that the environmental carrying capacity of the chain depends on the conditions of technology, preferences, and the structure of production and consumption. In this sense, Esfahbodi et al. (2016)

include in an environmental GSSC model, the sustainable procurement, production, ecodesign, manufacturing, warehousing, distribution, food miles (Passel, 2013), usage, recycling and disposal (Reefke and Sundaram, 2017). The eco-friendly design includes the elimination of waste (Zhu et al., 2008). Reefke and Sundaram (2017) propose the measure and control of greenhouse gas emission levels along the supply chain. Additionally, authors indicate that a general concern for environment conservation is also needed (Reefke and Sundaram, 2017) and a corporate commitment (Dubey et al., 2016) from stakeholders to an environmental GSSC. Moreover, many authors emphasise the importance of environmental cooperation in developing countries (Ding et al., 2016) where a potential lack of green resources, expertise and capabilities exists (Esfahbodi et al., 2016).

To direct the research, the following hypothesis was tested:

H₃: The development of the supplies market can contribute to an environmental GSSC model closing the supply loop and reducing food miles.

The revision reveals that sustainable indicators of GSSC (Dubey et al., 2016) are related to environmental management (Esfahbodi et al., 2016), information flows (Soosay et al., 2012), and inter-organisational links (Reefke and Sundaram, 2017; Esfahbodi et al., 2016) in developing countries. Then, the GSSC model considers the evaluation of the sustainability indicators using the whole-of-chain perspective of the value chain analysis (Esfahbodi et al., 2016; Soosay et al., 2012). Moreover, the model includes the domestic expectations (Reefke and Sundaram, 2017) while permits competition in the global market (Ras and Vermeulen, 2009), by considering the global/local layers feedback (Ding et al., 2016). The continuous control and feedback of the layers will approximate the model considering the constantly changing economic context and also allow the adjustment of the GSSC model according to global/local sustainability goals (Ras and Vermeulen, 2009).

Figure 1 represents the GSSC model, taking into consideration sustainability indicators and the perspective of global and local value chains.

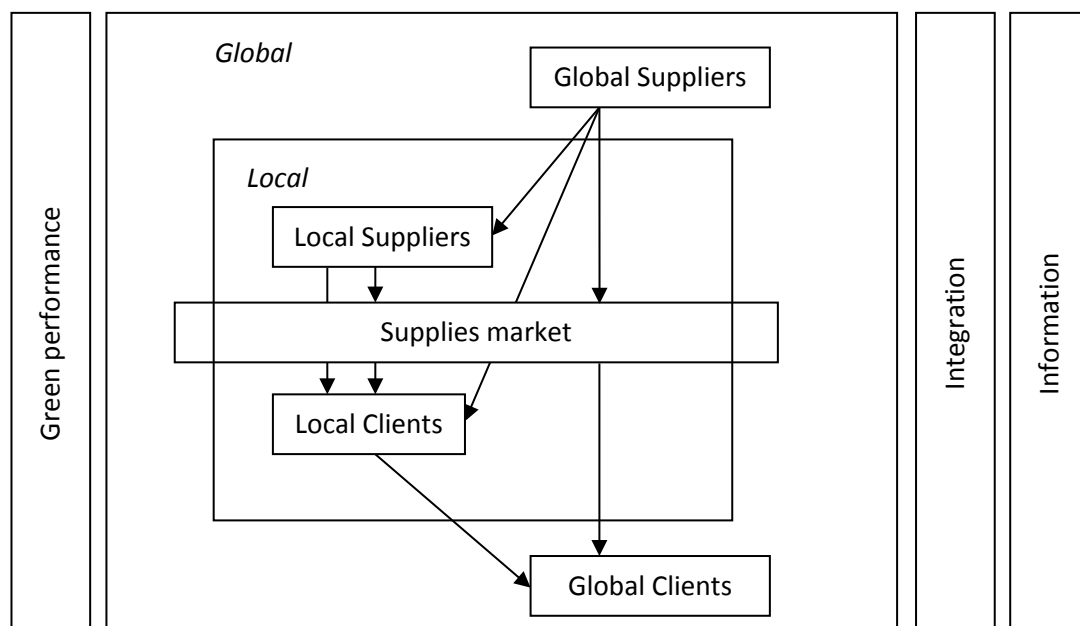


Figure 1. GSSC Theoretical Model

3. Material and Methods

In order to test the GSSC model, we used the value chain methodology to assess the Dominican value chain along the Santo Domingo food supplies market. A value chain analysis means a whole-of-chain perspective (Soosay et al., 2012) by means of a multidimensional assessment of the value chain's performance (Taylor, 2005). Quantitative and qualitative analyses of the layers between producers and consumers in the Santo Domingo supplies market were carried out. From primary production, we selected the Barahona region producers due to it having households where 63.3% were poor and 21% indigent. As a final point, we chose the Santo Domingo consumers because of the location of the food supplies market. For each value chain layer, we developed the most adequate market research method. We surveyed 234 Barahona producers in light of the sustainable commercialisation to Merca Santo Domingo during 2015. The producers were contacted through the Barahona producers associations and revealed the amount of products grown, rice (14.5%), sweet potatoes (14.5%), avocado (4.3%), coffee (22.2%), pigeon pea (14.5%), common beans (15.0%) and organic bananas (15.0%). Producers were men, predominantly aged 46-60 (46.15%), and have started primary education (46.15%). Producers declared an average of 9.89(±1.13) sq m cultivated land and the amount of farm workers was 0.99. Most of them declared not having access to agricultural credits (55.56%) and relied on some public technical assistance (55.98%). We developed a Delphi study to evaluate the producers' association performance in the supply chain. This two-round expert panel started on the 19th February, 2015 was conducted with 18 experts from producers' associations, managers of the Santo Domingo supplies chain, scholars and civil society representatives. The analysis of the Santo Domingo supplies market included interviews with wholesalers, retailers and managers. We interviewed the Merca Santo Domingo supplies market manager in 2015 and the general Dominican markets manager in 2016. We carried out face-to-face semi-structured surveys with 24 wholesalers (from a total of 35) and 30 retailers (from a total of 40) in 2015 and again in 2016. Then, we surveyed a total of 400 Santo Domingo consumers to measure the behaviour and perception of food value and markets, during January 2016. The table 2 presents the profile of the consumers of the sampling.

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Finally, an expert focus group discussed the results of the comprehensive Dominican value chain and validated the findings. This focus group was developed on 3 February, 2016 in San Cristobal city. The group consisted of eleven experts including technicians, agrofood sector advisers, agriculture ministry technicians, producers and consumer representatives.

4. Results and Discussion

4.1. Information flows and social sustainability of the Dominican supply chain

In order to analyse how the food supply chain meets the consumer expectations (Reefke and Sundaram, 2017) we asked local consumers about their foodstuff preferences and intermediaries about their perception of consumer preferences (Table 3). The consumers declared flavour as their main preference, followed by colour and ripeness. Women declared more preferred size, price and ripeness than men. Men preferred a larger weight and shape than women. While retailers and wholesalers considered size as the consumers' first preference, consumers placed it in fifth position. On the other hand, retailers considered price as the third factor in consumers' buying decisions, while consumers placed it fourth and wholesalers placed it sixth. This dynamic represents a gap in information between final consumption and suppliers, that can lead to a non-inclusive, transparent and responsive information flows (Soosay et al., 2012) in the local Dominican food value chain. At the same time, global US consumers expect from the CAFTA DR, bananas and plantains (\$831 million), coffee (unroasted) (\$762 million) other fresh fruit (\$630 million), raw beets and cane sugar (\$231 million), processed fruits and vegetables (\$183 million), and fresh vegetables (\$180 million) (Office of the United States Representative, 2013) to be completely fresh, clean, healthy and safe, according to traceability requirements (Ras and Vermeulen, 2009).

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Local consumers declared a lack of cleanness and food safety related to Dominican foodstuffs (Table 4) (SESPAS, 2009). There is a strong consensus regarding the need to improve food safety in the Dominican local food chain. The Santo Domingo supplies market manager stated that the supplies market requires harmlessness and hygienic foodstuffs to be sold, while the producers and producers' associations declared that the production stage lacks the resources to prepare foodstuffs according to these requirements. The Santo Domingo supplies market has set up a service to aid producers in improving food safety and traceability requirements (Chin and Tat, 2015). In this sense, the Santo Domingo supplies market requirements can become a driving force in meeting the consumers' expectations for Dominican local foodstuffs (Ortiz-Miranda and Moragues-Faus, 2015).

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The flows of information (Dubey et al., 2016) in the Dominican value chain show that a quarter of wholesalers do not seek out information and that 60% of the retailers were informed by their previous suppliers. The weak information flows indicate that the stakeholders have to make more use of the information that exists for their collective competitive advantage (Soosay et al., 2012). The Santo Domingo supplies market counts these numbers with a market information service used by a third of wholesalers, but none of the retailers. The information market service compiles the foodstuff prices, statistics and purchase conditions and can coordinate the supply during periods of shortage. The intermediaries expressed that their main problems are the high prices, low quality of the food, scarcity and heterogeneity. The wholesaler's main problems were also the price and quality of food together with the commercial negotiation, transportation and the producers' lack of financing. In this sense, the Santo Domingo

supplies market can achieve the information flows between the stakeholders, thereby reducing risk, increasing equity and transparency and contributing to the sustainability of the value chain (Erol et al., 2009; Reefke and Sundaram, 2017). Furthermore, the Santo Domingo supplies market social commitment contributes to supporting the local producers and enhancing the channeling of the local producers' foodstuffs along the national markets' network (Erol et al., 2009) with a possible ethical sourcing and purchasing (Rimmington et al., 2006) which contributes to protect the national identity (Robertson, 2005). The presence of the Santo Domingo supplies market information service, the supplies market commitment to support local producers and the commitment of producers to hygiene and food safety have confirmed the first of the hypotheses that this study sought to test, H_1 : The development of the supplies market can contribute to a social GSSC model increasing food safety and flows of information.

4.2. Integration and economic sustainability of the supply chain

The economic assessment of the value chain includes the coordination and integration of supply chain members to maintain commercial long-term benefits (Ding et al., 2016). The analysis revealed the foodstuff flows from primary production to final consumption (Soosay et al., 2012) along the Santo Domingo supplies market. Figure 2 shows the percentage of foodstuff flows and the key stakeholders involved in each stage of the Dominican supply chain, as declared by i) wholesalers, and ii) retailers.

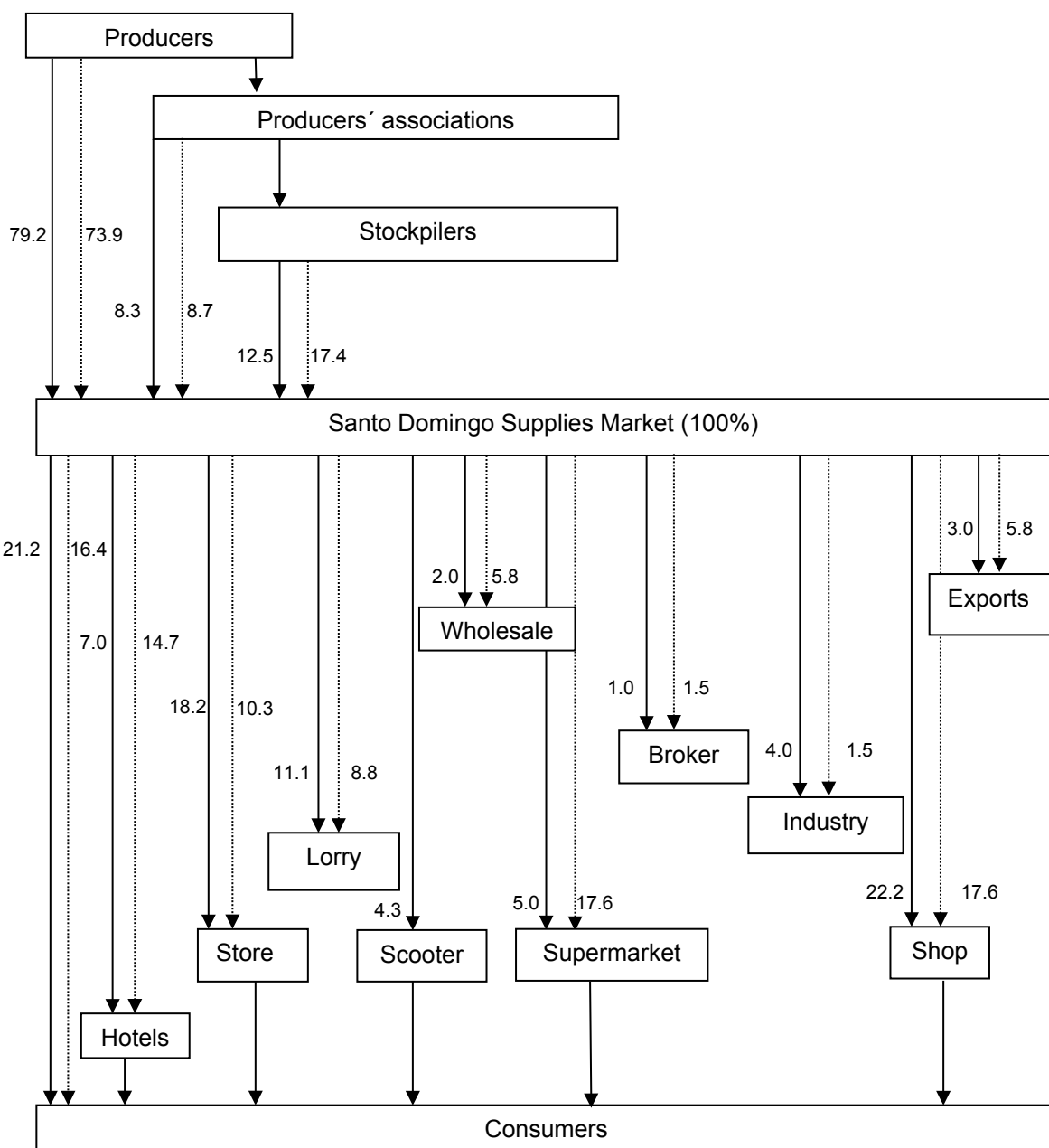


Figure 2. Santo Domingo supplies market value chain. Global and local suppliers and clients declared by wholesalers (left continuous lines) and retailers (right discontinuous lines) show the percentage (%) of foodstuffs received and sent by chain layers.

We have to note that although the supplies market stakeholders stated that they were supplied by local producers, the producers' surveys revealed that the intermediaries use persons in the field who are called "buscones" in Spanish who inform them of the convenient moment and conditions for wholesalers to purchase the products. In this sense, a strategic Dominican supply chain members' collaboration and integration would be crucial for the success of a GSSC (Dubey et al., 2016). Five strategic destinations are described, i) consumers, ii) hotels and resorts, iii) exportation, iv) industry and v) shops, eliminating possible useless intermediaries. Three of these final destinations, supermarkets, hotels and exporters were supplied by retailers (17.6%,

14.7%, 5.8%) more than wholesalers (5.0%, 7.0%, 3.0%) which can cause a lengthening of the supply chain. Moreover, 5.8% of retailers supplies wholesalers.

Despite there being around 1,124 producers' associations in the country (IICA, 2009) none of them help local producers' access consumers by means of commercialisation activities. Producers declared a lack of resources for warehousing, cleaning, classifying and transporting foodstuffs to consumers. Self-financing is also a challenge for Dominican producers (Reefke and Sundaram, 2017). The experts pointed out that producers need to make access to consumers a priority and they must adopt an entrepreneurial spirit (Ras and Vermeulen, 2009). Additionally, it was found that the integration between producers and retailers, industries or consumers is scarce (Esfahbodi et al., 2016). At the global CAFTA DR exportation level, poor use of the Santo Domingo supplies market (3% of wholesale sales and 5.8% of retail sales) was noted and the experts declared the existence of a side distribution channel for international exportation companies. The experts noted the need for better inter organisational integration between links to promote easy access to innovative technologies for the whole supply chain (Dubey et al., 2016). The Santo Domingo supplies market manager spoke about the supplies market's commitment to support the integration of local producers and the elimination of intermediaries. In this sense, the supplies market contacts producers with industrial cooperatives, like Copaneyba, Vega Real or Altagracia that invest in rural areas to add value to foodstuffs and eliminate intermediaries. The supplies market accompanies local producers in creating commercialisation cooperatives, and advising them about low interest rates and national credits from the Agrarian Development National Special Fund (FEDA). Moreover, the Santo Domingo supplies market can subsidise the producers' transportation costs when they fulfill their requirements. The presence of the Santo Domingo supplies market advice service promoting and reinforcing the creation of producers' commercial associations, its commitment to improving coordination among supply chain members and the subsidy for foodstuffs' transportation have confirmed the second of the hypotheses that the research study sought to test, H₂: The development of the supplies market can contribute to an economic GSSC by integration of local producers and the elimination of intermediaries.

4.3. Green value chain and environmental supply chain sustainability

The Dominican consumers showed little environmental concern for the performance of the supply chain and markets (Table 4), while global consumers expect increasingly safe and healthy products (Ras and Vermeulen, 2009) that come from fair-trading and for fair consumption (Turner et al., 2007). Furthermore, local consumers preferred American and European importations or Dominican foodstuffs for exportation rather than local products due to cleanliness and safety (Table 4). The consumer preference for international foodstuffs can increase greenhouse gas emissions and the carbon footprint due to food miles (Passel, 2013). Food transportation creates most of the greenhouse gas emissions in the food supply chain (Frohmann et al., 2012). Frohmann et al. (2012) have advised about the environmental costs of the consumption of imports. The experts

agreed that the consumption of imports is a matter of education and consumers' income in the Dominican Republic. We found that younger consumers (aged 15-24) preferred more imports (31.25%) than older (40-54) consumers (11.23%). Households with only one generation preferred more imports (82.98%) than households with 2-3 generations (63.83%), which indicates a possible increase in consumption of imports in the future. Although the United Nations has provided recommendations for the ecological footprint for Dominican exportation foodstuffs (Frohman et al., 2012), there is a lack of measure and control on the greenhouse gas emissions levels along the Dominican value chain (Reefke and Sundaram, 2017), and even less on the comparison of greenhouse gas emissions levels between imports and local productions. In this sense, the measurement and control of the greenhouse gas emissions levels can be put in place to mitigate and minimise negative environmental impacts. In this line, sustainable distribution initiatives should be implemented in order to eliminate the emissions associated with products transportation along the supply chain (Green et al., 2012). Hollos et al. (2012) found that sustainable distribution aids the reduction of waste levels and CO₂ emissions in the chain, as it entails green packaging and logistics characteristics that minimise the footprints left as a result of product transportation.

The GSSC requires consideration of the environmental impacts of the production process as food flows through the supply chain (Hsu et al., 2013). The experts stated that there were few environmental certified intermediaries in the local Dominican supply chain. Wholesalers and retailers declared few initiatives for remanufacturing and recycling (Zhu et al., 2008). Moreover, they presented limited sustainable logistic considerations such green packaging (considering size, shape, and materials), which are crucial in sustainable distribution (Seuring and Müller, 2008) for reducing materials usage, increased space utilisation in the warehouse, and reduction in handling required. In this sense, the intermediaries are at an early stage of adopting distribution practices to support environmental planning, with the consideration of better handling, shorter movements (Figure 2), minimising the possible empty miles from the supplies market to consumers, using more direct routes, and better space utilisation (Zhu et al., 2008).

On the other hand, the experts declared that the side distribution channel for international exportations alongside logistics providers with green expertise, capabilities, and resources results in effective sustainable distribution initiatives (Zhu et al., 2008). Sarkis (2006) points out that green logistics providers aim to provide outsourced logistics services that have the capacity to minimise negative environmental impacts.

In this line, the country's main exports are organic foodstuffs. This global order has caused some Dominican producers to adopt environmental practices. International firms have instituted sustainable procurement policies with local suppliers in response to increasing pressure from regulatory bodies and the environmental expectations of global customers (Esfahbodi et al., 2016). Nevertheless, experts declared that organic products are sold locally without a surcharge and ecological label due to the local consumers' lack of environmental concern.

The experts declared little presence in the Dominican value chain of the reverse logistic process where used or end-of-life products are retrieved from the point of consumption for possible recycling and remanufacturing purposes (Lai et al., 2013). In this sense, the wholesalers and retailers declared up to 15% of food rejections in the supplies market due to lack of quality or quantity. The wholesalers declared rejections were sold to lower quality markets (37.5%), gifted (31.25%), or thrown away (31.25%), while retailers declared mainly gifting or throwing rejections away. Apart from the gifted or resale of rejections, no effective reuse or surplus sales and divestment (Zhu et al., 2008) of other unused products or unproductive assets of the supply chain were declared. The experts stated an absence of appropriate waste management policies, legislation on recycling and remanufacturing (Zhu et al., 2008), and appropriate closed-loop infrastructure. In this sense, the experts declared the Dominican value chain far from being a circular economy. This forward/linear supply chain (Figure 2) that suggests constant inputs of natural resources and an unlimited capacity to assimilate waste (Geyer and Jackson, 2004) requires the ‘close the supply loop’ by including the reuse, remanufacturing, and recycling of products and materials (Zhu et al., 2008). Moreover, the experts indicated a lack of green resources, expertise and capabilities (Esfahbodi et al., 2016) together with scarce environmental cooperation (Ding et al., 2016). The experts expressed the necessity of involving the government in the green performance of the food supply chain and in the stakeholders’ environmental activities.

The Santo Domingo supplies market manager stated that the supplies market comes with a sustainable waste management system. In this sense, the supplies market uses power supplied by the Palamarca Electric power station of Santo Domingo North which provides fridge warehouses to load unsold products, reducing wastage. Furthermore, market leftovers are given to the local food bank and the supplies market strategic location of Santo Domingo port and international airport favour better handling and shorter movements (Zhu et al., 2008). Additionally, the Santo Domingo supplies market with supply agreements to the national hotels association (ASOARES), exporters association (CANAGROUP), Future South Development Association (“Sur Futuro”), Dominican Agribusiness Board (JAD), and Dominican Import-Export center (CEI-RD) all help to minimise possible empty miles, use more direct routes, and minimise negative environmental impacts and wasted resources, from the acquisition up to the final use and disposal of products (Hsu et al., 2013). Moreover, the Santo Domingo supplies market encourage green packaging and reverse logistic and sustainable distribution initiatives that can close the supply loop and meet the environmental GSSC. The Santo Domingo supplies market contributes positively to improving the supply chain environmental performance (Erol et al., 2009). In doing so, the supplies market made the decision to source domestically or even locally, as opposed to internationally (Carter and Easton, 2011). It promotes loop, sustainable, and efficient food local chains. Moreover, the Santo Domingo supplies market contributes to healthy consumption (SESPAS, 2009) by reducing fats, soda, preserved and precooked foods (Menchú et al., 2013) and invests in campaigns on fair closed-supply loop food consumption, shifting consumption patterns.

The Santo Domingo supplies chain sustainable waste management system, direct access to better handling and shorter movements, agreements to use more direct routes, the ability to minimise wasted resources and possible empty miles, along with a commitment to a closed-supply loop that includes green packaging, reverse logistics, and sustainable distribution have confirmed the third of the hypotheses that the research study sought to test, H₃: The development of the supplies market can contribute to an environmental GSSC closing the supply loop and reducing food miles.

5. Conclusions

This study is an attempt to develop a theoretical framework for GSSC in developing countries, within the complex dynamic of distribution (as a result of globalisation), and also considers the need to take advantage of the respective regions. Since the literature of GSSC in developing countries is very limited, this study will help researchers to understand the use of a GSSC model for developing countries, with regards to sustainable indicators and engaging with empirical methods, as a powerful methodology for conceptual framework development. In this sense, the current study analyses the drivers in the adoption of a GSSC management, which addresses sustainability at all stages and interactions, ensuring it meets domestic expectations and permits competition in the global market. The GSSC theoretical framework developed helps inter-organisational dynamic interactions, the flow of information, and environmental management of the supply chain in developing countries through a glocal approach. The GSSC model also helps to clearly understand the key role of the intermediary stakeholders' organizations, supplies market, and the development of a sustainable supply chain depicts the actions needed to attain the desired sustainability level. The results of our present study show the supply chain managers and policymakers the right direction to take to achieve sustainability. The results show that GSSC should shape environmental sustainability, economic development, and consider social welfare. It needs to harmonise global trade orders and act locally to cover customers' expectations and protect national identity. In this sense, the supplies market can: i) become a driving force for producers to meet consumers' expectations; ii) achieve the information flows between layers; iii) enhance the distribution of local products in glocal market networks; iv) promote producers' organisations and engage their customers in sustainability initiatives; v) improve the coordination among supply chain members supporting the easy access to innovative technologies; vi) improve the supply chain environmental performance; and vii) encourage green packaging, reverse logistics, and sustainable distribution initiatives that can close the supply loop and meet the environmental GSSC.

Practical implications

This research can encourage managers to regulate food supply chain stakeholders' business activities without harming the environment while meeting the social expectations. It can serve as an audit tool and later on as a benchmarking tool for managers and stakeholders to invest in appropriate infrastructures that enhance a GSSC.

This research can help policymakers to ensure measures exist for a sustainable supply chain, especially in order to improve food safety and fair consumption. According to the supply chain performance and regional environmental conditions, the government may implement a step-wise policy in which environmental standards will be periodically revised and stricter emission standards enforced. This paper can contribute to improving a producer's ability to address the challenges put forward by value chain stakeholders, which can be promoted by strengthening the association and information flow for the members of the chain. The holistic vision of the value chain presented in the paper can influence the stakeholders' avoidance of uncertainty.

The model can aid policymakers at central national level to monitor the local/global supply and demand, to support strategy decisions in order to achieve sustainability goals and to consider operational decisions such as enhancing strategic subsectors, signing appropriate trade agreements, controlling imports and exports, and establishing trade barriers in order to convince the supply chain to extend its focus beyond traditional economic goals to the triple bottom line.

Limitations

The research limitations come about through the selective bias and the ambiguity of the inferred hypotheses. The dynamic supply chain development due to globalisation, CAFTA DR, dependency on foreign markets and imports, outsourcing, risks of supply chain disruption or consumer preferences that limit the research to the study context also deserve special attention.

The implementation of the GSSC model can be limited by the lack of commitment and social responsibility of the supply chain's stakeholders. The absence of a general concern for environment conservation and a corporate commitment from stakeholders to environmental supply, means the lack of environmental cooperation could obstruct green resources, expertise, and environmental concern capabilities. Moreover, the lack of collaboration can limit the access to innovative technologies for the local and lower-tier members of the supply chain.

Further research directions

There is scope for further research regarding the generalisation of the findings with respect to the majority of emerging and CAFTA DR economies. Future studies may examine other emerging markets to eliminate the potential effect of country-level variance such as market size, economic development and legal systems. This study can map the optimal decision policies of government subsidies and incentives for an environmental performance of the supply chain that requires deeper analysis. The effective reuse, recycling or surplus sale and divestment of unused products or by-products from the food supply chain are also an important research direction for environmental sustainability. The assessment of food miles for imports can provide scenarios for sustainable food transportation, logistics and distribution. Further research can serve to eliminate wasteful activities and identify activities that offer the greatest

scope for adding value to consumers through improved food safety and environmental performance. The model can be generalised for other studies related to consumer shifting patterns, market externalities that affect the chain performance, global regulations that impact the sustainability of the chain, and national subsectors support.

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1 Tables

2 Table 1. Sustainable supply chain indicators revision

Social	Economical	Environmental
Customer satisfaction (Reefke and Sundaram, 2017; Halme <i>et al.</i> , 2006).	Management and control of the chain (Soosay <i>et al.</i> , 2012)	Environmental integration and cooperation (Soosay <i>et al.</i> , 2012; Reefke and Sundaram, 2017; Dubey <i>et al.</i> , 2016; Lee <i>et al.</i> , 2012; Tseng and Chiu, 2013; Erol <i>et al.</i> , 2009; Nordheim and Barrasso, 2007).
Health and Safety (Dubey <i>et al.</i> , 2016; Reefke and Sundaram, 2017; Choi and Sirakaya, 2006).	Management skills: planning, leadership, organizing (Ras and Vermeulen, 2009; Darby and Jenkins, 2006).	
Fair trade and consumption (Passel, 2013).	Operational skills: financing & administrative (Rimington <i>et al.</i> , 2006; Ras and Vermeulen, 2009; Ortiz-Miranda and Moragues-Faus, 2014; Reefke and Sundaram, 2017).	Enabling info technologies (Dubey <i>et al.</i> , 2016; Reefke and Sundaram, 2017).
Information flows and strategic suppliers collaboration (Soosay <i>et al.</i> , 2012; Dubey <i>et al.</i> , 2016; Dam and Petkova, 2014; Vachon, 2010).	Logistic optimization (Dubey <i>et al.</i> , 2016; Passel, 2013; Reefke and Sundaram, 2017).	Institutional pressures (Dubey <i>et al.</i> , 2016; Ding <i>et al.</i> , 2016; Passel, 2013; Hopwood <i>et al.</i> , 2005).
Equity (Dubey <i>et al.</i> , 2016; Chin and Tat, 2015; Rimington <i>et al.</i> , 2006).	Economic balance (Martínez-Jurado and Moyano-Fuentes, 2014; Dubey <i>et al.</i> , 2016).	Green production (Dubey <i>et al.</i> , 2016).
Internal pressures (Dubey <i>et al.</i> , 2016; Reefke and Sundaram, 2017; Darby and Jenkins, 2006; Searcy <i>et al.</i> , 2007).	Continuous improvement (Dubey <i>et al.</i> , 2016).	Food Miles (Passel, 2013; Lakshminera and Palanisamy, 2013; Esfahbodi <i>et al.</i> , 2016; Green <i>et al.</i> , 2012).
Employment (Ras and Vermeulen, 2009).	Diversity (Dubey <i>et al.</i> , 2016).	Efficiency warehousing (Reefke and Sundaram, 2017).
Social values & ethics (Dubey <i>et al.</i> , 2016; Rimington <i>et al.</i> , 2006).	Innovativeness (Ras and Vermeulen, 2009).	Waste management (Hopwood <i>et al.</i> , 2005; Esfahbodi <i>et al.</i> , 2016; Zhu <i>et al.</i> , 2008).
Impact local community and Rural development (Ding <i>et al.</i> , 2016; Tang and Zhou, 2012; Reefke and Sundaram, 2017; Choi and Sirakaya, 2006).	Technical skills (Ras and Vermeulen, 2009).	Greenhouse gas emissions (Reefke and Sundaram, 2017).
Transparency (Erol <i>et al.</i> , 2009).	Increased tech information (Hopwood <i>et al.</i> , 2005; Reefke and Sundaram, 2017; Ding <i>et al.</i> , 2016; Erol <i>et al.</i> , 2009).	Environment conservation (Dubey <i>et al.</i> , 2016; Wiese <i>et al.</i> , 2012; Reefke and Sundaram, 2017; Tang and Zhou, 2012; Diakaki <i>et al.</i> , 2006).
Market timing (Ras and Vermeulen, 2009).		Environment corporate commitment (Dubey <i>et al.</i> , 2016; Hopwood <i>et al.</i> , 2005).

3

4

Table 2. Profile of the consumers surveyed with respect Santo Domingo population

Consumers		% Sample	%Santo Domingo (ONE, 2015)
Gender	Male	43.75	48.59
	Female	56.25	51.41
Age	15-24	35.16	32.16
	25-39	40.42	39.42
	40-54	24.42	28.42
Household size	1-2	20.41	
	3-4	48.98	
	5-6	30.61	
Household generations	1	41.70	
	2	49.79	
	3	8.51	

2

Table 3. Means and Standard Error for the characteristics preferred by customers expressed by supply chains' stakeholders. Intra-groups analysis ANOVA test, F and *p-value*

Destination preference	Means (SE)			Intra-groups analysis F
	Retailer	Wholesaler	Consumer	
Size	7.48(±0.13)	7.81(±0.09)	3.58(±0.068)	141.72***
Flavour	7.33(±0.12)	4.04(±0.08)	7.65(±0.07)	187.36***
Price	5.30(±0.24)	3.29(±0.14)	5.15(±0.12)	194.19***
Ripeness	4.89(±0.06)	1.28(±0.13)	5.79(±0.10)	230.17***
Colour	4.81(±0.19)	6.81(±0.09)	7.19(±0.11)	139.08***
Texture	2.52(±0.13)	4.62(±0.20)	3.34(±0.09)	43.31***
Weight	2.11(±0.10)	1.81(±0.09)	1.90(±0.14)	5.38**
Shape	1.30(±0.13)	6.38(±0.18)	1.40(±0.079)	457.99***

** $p < 0.01$; *** $p < 0.001$

5

6

Table 4. Consumer's requirements, preferences, willingness to pay and perceptions to improve the Dominican food value chain expressed in percentage of responses

Variable	Cases	%	Variable	Cases	%
Local	Improve food quality and hygiene	15.50	Pay surcharge	No	48.50
Makets	Support and invest on local production	15.50		5-10%	31.00
Needs	Control and stability of food prices	11.00		>10%	20.50
	Improve food freshness	7.75	Prefer imports	Yes	53.75
	Improve markets organization	7.75		Same price	21.25
	Market cleanliness	6.25		Same quality	21.25
	Improve food presentation	6.25		Price and quality	3.75
	Improve markets maintenance	5.25	Safety local food	No	54.0
	More food variety	3.00		Yes	46.0
	Reduce intermediaries	1.50	Supply quantity	No	16.0
	Improve storage	1.50		Yes	83.0
	Increase retailers	1.50	Traceability control	Scarce	62.25
	Organize food festivals	1.50		Enough	22.00
	No answer	15.75		No answer	15.75

9

Highlights:

- Indicators for a sustainable performance of the supply chain are selected.
- Global Sustainable Supply Chain Model for developing countries is created.
- Foodstuffs and information flows through Dominican supplies market are measured.
- Collaboration and integration is a challenge on green performance of supply chain.