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Sustainable Dyads in Supply Chain Management: A Qualitative Perspective

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Abstract

The study seeks to explore themes concerning collaboration for sustainable buyer-seller relationships involving information sharing along supply chains. Two case studies of ten dyadic sustainable relationships and a literature review are used to examine these themes. The case studies allow this undefined area to be clarified and existing theories to be empirically examined regarding fresh fruit and vegetables (FFV) industry. The study identifies five types of themes influencing information sharing in collaboration for sustainable relationships: two external themes at the chain level, namely information flow strategy and product flow strategy, and three internal themes at the dyad level, namely contracting strategy, price strategy and revenue strategy. The case studies reveal that top management plays a pivotal role in improving collaboration involving information sharing for better sustainability performance. There appears to be an established connection between the levels of collaboration between chain actors and dyadic actors in information sharing for their sustainable relationships. This study contends that chain actors involved in information sharing need to partner dyadic actors rather than do transactional processes. The multi-case studies that support the development of the framework provide real-life perspectives whose insights are a valuable practical reference for similar supply chain contexts.

Keywords: information sharing, collaboration, sustainable chain relationship, fresh fruit and vegetables;

1. Introduction

Witnessing a value transformation is needed in which supply chain actors are inextricably bonded through collaboration that links supply with demand, forming a competitive industrial supply chain [1, 2]. An understanding of collaborations based on information sharing between actors in agricultural supply chains is still highly underexplored. These attempts at ensuring that information sharing between such actors for the benefit of the total performance are referred to as collaboration in sustainable buyer-seller relationships. From a relationship marketing perspective, information has taken on its own reality, which can be detached from the movement of products [1, 3].

Relatively little attention has been paid to information sharing in their relationship marketing along the supply chain [4]. Yet this interface exhibits one of the most contentious flows for dyadic actors and their relationships and it attracts an increased attention from both policy makers and academics. Prior research considering the cross-functional relationship for information sharing has suggested that this interface exhibits many unclear characteristics [e.g. 5, 6, 7, 8]. There is often an undefined association between information sharing and collaboration, particularly in supply planning, pricing, revenue and market demand along the chain actors [5]. These tensions have created the need to examine sustainable buyer-seller relationships from a multidimensional perspective [9]. To allow practitioners and academics to identify how the association between information sharing and collaboration in a supply chain can be improved, it is necessary to identify the contextual factors that can be utilized to influence this interface. Although there have been several recent papers conceptualizing this association, they have been based purely on literature reviews or limited empirical results [e.g. 10, 11, 12, 13].

This study will use existing literature as well as case studies to examine the information sharing and collaboration interface along dyadic actors in a supply chain. This could be by identifying the possible high-order themes of sustainable relationships that can provide benefits in terms of sustainability chain performance [12]. The study poses the following research questions:

- RQ1: How can key themes of information sharing be associated for collaboration in sustainable relationships?
- RQ2: How and why are these key themes effectively linked to collaboration in sustainable relationships to improve supply chain performance in practice?

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This paper provides relevant views from the dyadic perspective of fresh fruit and vegetables (FFV) actors in supply chains. The article starts with a theoretical background on sustainable relationships, collaboration and information sharing. Next, the research methodology is presented. Then key findings and discussion are presented. Lastly, conclusions are provided with managerial implications.

2. Literature Review

2.1. Sustainable Buyer-Seller Relationships

The growing interest in sustainable relationships has led to the development of underpinning concepts to explain this term. Traditionally, a sustainable supply chain has been a set of various activities, with links to production, flow management of information and products, supply and demand, relationship management, logistics, contracting, risk, marketing, pricing, revenue, consumption, as well as value added activities along the supply chain [14, 9]. There is a focus on key outcomes of these activities in order to encourage actors to collaborate and improve their overall performance [12, 8]. An analysis of studies shows that sustainable relationships are defined as links being put into long-term collaboration between dyadic actors along the FFV supply chain [14, 15]. Based on the analysis of the studies, the key characteristics underpinning concepts of sustainable relationships may thus be identified as: product flow, information flow, information sharing, collaboration, and performance. The underlying rationale is to expand the body of knowledge in the field of sustainable relationships.

In this scenario, authors argued that it is important to identify a well-established approach to both information sharing and collaboration, thus leading to improved performance for a set of actors (e.g. number of buyers and sellers along the supply chain) rather than a single actor (e.g. a seller) [14]. Although these authors do not ignore the importance of the business buyer in collaboration, they do not focus fully on the involvement of the business buyer in the mechanism of information sharing, and especially in strategic issues, such as pricing and revenue. Recently, an emerged approach for examining both information sharing and collaboration in sustainable relationships has been established from the perspective of supply chain management [16, 17, 18]. Here the new approach is to consider how both buyers and sellers can focus on a mutually beneficial approach [15, 9]. In a more detailed scenario, this mutual approach focuses on pricing strategy between buyers and sellers from inside the supply chain and on revenue strategy between them from outside the supply chain [19]. This is also linked to an orientation towards the potential for collaborative activities based on information sharing in order to improve sustainable performance (e.g. economic, environmental and social themes) [12, 8, 18]. The present research suggests that there is a need to understand this more complex scenario of collaboration for dyadic SBSRs (Sustainable Buyer-Seller Relationships), and in particular, to examine the association between information sharing (e.g. sharing strategies of pricing and revenue), collaboration, and sustainable performance.

In summary, this shift has created an opportunity for more logical pricing strategies and the extraction of better revenues among the supply chain actors in their SBSRs [16, 17, 18]. Thus, in this research information sharing could be this opportunity that should be highlighted as a value creation for SBSRs to be involved in supply chain collaboration. Motivated by this issue, SBSRs is defined as a dyad that includes collaboration between a buyer and a seller aimed at creating value by information sharing along the supply chain actors for better sustainable performance.

2.2. Collaboration in Sustainable Buyer-Seller Relationships

Collaboration is an active process between actors where cooperation and coordination are achieved with key mutual segments between buyers and sellers [20]. The movement from coordination to collaboration requires high levels of commitment and information sources that lead to stronger dyadic sustainable relationships with other actors to reach that next step of integration whereby future design and product performance, and long-term strategic relationships, are formed. In fact, buying and selling actors are interdependent and become conduits of information between the business focal actors and their preferred suppliers, customers or service providers to create value better than before [15]. Experiences have shown that collaboration between chain actors may be enhanced through joint planning and joint problem solving at both pricing strategy and revenue levels. The FFV business with sustainable value chains has grown dramatically over the last two decades [9]. However, improvements in production and marketing activities along the agricultural value chain, especially enabled by unsustainable mechanizations and unplanned collaboration in resource use and consumer added value, have led to negative environmental, social and economic impacts [13]. These impacts are related to various pollutants (e.g. water resources, machinery usage, soil mineralization) as well as short-term social (e.g. job security and family business) and economic (e.g. income and profitability) benefits [18].

Drawing from the above, a supply chain needs to press for collaboration to serve the needs of both buyers and sellers in their SBSRs [13, 20]. Hence, this research has a focus on how actors need to foster a climate of mutual respect when collaborations are established, particularly when the business actors rely on the support strategies from the other dyadic side in both information flow and product flow.

2.3. Information Sharing in Sustainable Buyer-Seller Relationships

Information sharing is a key to the dissemination of information across all actors along the value chain, aiding interaction and sustainable collaboration [5]. Aggarwal and Srivastava [3] noted that frequent meetings to discuss joint involvement and to increase the sharing of information aided in the establishment of dyadic collaboration and its consequences. The inclusion of information flow into interaction collection and dissemination processes is also essential to developing

collaboration [21]. One of the key issues among dyadic SBSRs is pricing strategies and revenue approaches. Indeed, a new collaboration is needed based on pricing processes from a dyadic supply chain perspective for a joint outcome from production to consumption points. More importantly, this brings information as a collaborative tool to enhance the joint revenue along the dyadic sustainable relationships and ensure efficient information flow and product flow, where contracting between buyers and sellers is existing within the supply chain [19]. Such contracting collaborations in supply chains can define sustainability and codified information shared for better procedures and value creation [22, 18].

The leading evaluation of the role of information sharing on pricing and revenue strategies for collaboration in SBSRs was done, on pricing strategy, and on revenue strategy [19] (See Figure 1).

Therefore, when considering the active role performed by buyers and suppliers along the supply chain to manage information sharing on both pricing and revenue for collaboration, there is a need for a win-win approach in FFV values-based supply chains [9, 23]. In this research, this should have s focus on SBSRs, where involved actors interact in price setting across the entire supply chain in order to ensure the welfare of all strategic partners, including appropriate profit margins and agreements of an appropriate duration.

3. Research Methodology

3.1. Research design

The research is based on a qualitative methodology, which is applied by considering various underlying concepts and clarifying the associations between these conceptual themes [24]. This research has two questions highlighted as follows:

RQ1: How can key themes of information sharing be associated for collaboration in sustainable relationships?

RQ2: How and why are these key themes effectively linked to collaboration in sustainable relationships to improve supply chain performance in practice?

RQ1 is derived deductively from the literature and RQ2 is derived inductively after data collection. The present research reflects relevant views from the perspective of dyadic SBSRs in the context of the FFV supply chain in Jordan. Both secondary and primary data are used [24], generally with an inductive nature to provide knowledge about this specific context. Secondary data is analyzed following an extensive review of books and peer-reviewed journals. For primary data, a multi-case study method is a rich source for exploration and explanation of complex emergent phenomena. A triangulation approach is applied by the use of existing research studies (e.g. Journal articles) and case studies (e.g. multiple-case studies) to ensure construct validity. In previous research, the case study method has been instrumental in generating rich theoretical and practical insights, especially in the field of collaboration in sustainable FFV supply chains [e.g. 8, 23].

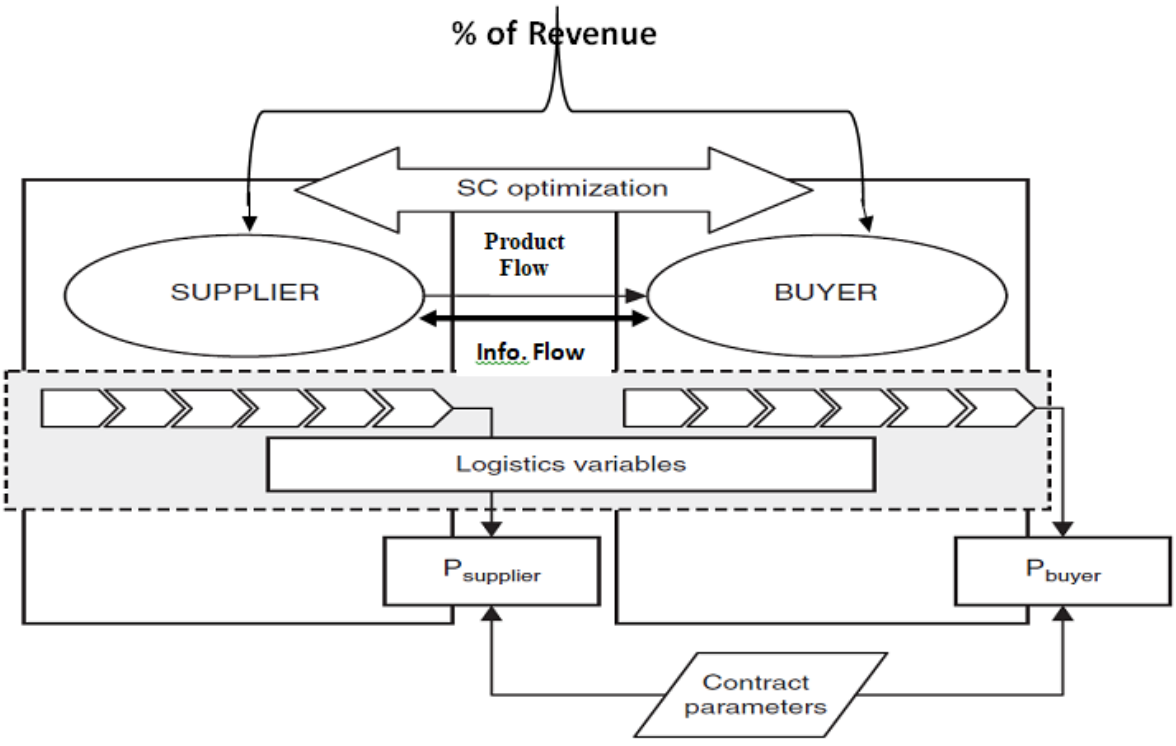

Figure 1. Pricing process and revenue in a dyadic SBSR [Source: Adopted from Van der Rhee et al. [19]

There are two case studies, including ten SBSRs, which have been selected based on theoretical sampling in order to provide new insights into an emergent theory. These cases are identified as sustainable collaborative relationships by certified bodies and each actor should have information sharing and collaboration functions in FFV supply chains. This sampling selection is based on advanced research of the online directory of sustainable firms in Jordan and it included firms that have been working for at least five years with various dyadic firms in FFV supply chains. This led to a list of 80 firms, which were then shortlisted to 10 firms based on three steps: satisfactory achievement records, positive email responses and an initial interview. Then, each firm was asked to identify a dyadic collaborative firm to form the unit of analysis as a dyadic sustainable relationship. This is where two different FFV supply chains (SCs) (Case: SC 1 and SC2) of similar 10 dyads (unit of analysis) of two different actors (sub-unit of analysis) are examined. Each FFV supply chain is formed of a type1-retailer-importer (for dyads A1, A2), type 2-importer-exporter (for dyads B1, B2), type 3-retailer-distrubutor (for dyads C1, C2), type 4-distributor-wholesaler (for dyads D1, D2), type 5-wholesaler-importer (for dyads E1, E2) (Table 1).

The basis for these studies was semi-structured interviews with four managers at each dyadic sustainable relationship. Managers as key informants were selected because they provide an overview of the information sharing and collaboration. Jordan is one of the developing countries which has agreements and contracts across FFV chain actors, including collaborative sustainable relationships [15]. The FFV supply chains is characterized by key features: sector structure of vertical and horizontal collaborations, product features as these are perishable products and sometimes seasonal products, actor types as this chain includes a variety of collaborative firms (importer, retailer, etc.) and dealing with international actors (e.g. supplying exporter). Hence a collaborative sustainable relationship approach is vital for the Jordanian FFV supply chain.

3.2. Data Collection

Primary data were collected from 40 semi-structured interviews as a key source and 10 observation days on different supply chain sites were applied within each actor for triangulation purposes. Each interview (ranging from one to two hours) was obtained from the managers involved in collaborative sustainable relationships in May-July 2017. The aim was to gain answers on how far collaboration in information sharing goes, what the roles of information sharing in the price process and revenue approach are within the FFV supply chain, how top management regard this collaboration in linking supply with demand with better information and product flows, and how collaborations affect sustainability performance.

Two managers at each actor of a dyad were selected for the data collection stage. Both literal replication and theoretical replication are followed by applying both multiple cases for the same dyad type and cases of different dyad types, both multiple level of managers for the same dyadic actor, same manager type for different dyad types, and same FFV supply chain type for different dyad types [25]. A case study protocol was applied for all cases for better research reliability. In total, 40 managers were interviewed for the two cases (10 dyadic sustainable relationships). To obtain reflective practitioner inputs, there were several contacts with those managers with specific clarifications involving emails, phone calls and document exchanges, which created mutual benefits. Interviews were conducted and recorded by the author in person, who were asked the same questions. The interviews were also transcribed and then sent to the managers for revisions. The approved interviews were used to develop the case studies, which were analyzed through cross-case analyses [24]. At the same time, research assistants as silent observers attended one meeting at each sustainable relationship.

Table 1. Case Study in the Context of FFV Supply Chains.

Case	Relationships	Age	Dyadic Industry	Establishment Year	Employees No.	Interviewee Type
Case 1 FFV (SC1)	A1	5	Retailer1-Importer1	1991-2000	100-200	Operation Manager; Relationship Manager-Operation Manager; Relationship Manager
	B1	7	Importer1-Exporter1	1991-2003	100-300	Marketing Manager; Contracting Manager - Operation Manager; Relationship Manager.
	C1	7	Retailer2-Distrubutor1	2000-2000	150-200	Marketing Manager; Contracting Manger - Operation Manager; Relationship Manager.
	D1	10	Distributor2-Wholesaler1	1980-2000	150-1000	Marketing Manager; Contracting Manager – IT Manager; Trade Union Manager.
	E1	5	Wholesaler2-Importer2	1980-1991	100-1000	Market Manger; Trader – IT manager; Service Manager
Case 2 FFV (SC2)	A2	6	Retailer3-Importer3	2000-2005	200-500	Operation Manager; Relationship Manager-Operation Manager; Relationship Manager
	B2	10	Importer4-Exporter2	2000-2010	200-400	Marketing Manager; Contracting Manager - Operation Manager; Relationship Manager.
	C2	12	Retailer4-Distrubutor3	1999-2005	200-500	Marketing Manager; Contracting Manger - Operation Manager; Relationship Manager.
	D2	12	Distributor4-Wholesaler3	1980-1999	200-1000	Marketing Manager; Contracting Manager – IT Manager; Trade Union Manager.
	E2	5	Wholesaler4-Importer4	1980-2000	200-1000	Market Manger; Trader – IT manager; Service Manager

3.3. Data Analysis

Several stages have been applied in data analysis as follows: **the first** was a coding (an analytical process in which data are indexed to facilitate analysis; concept-driven approach linking of data to the research idea), followed by initial codes that were generated from themes amongst the literature review, for data reduction and display for each case by using the interview transcripts and other sources (observations). **The second** was refinement for the selected key themes to be more focused as non-repetitive themes [24]. This is where each case of the five SBSRs was presented based on the key themes and related key quotes to support forming each proposition with the literature evidence. **The third** was a cross-case comparison for data exploration to enhance replication logic amongst the 10 dyads, providing the actor, dyad, and supply chain level-focused themes.

In summary, data analysis mainly followed two approaches: the first approach (coding and key themes) is the nested approach to analyze data gathered from each case [25]. This approach examines multiple sources from two managers for each actor as opposed to a single case (each SC: 20 managers, 10 actors, 5 sustainable relationships), providing a better opportunity to examine the cases. The second approach (cross-case comparison) is the cross-case approach to analyze the commonalities between the two cases. The process was iterative, moving backward and forward in time, exploring what their supply chain was like before the sustainable collaboration, how and why they started to change. The benefit of this analysis method was to allow the development of insights into the information sharing and collaboration association from the empirical findings. This research has achieved quality validity and reliability (Table 2).

4. Findings and Discussion

4.1. Case Study Level

At the case study level, the selection of variables for the initial conceptual association was guided by the existing literature review [e.g. 26, 18], which identified several initial themes as influencing the collaboration for SBSRs associated with information sharing. This is an exploratory level, where the findings of the two case studies of supply chains (SC1 and SC2) are presented and discussed based on the key themes identified by the literature and the sub-themes that emerged from the data analysis from both cases. This analysis resulted in 22 first-order themes for a sustainable relationship, which were then coded as 15 second-order themes that turned into five aggregate dimensions. These aggregate dimensions are associated to one overarching theme, “information sharing for collaboration in a dyadic sustainable relationship”, in order to establish the theoretical association for the current research (Table 3). The key themes matched to analyze the data from the exploratory case studies are: external key themes: product flow and information flow, and internal key themes: pricing strategy, revenue strategy and contracting in relation to information sharing in collaboration for SBSR in the FFV supply chains (overall aggregate dimension) as shown in the table 3(. This is to explore how key themes about information sharing can be associated for collaboration in sustainable relationship. Thus, the research provides an attempt to answer RQ1 at this level.

Table 2. Research Quality

Validity and Reliability	Research design	More related stage
Construct Validity	-Building trust with interviewees. -Multiple source of evidence at data collection: interviews; observation (meetings) -Chain of evidence at data collection: two relationships for each case and use the same case protocol. -Transcripts are refined by the interviewees	Research design Data collection
Internal Validity	-Explanatory approach: develop a theoretical association between information sharing and collaboration. [at both Case level/ Cross case level] -Chain of evidence at data analysis: key theme matching and coding via support of key literature and key interview quotations. [at Case level] -Chain of evidence at data analysis: key proposition development. [at Cross-Case level] -Data triangulation: comparing quotes from interviews with observations. [at Cross Case level]	Data analysis
External Validity	-Multiple cases: replication logic among the 10 relationships for two cases. -Analytical generalization: building a new framework.	Research design
Reliability	-Case study protocol is the same for all cases -Case database: interview quotes and meetings -Key themes guided propositions and discussions -External review: final case report was validated by uninvolved experts (Policy makers).	Data collection

Table 3. A summary for Interviews Data Structure: Key theme of Information Sharing in Collaboration for sustainable relationships from SC1 and SC2.

First-order concepts	Second-order themes	Aggregate dimensions
External-focused key themes "Chain Level"		
-Human asset specificity such as training and experience (SC1 and SC2) *-Physical specificity such as production to market equipment (SC1 and SC2)*	Asset specificity in the SC (L.R)	Product flow strategy
-Bonds and leadership in the SC network (SC1 and SC2)	Actors' (buyer's and seller's) SC position (NT)	
-Selecting the right dyadic actors and also working with the same dyadic actors (SC1 and SC2)	Transaction frequency between the dyadic actors in the SC. (L.R)	
-Flexible and able to link actors with visibility (SC1 and SC2) *-Joint planning between the dyadic actors (SC1 and SC2)*	Cooperation between the dyadic actors in the SC (L.R)	Information flow strategy
-Perform training programmes for the dyadic actors (SC1 and SC2) *-Emphasis on sustainable relationships for the dyadic actors (SC1 and SC2)*	Coordination between the dyadic actors in the SC (L.R)	
-Interaction between the dyadic actors in social events, exhibitions and study tours. (SC1 and SC2)	Communication between the dyadic actors In the SC (L.R)	
Internal-focused key themes "Dyadic Level"		
-Exchange activities in dyads (SC1 and SC2) *-Business planning with dyadic actors in the supply chain. (SC1 and SC2)*	Activities between the dyadic actors and other firms in the SC (L.R)	Contacting strategy
-Tapping into the chain's physical resources (SC1 and SC2) *-Tapping into the chain's human resources (SC1 and SC2)*	Resources gained by the two actors from their SC (L.R)	
-Problems with contracts (SC1 and SC2) *-Changes in policies and standards (SC1 and SC2)*	Uncertainty in the dyad (NT)	
-Cost analysis between the two actors in relationships *(SC1 and SC2)*	Cost analysis (L.R)	Price strategy
-Price setting across the entire supply chain relations (SC1 and SC2)	Pricing process (L.R)	
-Selfish behavior between the partners and misleading behavior in the SC. (SC1 and SC2)	Opportunism Between the dyadic actors in the SC (NT)	
-Costs distribution between the two dyadic actors (SC1 and SC2)	Sharing costs (L.R)	Revenue strategy
-Profits distribution between the two dyadic actors (SC1 and SC2)	Sharing profits (L.R)	
-Equal benefits of profits and sustainable aspects are between the dyadic actors (SC1 and SC2)	Equal benefits (L.R)	

Evidence is shown in FFV Supply chain 1 (SC1), FFV Supply chain 2 (SC2), Literature Review (LR) and New Theme (NT)

At the FFV supply chain level (see Figure 2), there was strong evidence in the literature that sustainable relationships cannot be formed without the link between demand and supply where products flow from the main supplier to the end-customer [27, 28]. This is important for all dyadic relationships in the supply chain. A manager SC1 said: "*The product flow is the movement of products which is managed and communicated on both assets investment and human resources from a supplier to a customer for good information […]."* Another manager SC2 said: "*In fact, we discuss the product flow with our chain actors to develop frequent collaboration […]."* Although information flow and systems may be an antecedent to the interaction of collaborative chain actors, the case studies found that all dyadic actors recognized the importance of developing strong information flow links, which include the collaboration themes. A manager SC1 explained: "*We all take it as a responsibility to try, where we can, to pick up competitive information based on cooperation and coordination […] frequently get it and bring it back in."* A manager SC2 explained that: "*He or she can get feedback from the communication with customers, end users, from the sales and marketing team, from his own team. It comes from a variety of points based on actor position [...] the market information is then disseminated back through regular, functional meetings and also systems."*

At the dyadic relationship level, the two actors in a dyadic sustainable relationship can share tactical information (e.g. operations and logistics) and strategic information (e.g. marketing and customer information) in order to incorporate more benefits [4]. Those actors can be motivated to share information when they are aware of the benefits and revenue control that information sharing can bring. A manager SC1 said: "*The companies ask us to provide them with information and we also do the same […] this helped us to sign contracts to collaborate with them all the time especially to have accurate, various and valuable information from our sustainable actors for better equal revenue and profits […]".* A manager SC2 explained: "*Yes, collaborations make the solid sustainable relationships. There are various methods of exchange through contracts, social networks, social events, workshops, mail, face-to-face meetings, telephone, internet, and faxes […] in addition we regularly plan together and form budgets and pricing strategy for our advanced collaboration."* Information sharing is enhanced by an efficient information flow in order to establish better sustainable value relationships for better decision making along the product flow [10]. It is this process of disseminating and sharing information between chain actors which is believed to underpin dyadic relationships between the two actors based on the sharing of pricing strategy and revenue strategy and on forming a contracting approach for both in order to enhance a sustainable FFV supply chain.

The dyadic actors in both supply chains realize the benefits of developing solid ties with each other. The findings suggest that dyadic actors have a key motivation behind developing information sharing for their collaboration. Therefore, from table 3, the overall aggregate theme of information sharing is linked to five aggregate dimensions: product flow strategy of asset specificity, actor position and transaction frequency; and information flow strategy of cooperation, coordination and communication at the supply chain level and contracting strategy of activities, resources and uncertainty; price strategy of cost analysis, pricing process and opportunism; and revenue strategy of sharing costs, sharing profits and equal benefits at the dyad level. Amongst these themes, actor position, uncertainty and opportunism are concepts that have newly emerged from the stage of exploring the two case studies. Therefore, the research attempts to further understand the key theme of information sharing for collaboration in SBSRs in the FFV context with a focus on these five dimensions, their themes and the newly emerged themes in the explanation stage of cross-case analysis below.

4.2. Cross-Case Study Level

Academic researchers have proposed definitions, frameworks and key findings to carry out development in sustainable supply chains [e.g. 14, 9]. Their research studies are formed based on key underpinning concepts that can be termed the building blocks of assumptions and frameworks. However, a wider body of knowledge about SBSRs is needed to overcome overlapping concepts in order to generate consistent findings [9]. Thus, the intention of the present research is to contribute to the body of knowledge by providing new propositions for collaboration for SBSRs attached to information sharing between the dyadic actors in FFV supply chains.

At the cross-case level, to answer RQ2, we explain how and why the key themes of information sharing are effectively linked to collaboration in SBSRs to improve value chain performance in practice. The exploratory case studies have indicated that the key themes should be categorized into two themes: theme 1- external-focused key themes between all dyadic actors at the supply chain level: information flow of cooperation, coordination and communication; product flow of assets investment, actor position and frequency. Theme 2- internal-focused key themes between dyadic actors in their dyadic sustainable relationships: pricing strategy of cost analysis, pricing process and opportunism; revenue strategy of sharing costs, sharing profits and equal revenue; contracting strategy of activities, joint planning and opportunism. Amongst these, information sharing has become the central theme, which is formed by themes 1 and 2 as antecedences for information sharing. The cross-case analysis has provided more explanations for these key themes, where the dyadic actors of sustainable relationship are the key sustainable actors that find the right framework for collaboration to create sustainable value along the FFV supply chain. Table 4 illustrates the key themes, their definitions and key supporting authors.

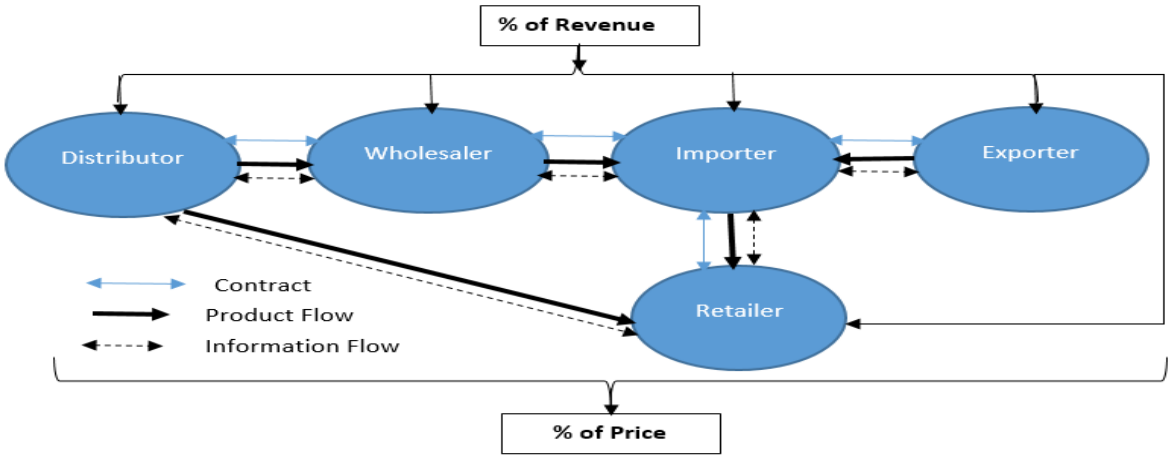

Figure 2. FFV supply chain.

Table 5 shows data triangulation, including representative quotes from interviews and observations. The interviewed managers in all cases among the ten relationships indicated the importance of pricing strategy, revenue strategy and contracting strategy as three key themes for internal-focused information sharing drivers [14, 29] and the concepts of product flow and information flow as two key themes for external-focused information sharing drivers [26, 18]. This is also supported by evidence from meetings between the dyadic actors at each sustainable relationship.

Table 4. Key themes of information sharing for collaboration in sustainable relationships, their definitions and key supporting author.

Key theme	Definition (Present research)	Key supporting author
Information flow Strategy	Both effective formal and informal interactions for information management (cooperation, coordination and communication) where chain actors working at cross-purposes with a dyadic actor to develop cohesive strategy and systems for information sharing, which is essential for collaboration.	Porter and Millar (1985); Burritt and Tingey-Holyoak, (2012).
Product flow Strategy	Both direct and indirect interactions for relationship management (asset investment, actor position and transaction frequency) where chain actors working at cross-purposes with a dyadic actor to exchange products along the supply chain forming a link between demand and supply for collaboration.	Horvath (2001); Flynn et al. (2010).
Contracting Strategy	An arrangement that can be as a set of rules of between dyadic actors in their collaborative supply chain for optimization and what roles they may perform based on their information sharing.	Williamson (1979)
Price Strategy	An approach that involves price setting and processes across dyadic actors in the entire supply chain in order to link strategic partner to better business agreements of appropriate duration.	Voeth and Herbst (2006) Formentini and Romano (2016)
Revenue Strategy	An approach that involves sharing costs and profits across dyadic actors in the entire supply chain in order to link strategic partner to better profit margins of appropriate duration.	Van der Rhee et al. (2010); Formentini and Romano (2016)
Information Sharing	A set of exchanges of data, knowledge and experience between the dyadic actors for collaboration in their SBSR in the entire supply chain.	Porter and Millar (1985). Kembro, et al. (2014)
Collaboration	A business relationship between dyadic actors based on information sharing that yields in a competitive advantage resulting in a greater sustainability business performance.	Spekman et al. (1998); Luzzini, et al. (2015).

Table 5. Data triangulation: interview quotes and observations.

Case	Relationship	Representative Quotation	Observation
Case 1	Relationship A1	"*We are looking for a win-win solution, where we can, to work cooperatively with our importer […] to develop a sustainable relationship of coordination, good communication, trust and agree on beneficial options for competitive resource agenda and training programs[…].”*	A meeting between the retailer and the importer, June 2018.
	Relationship B1	"*Our sustainable importer always ask about how we can help in managing their product flow with other transactional actors […] we do that in different ways such as providing a holistic support for quality systems at chain level, negotiate with the government to solve their leading approach along the supply chain […].”*	A meeting between the importer and the exporter , June 2018.
	Relationship C1	"*Our contracts are for setting sharing many things together[…] actually we share activities, resources and uncertainty for the success of our dyad, leading to shar information in a way of sharing costs, price setting and also positive financial benefits with them […]”.*	A meeting between the retailer and the distributor, June 2018.
	Relationship D1	*“We also support jointly our regular and old suppliers in a dyad for tax flexibility, sharing our market facilities, providing a membership for market information, but still this is not effective […]”.*	A meeting between the distributor and the wholesaler, July 2018.
	Relationship E1	"*Our relationship with importers is for setting together and putting joint planning together for our costs and then profits […] It is a way of sharing information for gaining better performance with our actors in the chain […]”.*	A meeting between the wholesaler and the importer, July 2018.
Case 2	Relationship A2	*“[…] we do want to support our retailer to develop our coordinated transportation and equipment and there is frequent meetings for this cooperation.”*	A meeting between the retailer and the importer, June2018.
	Relationship B2	"*Yes, we do want to support exporters to develop their logistics (e.g. transportation and equipment) in the future transactions and there is a number of sharing for frequent meetings, plans, cost, profits and training for this sustainable purpose.”*	A meeting between the importer and the exporter , June 2018.
	Relationship C2	"*Our sustainable retailer ask about how we can manage their product flow with other transactional actors […] we do that in different ways such as providing a holistic support for quality systems at chain level, negotiate with the government to solve leading approaches along the supply chain […].”*	A meeting between the retailer and the distributor, June 2018.
	Relationship D2	*“Our dyadic actor is fully aware about our pricing strategy on raw material, packaging, customer service and even our damaged inventories […].*	A meeting between the distributor and the wholesaler, July 2018.
	Relationship E2	*“Pricing together is the way we share information […] we always try to avoid any misleading by analysis costs together and putting prices scenarios together.”*	A meeting between the wholesaler and the importer, July 2018.

Both the literature review and cross-case findings support the suggestion that information sharing is the main key for collaboration between dyadic actors that affect their sustainable relationship, and this is also based on good information sources from both actors and demand-side [6, 30]. Findings from cross cases highlighted how dyadic actors at both levels, chain and dyad, share information for a long-term collaboration, and this reflects a positive sustainable relationship approach. The key findings have highlighted the fact that both dyadic actors in all relationships for dyads (A1, A2), (B1, B2), (C1, C2), (D1, D2), (E1, E2) generally identify high effects of the antecedents in forming information sharing for collaboration in SBSRs. The relationships of cases (E1, E2) show low to medium effects of the antecedents in forming information sharing in sustainable relationships. Overall, the most significant antecedents are information flow, pricing strategy, revenue strategy towards information sharing as can be seen in the overall scores of cross cases that reflect medium to high effects of the antecedents. On the other hand, the rest of the antecedents, product flow and contracting strategy, reflect medium effects of the antecedents in forming information sharing in collaboration between the dyadic actors for better sustainable relationships in FFV supply chains (Table 6).

This research finds that there is strong support for the emergent propositions from the two cases, where dyadic actors function to build their sustainable relationships of collaboration based on the information sharing between them, where information flow and product flow also affect these dyads at the FFV supply chain level. In these cases, the dyadic actors are mainly local organizations which form strong collaborations in their sustainable relationships along the FFV supply chains. This includes training and workshops as coordination activities, equipment and technology for production development as resource allocations, quality control as joint planning, cost analysis for their shared products, and reasonable sharing costs for input purchasing and various business tours. These findings are consistent with works by Fearne [14], Mikkola [31], Bailey and Francis [10] and Porter and Kramer [16], who have indicated that many of these themes drive information sharing in collaboration for sustainable relationships. However, in both cases the dyads E1 in SC1 and E2 in SC2 offer weak support for these propositions. In both dyadic sustainable relationships, actors are part of a wholesaler-importer dyad which provides very limited support for information sharing between them along the supply chain. For example, there is a membership body at the wholesaler site for the importer and this is not effective and has very limited activities. There is also a limited number of coordinated training sessions and workshops within specific projects. Quality control programmes are also very few as a joint planning, certification body as cooperation is available for cooperation in a short time, and both have low sharing costs for exhibitions and tour visits for local and export markets. This finding gives a similar framing to those developed by Jraisat and Sawalha [32] and MacMillan, et al. [33].

Table 6. Antecedents of Information Sharing in collaboration for sustainable relationships: Cross-Case Comparison based on chain level /dyad level-focused themes

Case Study		External-focused Key theme (Chain level-focused)						Internal-focused Key theme (Dyad level-focused)								
		Information Flow			Product Flow			Pricing Strategy			Revenue Strategy			Contracting Strategy		
		Cooperation	Coordination	Communication	Assets investment	Actor position	Frequency	Cost Analysis	Opportunism	Pricing Process	Sharing Costs	Sharing Profits	Equal Revenue	Activities	Resources	Uncertainty
Case 1 (SC1)	Relationship A1	H	H	H	H	M	H	H	M	H	H	M	H	H	M	H
	Relationship B1	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
	Relationship C1	H	H	H	H	H	M	H	M	H	H	H	H	H	H	H
	Relationship D1	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
	Relationship E1	M	M	L	L	L	L	L	L	M	L	L	L	M	L	L
Case 2 (SC2)	Relationship A2	H	H	H	H	H	H	H	M	H	H	H	H	H	M	H
	Relationship B2	H	H	H	H	M	H	M	L	H	M	M	M	M	M	H
	Relationship C2	H	H	H	M	H	M	H	L	H	M	M	H	M	M	H
	Relationship D2	M	H	H	L	L	H	M	L	M	M	M	M	M	M	M
	Relationship E2	M	L	L	L	L	L	L	M	M	L	L	M	M	L	L
	Overall Score	H	H	H	M	M	M	H	M	H	H	M	H	M	M	M

Level of scoring from the perspective of dyadic actors: High (H), Medium (M), Low (L).

The key findings have highlighted how information flow promotes collaboration, and that effective internal formal interaction (meetings and conferences), and informal interaction (casual contacts) may be used to develop a cohesive strategy at a dyad level. Cooperation has become the starting point for information flow as a necessity [20]. Coordination and communication between partners takes various forms, such as the use of information technology and/or other traditional ways such as current plan sharing and exchange of resources and experts, possibly between chain members and service providers [31]. The case studies found that all ten relationships recognized the importance of developing cooperation, coordination and a communication approach, including the process of an interest base for information sharing. Most of the managers in all dyads displayed evidence of these themes between the dyadic actors through the development of collaborative SBSRs. There was negotiation in many relationships about what is jointly possible and desirable. A few relationships showed little evidence of good information flow and cooperation in exchange information, and these relationships were the least effective in collaboration. It is proposed that:

P1. Information flow of cooperation, coordination and communication between dyadic actors at the chain level will have good effects on information sharing between them in their collaboration for a sustainable relationship.

Product flow was added to the key themes, with the expectation that it would have a positive impact upon collaboration. It is indicated that the members of a chain are all actors with whom the focal actor interacts directly or indirectly through its service providers, suppliers or customers, from the point of origin to consumption. Actors partake in the various value chain flows, including product, payment, information, agency support and promotion flows [28]. it is necessary to manage product flow to facilitate other flows, such as information and financial flows at the chain level to create knowledge sharing and dissemination mechanisms at the dyad level. The benefits of cross-functional collaboration between actors on which value to create and what information to share, for instance, is already apparent due to increased collaborative quality control and systems (e.g. HACCAP, Global GAP etc.), transactional framework and regulation positions (e.g. local authority or international authority), etc. [15]. The case studies found that all ten relationships focus on product flow to share product activities in the FFV chain, leading to information sharing for both dyadic actors. It is proposed that:

P2. Product flow of asset specificity, transaction frequency and actor position between dyadic actors at the chain level will have good effects on information sharing between them in their collaboration for a sustainable relationship.

Contract strategy is an approach to formal and informal agreements to set up the dyadic relationship with the highest mutual sharing of information and the lowest possible costs [34, 35]. This strategy is related to an economic approach that is linked to enhancing transactions between buyers and sellers based on maintaining incomplete contracts. This strategy will encourage various activities and resources allocation to help actors in sharing information for better actions towards best costs, prices and profits. Furthermore, dyadic relationships are the core of investments in time, money and effort, and they are means by which information and uncertain actions and performance are merged [15]. The case studies found that all ten relationships focus on the contracting strategy in formal or informal ways to share activities (e.g. planning quality protocols), allocate resources (e.g. adopting new ICT technology) and manage uncertainty (e.g. use of traceability systems), leading to information sharing for both dyadic actors. It is proposed that:

P3. The contract strategy of activities, resources and uncertainty management between dyadic actors at the dyad level will have good effects on information sharing between them in their collaboration for a sustainable relationship.

Price strategy is a way for dyadic actors in their collaboration to analyze costs and pricing processes along their functions, leading to sharing a set of information [15]. This mutual strategy focuses on pricing between buyers and sellers from inside the supply chain, affecting the price lists offered to end customers [19]. This economic approach is part of sustainability development to be integrated with mainstream information and management systems. Gathering and sharing data from various valuable sources leads to rich information availability, leading to better social interaction and environmental aspect along the chain [36]. All managers explained that they fully apply the concept of pricing in their actions with the dyadic actors and most of their partners are aware of the importance of efficient collaborative cost analysis for reintegrating the business functions for better benefits for economic and social issues. A sustainable relationship is highly vulnerable compared to other relationships due to external directions such as incorrect information, economic issues, off-season supply and demand and environmental regulation, as well as internal directions arising due to weak organizational structure (e.g. no expertise, poor data, insufficient information systems and information visibility). These directions have led dyadic actors to bond with each other in order to gain support in managing their internal and external effects [30, 28]. Hence, an efficient price strategy plays an important role in supporting actors against such chain-related ambiguities. It is proposed that:

P4. The price strategy of cost analysis, pricing processes and opportunism between dyadic actors at dyad the level will have good effects on information sharing between them in their collaboration for a sustainable relationship.

Revenue strategy is an approach to sharing costs and profits between dyadic actors in their operations strategy, methods and technologies in order to include the implementation of the supply chain paradigm and information management. In particular actors play the key role in equal value and return along the chain for activities that link widely dispersed producers to consumers. Revenue strategy is now viewed by many scholars as a powerful action for moving towards collaboration and for speeding sustainable results in the value chain. Revenue strategy between dyadic actors provides equal benefits, including revenue enhancements, cost reductions, and flexibility to cope with high demand uncertainties [37]. Literature and the case studies indicate that revenue

strategy is important to establishing SBSRs based on information sharing, and it is a synergy for collaboration. It is proposed that:

P5. Revenue strategy of cost sharing, profit sharing and equal benefits between dyadic actors at the dyad level will have good effects on information sharing between them in their collaboration for a sustainable relationship.

All the case studies agreed that collaboration between dyadic actors has a positive impact on sustainability value chain performance, and that collaboration based on information sharing is not just based on close relationships, but must be supported by aligned goals and interaction development. A number of authors [e.g. 38, 39] have identified a positive link between collaboration and improved sustainable performance. Weak collaboration between dyadic actors may have a detrimental effect upon business performance, whilst effective collaboration should improve business performance. Each actor was asked about their actors' performance in terms of profit and access to markets, social factors (e.g. job creation, family work) and environmental factors (e.g. water pollution, chemical use, health hazards). The dyads A, B and C were the actors that most reflected sustainable performance and also achieved the highest indicators in terms of their industry norm and had a healthy market share, positive social impact and efficient environmental activities, whereas cases D and E both exhibited the least collaboration between dyadic actors and had the lowest profit and a weak market share, minimum social interaction and limited environmental results. According to Hsu et al. [4], actors should pay attention to both financial (e.g. profit) and non-financial (e.g. quality) criteria of business performance. Sustainability management includes considerations of social aspects and environmental issues of actor activities, as well as their interaction with economic performance. This is important considering that actors usually focus on these criteria and tend to neglect the sustainability criteria. In fact, high sustainability-performing collaboration included a few distinctive features, regarding the family business stability, hazard analysis, climate change, and longer interaction amongst value chain actors in the agricultural sector. These measures of business success indicate a positive association between information sharing in collaboration and sustainability performance. Therefore, it is proposed that:

P6. *Improvements in collaboration between dyadic actors based on information sharing will positively influence sustainability performance at the chain level*.

As can be seen in the conceptual framework in Figure 3, the direction of the variables in the conceptual framework should proceed from the actors' factors influencing information sharing to collaboration between dyadic actors, and then to overall sustainability value chain performance in the FFV supply chain.

5. Conclusions and Managerial Implications

The present research has explained the studied themes jointly and extended extant work by focusing on the sustainable relationship context. This work provides propositions that have been generated with support from the literature review and a multi- case study.

This research raises interesting areas of study. First, the conceptual framework (Figure 3) indicates significant opportunities for future studies. A key opportunity exists at the collaboration levels which are developed within the sustainable relationship context. Prior research has indicated that information sharing [e.g. 5, 10, 15] is needed at various levels of collaboration development and then improvement, raising empirical questions to examine each level, both dyad and chain. This study is qualitative in nature and the conceptual framework needs to be tested through further qualitative studies or quantitative studies involving large-scale surveys.

From a practical perspective, both dyadic actors who work at improving collaboration for sustainable relationships in the FFV supply chains can benefit from the conceptual framework. This framework offers a guideline to form and describe collaboration between actors along the value chain based on information sharing. Five antecedents to information sharing are highlighted that may be applied to improve collaboration at the dyad level between partners along the information flow that leads to better value creation in their functions including the product flow within the FFV supply chain. To improve information sharing between the dyadic actors, managers should identify good source of information, classify information types, apply a variety of sharing methods and indicate what value of information they need. Managers can apply contracting strategies, such as activities of supply scheduling and planning, price strategies, such as sharing the pricing process, and revenue strategies, such as distributing an equal return percentage. In this way, managers can have shared information (e.g. data or knowledge on quality control, demand, packaging etc.) in their value generation activities along the chain activities for sustainable value added in FFV supply chains.

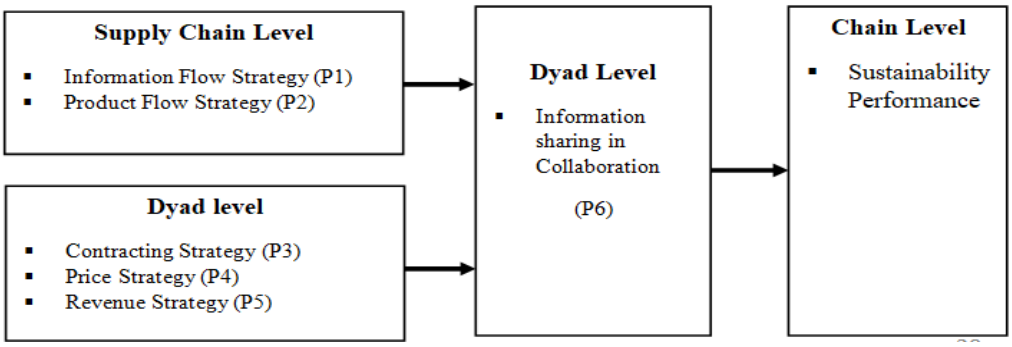

Figure 3. Conceptual framework: collaboration for sustainable relationships in FFV supply chain

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