Effect of Trust on Supply Chain Collaboration: Enhancing Downstream Logistics Efficiency of Agricultural Supply Chains

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Abstract

With the growing world population and diminishing agriculturally productive land, the global agricultural production has become barely sufficient to meet the requirements of the world population. As a consequence, agricultural logistics has emerged in order to ensure that agricultural productions are not spoiled on the way to the consumer and reach the consumer with better quality. Today the consumers are more demanding on food quality and sustainability, resulting the requirement of redesigning the Agricultural Supply Chain (ASC) networks and establishing best practices in place, especially in the perspective of logistics. Thus, infrastructure such as, temperature controlled storage facilities and vehicles, access to cutting edge technologies, real time access to information regarding demand, supply, weather conditions ,price fluctuations etc., proper handling of surplus and agricultural value addition should be introduced to the traditional ASCs. Although having sophisticated infrastructure is important to enhance the efficiency and the productivity, it is difficult for small farmers, retailers, wholesalers, etc., to invest on these new-fangled infrastructures. It's a known fact that collaboration is a strategic decision which aids in gaining competitive advantages, superior supply chain performance and it is a key for achieving logistical performance excellence. In order to maintain a close and fruitful relationship with the participants of supply chain, trust has been considered as a core factor. Accordingly, this study is concerned with the applicability of two concepts, "Trust" and "Collaboration" in resolving downstream logistics issues in less sophisticated, and less organized supply chains, such as the ASCs, to improve logistics efficiency. This scrutiny presents the findings of a comprehensive and systematic review of literature in the areas of trust, collaboration and logistics efficiency of ASCs and subsequently presents a conceptual framework for factors involved in trust building and collaboration in improving downstream logistics efficiency of ASCs.

Keywords: Agricultural supply chains, Collaboration, Downstream Logistics Efficiency, Trust

INTRODUCTION

Agriculture is the foremost method of appeasing the hunger of world's population.As the population increases, agricultural production and supply alsorequires to be increased, in order to meet the increasing demand which can only be satisfied by efficient

logistics(Chandrasekaran & Ranganathan, 2017). Hence, agriculture commodity has to be transported efficiently from farmers to the consuming regions, where agriculture supply chain management plays a prominent role (Ahumada, 2009; Etemadnia, 2015; Chandrasekaran & Ranganathan, 2017) but, the downstream agricultural supply chains are governed by numerous number of inefficiencies and issues which considerably decline the performance and efficiency of downstream logistics. ASCs will continue to deteriorate unless major operational improvements are implemented (Taylor, 1994) and strategic supply chainmanagement is of growing importance within the agricultural sector(Mehmann & Teuteberg, 2016).

Many researchers have emphasized collaboration as a strategic decision to achieve successful and efficient supply chains. Supply chain collaboration enables firms to achieve better performance in terms of cost reductions, revenue enhancements and flexibility in dealing with supply and demand uncertainties(Simatupang & Sridharan, 2002).Collaboration significantly influences logistical service performance, which implies that firms should promote cooperation and collaboration across their supply chain processes to achieve logistical efficiency and effectiveness(Stank, et al., 2001). Thus, based on the previously established fact, collaboration has a positive impact on logistical efficiency of supply chains, this study explores the concept in the context of the agro-food industry to understand how collaboration in an ASC can be conjoined to solve the downstream agricultural logistics issues and how it leads to more efficient downstream logistics.

Trust is a fundamental concept characterizing most inter-personal and inter-organizational relationships(Mouzas, et al., 2007). A successful supply chain performance is based on a high level of trust and a strong commitment among supply chain partners(Kwon & Suh, 2004). Accordingly, this study scrutinizes the factors affecting the trust between supply chain partners of ASCs and effect of trust on enhancing supply chain collaboration.

There are various approaches and models developed to enhance the logistics efficiency of supply chains. There are many studies carried on this milieu. This study meticulously and systematically analyzes the published literature with the objective of identifying the knowledge gaps in improving downstream logistics efficiency of ASCs and explores the applicability of two concepts, “Trust” and “Collaboration” to resolve the downstream agricultural logistics issues inimproving the logistics efficiency. These findings would be of immense importance for ASC stakeholders to accomplish their goal to maximize the profits while providing a superior service to the consumers. This paper sheds new light on the application of the two

concepts, trust and collaboration in low value, high risk and volatile ASCs with less financial investments.

The remnants of the paper are structured as follows: the methodology of this study, the results of the systematic literature review, cessation of the paper by giving conclusions and offering some perceptions on future research.

METHODOLOGY

The approach adopted to investigate the state of knowledge in the assorted area is the content analysis; which is based upon an explicit sequence of steps with which to systematically organize elements of text so as to enable an investigator to meaningfully interpret and make inferences about the patterns in the content of the overall body(Bowen & Bowen, 2008). The foremost step of the analysis was to search for articles related to the study. There were number of studies that have been conducted by considering various aspects of logistics efficiency, collaboration and trust. This search resulted in altogether fifty-one articles. These articles were further screened based on the title and the abstract in the next phase and selected twenty-six articles. Full text of each of these articles were reviewed and eliminated the articles which are not pertinent to the scope of the study. Thus, in total fifteen articles were included in the study. The selection process is shown in the Figure 1. All the articles that were reviewed are listed on this paper under the list of references. It is believed that the papers selected and reviewed were a considerable representation of the exhaustive body of the research work being accomplished in this area of study.

A comprehensive literature review was done with the intention of finding the effect of trust and collaboration on the downstream logistics efficiency of ASCs and revealing the research gap in the area. Only contemporary articles which were published within the years of 1997 and 2018 were chosen for the review with the intention of enhancing the relevance to the current context.

The content of the articles was categorized under the factors on which the researches were carried on and profound content analysis has been conducted.

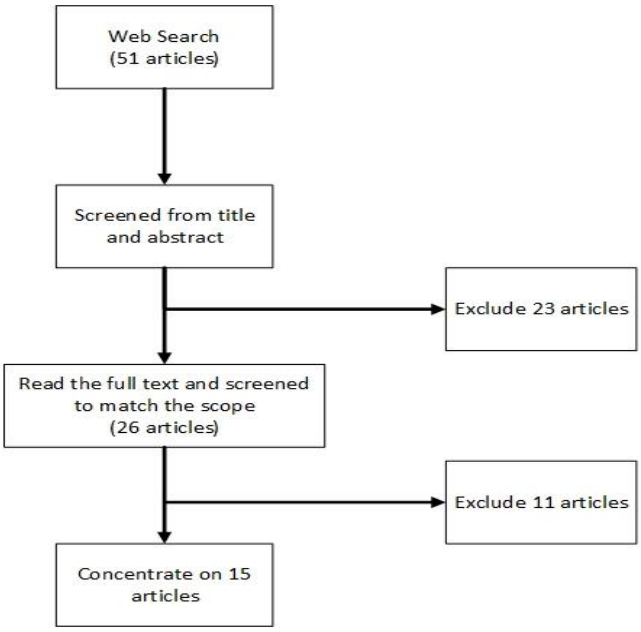

Figure 13: Literature screening for the Meta-analysis

MAIN RESULTS OF THE REVIEWED STUDIES

Logistics Issues of ASCs

Logistic performance of the ASCs mainly depends on preserving the quality of the agro products. A study was conducted to find the opportunities for improving the quality controlled logistics of agricultural supply chain networks and it discusses the prospects of using real time product quality information for redesigning and management of ASCs, and presents a preliminary diagnostic instrument for assessment of 'critical quality' and 'logistics control' points in the supply chain network. According to the results of the paper, supply chain stakeholders should define consumer preferences on product quality attributes and definition of the consumer product acceptance period, define the critical quality points in the supply chain, that have major impact on the product quality attributes, measure product quality attributes and use quality change models to predict product quality in all supply chain stages, log data and exchange of (demand and supply) information with supply chain partners realtime, use local dynamic logistics and quality control in each stage to optimize product quality, use ASC and management practices to direct specific products batches under specific environmental conditions to specific market segments in order to preserve the quality of the agro products and thereby improve the logistic performance (Van der Vorst, et al., 2011).

(Bottani, et al., 2014)Proposed an integrated approach to increase sustainability and efficiency of logistics activities. This study has proposed a detailed framework which aids in designing a sustainable and efficient logistics scenario for food industrial districts and to evaluate the subsequent economic and environmental performance. The framework takes into account the main logistic processes of a targeted cluster of independent companies, and helps in designing a new scenario where those processes are managed in a pooled way. The proposed framework represents a quantitative approach to improve the logistics efficiency in terms of warehousing, transportation, distribution and workforce organization of food districts through aggregation and integrated management of logistics processes.

A study on countermeasures of the logistics efficiency of fresh agricultural products in China states that improving the present logistics efficiency of fresh agricultural products is important as it is good for both the producers and the consumers' vital interests and it is necessary for the improvement of competitiveness. Researchers have identified, fragmented production, high lost rates in the logistics and lagging behind of the logistics infrastructure that leads to high logistics costs as the main problems regarding the current scenario. Order production to promote agricultural products production towards to large scale production, develop the advanced way of cold-chain logistics, greatly develop the third party logistics service, develop supermarket sales mode, and bring in different kinds of advanced logistics technology are the measures that have been identified through this study in order to improve the logistics efficiency of fresh ASCs (Zhang, 2015).

(Liljestrand, 2017)conducted a study with the purpose of expanding the understanding of how logistics can reduce food wastage in food supply chains using a multiple-case study conducted in three Swedish food supply chains of meat, fruit and vegetables. This scrutiny has identified mismatch of demand and supply, mismatch of shelf life and lead time, mismatch of assortment and shelf life and mismatch of packaging and logistics systems as the causes of food wastage and presents nine logistics solutions to overcome the wastage. Logistics solutions as presented by the study are, collaborative forecasting, division of lead time, managing level of safety stock, make to order flows, measure of service level, price reductions, product group revisions, visualizing damaged packaging and packaging development.

Supply Chain Collaboration

The study on *"Collaborative commerce or just common sense? Insights from vegetable supply chains in Ho Chi Minh City"* has demonstrated that collaborative commerce is not restricted to trade in branded products between large, multi-national organisations and supply chains and

the applicability of the concept to highly volatile ASCs.Findings of the paper are based on a research conducted in and around Ho Chi Minh City in Vietnam. This study illustrates that collaborative trading practices can also be used for the management and development of the food supply chains, old and new, which is generally regarded as low value through strong collaborative culture and trading environment that are conducive to information sharing and supply chain coordination. This study has used two case studies, one from supermarket supply chains and one from traditional vegetable supply chains which emphasize the contribution of collaboration for the performance of the fresh vegetable supply chains.Paper elaborates the significance of the information sharing, joint planning and the supplier development to reduce the risk of non-compliance in collaboration.(Cadilhon , et al., 2005)

A case study based research was done in (Matopoulos, et al., 2007) on "*A conceptual framework for supply chain collaboration: empirical evidence from the agro-food industry*" to investigate andunderstand collaboration in the context of the agro-food industry and how a range of factors impact on the intensity of collaboration through a case study at the grower processor interface.This research revealed that while there is a true need for supply chain collaboration, the structure of the agro-food sector along with the nature of products affects the intensity of collaboration, to more operational and tactical level, as well as to logistics-related activities.In contrast to the case study, elements of trust, power, dependence, and risk/reward sharing in establishing and maintaining supply chain relationships, as well as the role of the above elements in selecting partner, deciding upon collaboration width and depth are important. Trust affects the intensity of collaboration limiting the depth and the width of collaboration.

The study on "*Collaboration and trust in two organic food chains*" attempted to determine the presence of collaboration along the Finish organic food chain from farmers to retailors. In this study collaboration is expressed in terms of communication and trust between the actors. Findings of the research suggests that frequent communication is not an indication of collaboration, and when building trust, it is less important than the quality of communication. Trust is the prerequisite for collaboration. Particularly the competence demonstrated as an exchange partner, seemed to hold the key for a trustful relationship. Power imbalance and the different value systems were not insuperable obstacles for trustful and collaborative relationship.(Kottila & Rönni, 2008)

A research on "*Towards a grounded view of collaboration in Indian agro-food supply chains*" highlighted the perceptions of buyers and suppliers towards each other. This study presents a comprehensive framework and add a generic model to understand supply chain collaboration

through content analysis of interview transcripts supplier selection, joint planning and information sharing were found to be main antecedents while profits; waste reduction and supply chain efficiency were major outcomes of collaboration. According to the research findings, the suppliers are usually more doubtful of the buyers and do not trust them easily. Hence, it is very important to have good relations with suppliers and should make provide incentives to suppliers for collaboration.(Aggarwal & Srivastava, 2016)

Trust among Supply Chain Partners

As stated by a study done in 1997, supplier firms must make significant investments to develop and maintain customer trust. For suppliers, the value of such efforts is most apparent when high levels of buyer trust lead to more favorable purchasing outcomes for the supplier. Results of this study suggest that though the process of building customer trust is expensive, time consuming, and complex, its outcome in terms of forging strong buyer-seller bonds and enhanced loyalty could be critically important to supplier firms. The authors integrate theory developed in several disciplines to determine five cognitive processes through which industrial buyers can develop trust of a supplier firm as calculative process (Trustor calculates the costs and/or rewards of a target acting in an untrustworthy manner), Prediction process (Trustor develops confidence that target's behavior can be predicted), Capability process (Trustor assesses the target's ability to fulfill its promises), Intentionality process (Trustor evaluates the target's motivations) and Transference process (Trustor draws on "proof sources," from which trust is transferred to the target).(Doney & Cannon, 1997)

(Sako & Helper, 1998) Examined the determinants of inter-organizational trust using survey data from automotive industry. The study has defined trust and derived a model of its determinants using transaction cost economics, game theory and sociological exchange theory. As stated by the study, there are three forms of trust as, contractual trust (trusting that other party will carry out its contractual agreements), competence trust (trusting that other party is capable of doing what it says it will do), and goodwill trust (trusting that other party make an open-ended commitment to take initiatives for mutual benefit while refraining from unfair advantage taking). According to the study, the conditions which facilitated the creation and sustenance of trust were found to include long-term commitment, information exchange, technical assistance, and customer reputation.

Empirical analysis done by Robert B. Handfield and Christian Bechtel presents a model that suggests the dedication of site-specific assets by a supplier is an important precursor to greater human asset investments and can lead to a greater level of trust between the parties. Managers

who are keen on improving supply chain responsiveness should work towards building greater levels of trust with key-input suppliers, and explore opportunities for colocation and information sharing on a regular basis.This model was tested with data gathered from a sample of purchasing managers in North American manufacturing firms.(Handfield & Bechtel, 2002)
According to the paper "Building trust on growers and market agents", when the grower and the market agent share similar goals, trust is facilitated. To reinforce trust, growers prefer to transact with those market agents who are prepared to invest in their relationship with the grower. Conversely, the market agents' propensity to act opportunistically, to exercise power and to withhold information from the grower will have a significant negative impact on the trust that develops between growers and market agents.(Batt, 2003)
Results of a study on "*Factors Affecting the Level of Trust and Commitment in Supply Chain Relationships*" conducted using a comprehensive survey of supply chain practitioners indicate that a firm's trust in its supply chain partner is highly associated with both sides' specific asset investments (positively) and behavioral uncertainty (negatively). It is also found that information sharing reduces the level of behavioral uncertainty, which, in turn, improves the level of trust. A partner's reputation in the market has a strong positive impact on the trustbuilding process, whereas a partner's perceived conflict creates a strong negative impact on trust and the level of commitment is strongly related to the level of trust.(Kwon & Suh, 2004)
(Mouzas, et al., 2007) States that trust in business-to-business marketing is a multilayered construct that needs conceptual clarification. As an emotional paradigm it is applicable to inter-personal relationships. Business relationships, comprises with inter-personal and inter-organizational relationships and thus, this paper proposes a conceptual framework that adds a rational standard applicable to inter-organizational relationships, namely that of reliance.
As stated by a study conducted in 2011, there are two forms of trust as trust in competency and affective trust affecting the collaboration of buyer and supplier firms. Trust in competency is the expectation of trustworthy behaviors as a result of conviction for the knowledge, know-how, and expertise of partners while affective trust is the emotional trust attained from long-term-based inter-personal interaction. This paper reveals that affective trust has a significant influence on collaboration in information sharing and benefit/risk sharing, whereas trust in competency affects collaboration in joint decision making and benefit/risk sharing. Regarding supply chain collaboration, joint decision making and information sharing are found to affect logistics efficiency. Insignificant relationships are detected between affective trust and joint

decision making, between trust in competency and information sharing, and between benefit/risk sharing and logistics efficiency.(Ha, et al., 2011)

All the articles taken into consideration in the analysis are briefed in the summary table shown in the Table-1.

Table 41: Main results of the reviewed studies

Title	Year	Objective/s	Design Method/s	Key findings
Towards a Diagnostic Instrument to Identify Improvement Opportunities for Quality Controlled Logistics in Agri-food Supply Chain Networks	2011	To find the opportunities of using realtime product quality information for improvement of the design and management of ASC and presents a preliminary diagnostic instrument for assessment of 'critical quality' and 'logistics control' points in the supply chain network	A case study	• Improvement opportunities in the supply chain as to increase both product availability and quality.
Improving logistics efficiency of industrial districts: a framework and case study in the food sector	2014	To proposes an integrated approach to increase sustainabilityand efficiency of logistics activities	Introduce a framework and tested with a case study	• Pooled management of packaging, procurement, warehousing and transportation activities could improve the sustainability of industrial district, in terms of efficiency and resources used.
Study on Countermeasures of the Logistics Efficiency of Fresh	2015	Find the ways to improve logistics efficiency of fresh agricultural products	Survey	• Quality, safety and commercial value of products can be improved through shortening logistics chains, times,

Agricultural Products in China				promoting the standardization and modern development of logistics of fresh agricultural products
Logistics solutions for reducing food waste	2017	To expand understandings of how logistics can reduce food waste in food supply chains	Case study Data collection: semi structured interviews and site visits	• A joint analysis of nine logistics solutions revealed that to efficiently reduce food waste in food supply chains
Collaborative commerce or just common sense? Insights from vegetable supply chains in Ho Chi Minh City	2005	To demonstrate that collaborative commerce is not restricted to trade in branded products between large, multi-national organisations.	Insights from extensive field research in Vietnam.	• Collaborative principles are simple and easy to adopt when the culture is conducive to collaboration and a partnership approach to trading relationships.
Collaboration and trust in two organic food chains	2008	To determine the presence of collaboration along the Finnish organic	A case study with two cases	• High frequency of communication is not an indication of collaboration, and is less

		food chain, from the farmers to the multiple retailers		important than the quality of communication in the creation of trust • Competence demonstrated as an exchange partner is the key for a trustful relationship.
Trust development and horizontal collaboration in Logistics: a theory based evolutionary framework	2015	To provide a sound theoretical foundation, inthe form of a theorybased framework, to show a potential way to develop horizontal collaboration effectively by considering trust among partners	Develop an evolutionary framework	• Mutual trust among partners is developed through increased and continuous collaboration
Towards a grounded view of collaboration in Indian agri-food supply chains	2016	To understand the process and role of supply chain collaboration in Indian agri-food industry and highlight the perceptions of buyers and suppliers towards each other	A case study	• Generic model was derived to understand the process of supply chain collaboration supplier selection • Joint planning and information sharing are the main antecedents and profits, waste reduction and supply chain efficiency are major outcomes of collaboration

An examination of the nature of trust in buyer-seller relationships	1997	To determine processes through which industrial buyers can develop trust of a supplier firm and its salesperson	Develop theoretical model and tested using data collected from purchasing managers	• several variables influence the development of supplier firm and salesperson trust • Trust of the supplier firm and trust of the salesperson influence a buyer's anticipated future interaction with the supplier
Determinants of trust in supplier relations: Evidence from the automotive industry in Japan and the United States	1998	To examines the determinants of inter-organizational trust	Survey	• Conditions which facilitate trust are long-term commitment, information exchange, technical assistance, and customer reputation • Vertical integration was found not to have a significant effect on trust.
The role of trust and relationship structure in improving supply	2002	To answer the question “How can purchasing managers structure relationships with suppliers to achievea desired outcome, given varying degrees	Present a model	• Buyer-dependence, supplier human asset investments, and trust are all positively associated with improved supply chain responsiveness

chain responsiveness		of dependence on suppliers and different market channel forms?"		
Building trust between growers and market agents	2003	To find the factors affecting the trust building between growers and market agents	Survey Data collection: mail questionnaire	• Grower's satisfaction with the exchange transaction have the, most significant influence on building trust between the grower and their most preferred market agent. • When economic outcomes are higher than expected, growers give higher credit to their market agent and thereby trust improves.
Factors affecting the level of trust and commitment in supply chain relationships	2004	To fill the gap between the theoretical argument and empirical testing of the relationship between trust and commitment among supply chain partners	Survey	• Firm's trust in its supply chain partner is highly associated with both sides' specific asset investments (positively) and behavioral uncertainty (negatively). • Information sharing reduces the level of behavioral uncertainty and improves the level of trust. • A partner's reputation in the market has a positive impact on the trust building process and partner's perceived conflict

				creates a strong negative impact on trust. Level of commitment is strongly related to the level of trust.
Trust and reliance in business Relationships	2007	To define the role of trust and reliance in business relationships	conceptual model is developed, and its implications analyzed and discussed	• One of the particularities of trust is its inherent anthropocentricity. • As a concept, trust is more applicable at the level of inter-personal relationships than to inter-organizationalrelationships
Suppliers' affective trust and trust in competency in buyers: Its effect on collaboration and logistics efficiency	2011	To measure trust that logistics/supply chain management managers of supplier firms perceive towards inbound managers of buyer firms, and investigate the effect of trust on supply chain collaboration and logistics efficiency	An empirical analysis conducted with Korean firms	• Affective trust has a significant influence on collaboration in information sharing andbenefit/risk sharing, • Trust in competency affects collaboration in joint decision making and benefit/risk sharing. • Joint decision making and information sharing are found to affect logistics efficiency. • Insignificant relationships are detected between affective trust and joint decision

				making, between trust in competency and information sharing, and between benefit/risk sharing and logistics efficiency.

DISCUSSION

The categorization of factors studied in the selected articles is discussed in the following sections.

Factors affecting Logistics Efficiency

Table 2 depicts the factors that leads to logistics efficiency.

Table 42: Factors affecting logistics efficiency

Study	Factors affecting logistics efficiency				
	Forecasting	**Quality inspection**	**Inventory and warehouse management**	**State of the art technology**	**Modern infrastructure**
(Van der Vorst, et al., 2011)	*	*			*
(Bottani, et al., 2014)			*		*
(Zhang, 2015)		*	*	*	*
(Liljestrand, 2017)	*	*	*	*	*

Under this category, the studies which are focused on the factors that affect the logistics efficiency are categorized.

A supreme portion of the agro products is perishable and in most occasions, downstream agro product transportation takes place in open caters. Thus these products are exposed to

uncontrolled temperature conditions and it leads to continuous emission of CO_2through respiration of the products (Chandrasekaran & Ranganathan, 2017). Ultimately, product quality is deteriorated. All the considered studies have reflected modern infrastructure as a crucial aspect for the logistics efficiency of the ASCs. These infrastructure includes the specialized temperature controlled transportation and storage equipment (Van der Vorst, et al., 2011). Having a developed interconnected road network is critical for the downstream logistics efficiency as well (Zhang, 2015).

Consumer preferences and acceptance period of product quality attributes, identifying critical quality points, product quality measurement and prediction and adoptive logistics and quality control based on the customer requirements and current product quality is important for maintaining the logistics efficiency (Van der Vorst, et al., 2011). This will preserve the product quality and will boost the customer satisfaction.

Forecasting reduces the food waste due to the mismatched supply and demand (Liljestrand, 2017). Forecasting the demand, fluctuation of demand due to seasonal changes or weather conditions helps to shrink the food wastage or food shortage (Liljestrand, 2017). Owing to forecasting, ASC stakeholders could manage their inventories or use value addition in order to meet surpluses or shortages efficiently.

Having modern storage equipment for cold storage, preservation and gas conditions reduce the cost of preserving and improve the quality of agro products (Zhang, 2015). Adequate number of warehouses with ample space to store the production is critical for downstream logistics efficiency of ASC. Warehouses should be properly managed and maintained.

Integrating modern technologies and digitizing the supply chain enhance the performance of the supply chains. Using Nano technology, biological preservation technologies, ozone gas preservation technology, shorten the logistics chains and improve efficiency (Zhang, 2015). Incorporating digital technologies such as cloud computing, intelligent systems with downstream ASC will pave the way for new digital era in downstream logistics of ASCs.

Features of Collaboration

Table 3 shows the features of collaboration identified through the review of literature

Table 43: Characteristics of collaboration

Study	Features of collaboration				
	Share resources	**Share knowledge**	**Effective communication and information sharing**	**Collective decision making**	**Risk/benefit sharing**
(Cadilhon , et al., 2005)			*	*	
(Matopoulos, et al., 2007)	*		*		*
(Kottila & Rönni, 2008)			*		
(Aggarwal & Srivastava, 2016)	*	*	*		
(Ha, et al., 2011)			*	*	*

Most of the studies have identified effective communication and information sharing as an approach for collaboration. Constant communication is not an indication of collaboration and what is important is the quality of the communication (Kottila & Rönni, 2008). Having an effective bi-directional communication among the supply chain partners in ASC ensures effective and efficient information flow in the supply chain. Sharing the information regarding demand, supply, production, strategies, operations, ensures the improvement in downstream logistics efficiency (Aggarwal & Srivastava, 2016).

According to the reviewed articles, sharing knowledge is another trait of collaboration. Most of the times, infrastructure that connects these numerous small stakeholders such as the farmers, wholesalers, processors and manufacturers, retailers, etc., is very weak. Farmers bring whatever they have produced to the market without actually having any knowledge about the real demand in the market(Aggarwal & Srivastava, 2016). These small stakeholders have limited access to knowledge. Through collaboration supply chain partners who have access can share knowledge with others, thus they also can use new technologies, new methods in cultivation, storage or transportation

ASC partners can involve in joint decision making through shared operational decision making, willingness of collaborative problem solution and willingness of collaboration in strategic decision making. In collaborative benefits/risk sharing, efforts are made to create mutual benefits, costs are shared and willing to cooperate in purchasing.(Ha, et al., 2011) Joint decision making and collaborative benefit/risk sharing in downstream agricultural logistics ensures efficient and effective product movement as all the operations and strategies are developed in a way that profit is maximized for all the partners and risk is minimized.

It is difficult for small farmers, wholesalers, retailers to invest in new technology, equipment and infrastructure, although there is a growing need for establishing better practices that would enhance the productivity and efficiency in agro industry.

According to the reviewed literature there are two types of collaboration as horizontal and vertical collaboration.Vertical collaboration occurs when two or more organizations such as the manufacturer, distributor, the carrier, and the retailer share their responsibilities, resources, and performance information to serve relatively similar end customers. Horizontal collaboration occurs when two or more unrelated or competing organizations cooperate to share their private information or resources such as joint distribution centers.(Simatupang & Sridharan, 2002)

Through horizontal collaboration of ASCs, farmers can collaborate with other farmers, wholesalers collaborate with other wholesalers, etc., and work towards achieving a common goal. This will encourage the sharing of information and resources within the supply chain, which ultimately leads to the improved logistics and supply chain performance. This would improve the quality of service provide to the consumers as well as their individual profits.

Through vertical collaboration, stakeholders at different levels of ASC collaborate together to achieve a common goal. This would boost the smooth and two-way flow of information and knowledge. Demand and supply data, market trends, customer needs and wants, etc., will efficiently transmit from one level to another. Thereby logistics efficiency will improve and the supply chain performance will thrive.

Factors affecting Trust

Common factors stated by the reviewed studies that affect trust are tabulated in Table 4.

Table 44: Factors affecting trust

Common factors stated by Study	Factors affecting trust				
	Honesty	**Reputation of the partner**	**Unique knowledge/ skills in what they do**	**Openness/ Information sharing**	**Technical assistance or help received from the partner**
(Doney & Cannon, 1997)			*	*	
(Sako & Helper, 1998)		*		*	*
(Handfield & Bechtel, 2002)				*	
(Ha, et al., 2011)	*		*	*	
(Kwon & Suh, 2004)	*	*		*	
(Batt, 2003)	*		*	*	*

According to the reviewed literature, most of the studies have identified openness or information sharing in a supply chain relationship leads to trust building between the partners. Information sharing reduces the degree of uncertainty, which in turn enhances the level of trust(Kwon & Suh, 2004).In the context of fresh product industry,market agents can generate greater trust with the growers by sharing information such as the demand information including the crop varieties which are having greatest demand, quantities and the quality of the products required by the customers. Quantity and quality information will help the supply chain partners involved in downstream ASCs to plan and organize their logistics processes so as to satisfy the customer requirements as the deterioration of the product quality mainly occurs during the logistics activities. Sharing sensitive market information will not onlyimprove transparency in the exchange, but also signal the market agent's desire to cooperate and collaborate(Batt, 2003). Thus, opening of the supply chain partners to each other and sharing information leads to stronger relationships bounded by trust. This is the base for collaborative relationship.

Trust that is based on a partner's expertise focuses on an expectancy held by a person that the partner's word or written statement can be relied on (Lindskold, 1978). Such supply chain stakeholders are trustworthy, since they know what they are doing.In ASCs expertise based trust could be developed when the supply chain partners have expertise knowledge and skills in handling, storing, transporting and selling certain agricultural products. The other party involved in the trust based relationship believes that they could gain more benefits financially as well as non-financially through this relationship. Thus, they tend to enter into a collaborative partnership centered on the trust in expertise knowledge of the other party.

Assistance or help received from the supply chain partners encompasses the technical assistance and sharing their knowledge and assisting them in engaging certain downstream logistics activities. One type of credible commitment that a customer can provide to a supplier is technical assistance and, the customer would have more trust in its supplier's competence as a result(Sako & Helper, 1998). In downstream ASCs this type of trust could be developed between stakeholders who assist their partners in logistics processes such as transporting and storing of the products. These associates will share their technical knowledge regarding these processes and will support their partners to reap the benefits of following proper techniques and methods.

Reputation is based on the perception of partners that other trading partners deliver quality products/services, and they keep their word and never second-guess the other’s intentions (Kwon & Suh, 2004). In most of the supply chains including ASCs, stake holders tend to build

relationships with other partners or engage in transactions based on their reputation. For an example, if the other party has a reputation for selling quality products at a reasonable price, it will pave the way for trust based on reputation.Ultimately the stakeholders enter into a partnership grounded on trust.

Perception of partners that other trading partners are honest leads to a trust based relationship(Kwon & Suh, 2004). Honesty of the other party is a very important factor which is considered before entering to a trade relationship or a transaction. In downstream ASCs opportunistic transactions, often lead to cracking of trust based relationships. Thus, partners should be honest with each other and should have the pure intention of helping each other to gain mutual benefits of the relationship.

(Sako & Helper, 1998) has identified three types of trusts as contractual trust, competent trust and goodwill trust. According to the reviewed literature these types of trusts affects the collaboration differently and they have different weights on collaboration and logistics efficiency. For an example, competency trust has a greater effect on joint decision making and benefit/risk sharing while information sharing is greatly affected by goodwill and contractual trust.(Ha, et al., 2011)Technical assistance or the help received from the partner and unique knowledge/ skills in what they doaffirm the competence trust while honesty establishes contractual trust (Sako & Helper, 1998). Thus the logistics efficiency and collaboration have a distinguishable effect from each trust type.

CONCLUSION

In the recent past, research interest and the importance of logistics efficiency of ASCs have made an enormous contribution on this topic. Based on the review, classification and analysis of the articles, some broad suggestions for future research can be put forth. Indeed, in spite of the significant development achieved over the last decade, there remain many important issues for future investigation.

Trust is the prerequisite for collaboration and collaboration is clamped to a supply chain function with the help of the trust. In a downstream ASC, building trust between the the farmers, wholesalers, retailers, food processors, etc., is very important as it is very challenging to survive in a highly volatile supply chain with limited resources and without any external backing. Thus collaborative relationships centered on trust should be developed, as most of the supply chain partners are of small scale and have limited access to resources, technology,

knowledge and infrastructure required to redesign the downstream ASCs to improve logistics efficiency.

If the supply chain partners are bound together with a sturdy trust centered bond, which affluences with contractual trust, competence trust and goodwill trust that will lead to a collaborative supply chain. Collaborative agricultural downstream supply chains which are both horizontally and vertically collaborated will encourage sharing resources and knowledge, effective communication and information sharing, collective decision making and risk/benefit sharing in order to improve the logistics efficiency through forecasting, quality controlling, inventory and warehouse management, usage of state of the art technology and modern infrastructure. Thus, trust has positive impact on supply chain collaboration and thereby downstream logistics efficiency of ASCs could be improved.Figure 2 shows the effect of trust and collaboration in improving downstream logistics efficiency of ASCs.

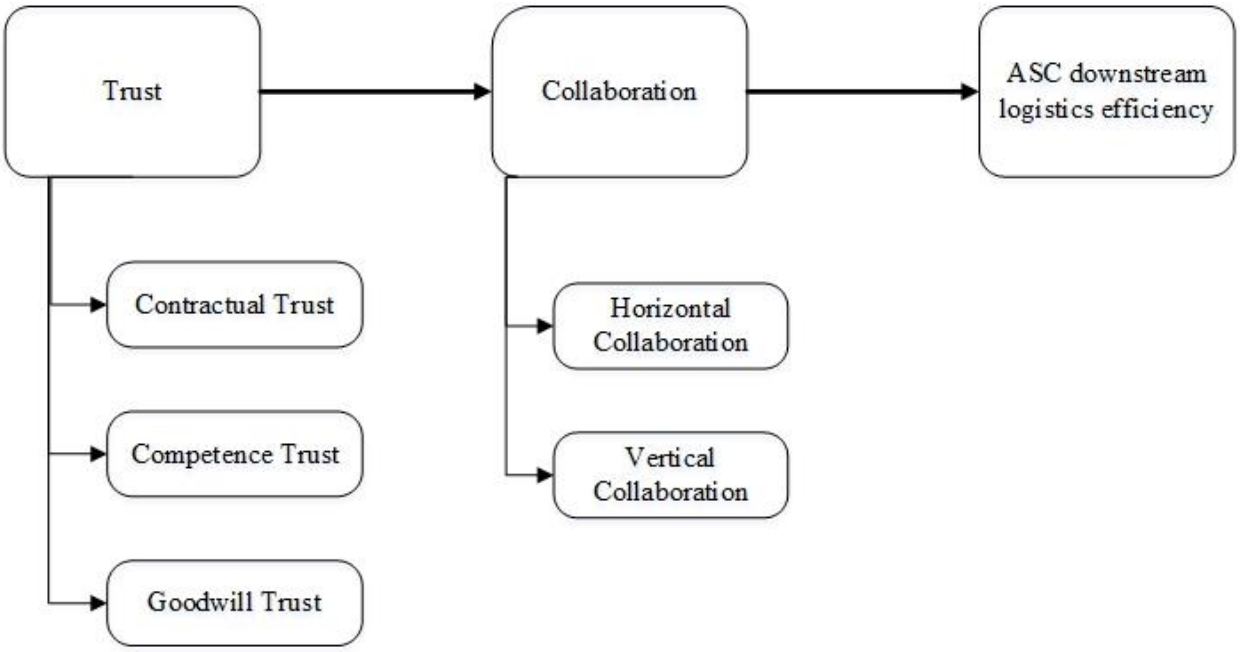

Figure 2: Effect of Trust and Collaboration in improving downstream logistics efficiency of agricultural supply chains

There are only few studies conducted to identify the factors affecting the downstream logistics efficiency of ASCs, other than collaboration and trust. Therefore, further researches should be conducted to investigate those factors as well. Very limited number of researches conducted on ASCs were focused on traditional ASCs, hence researchers should focus their attention on this area in order to propose improvements.

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