



Determinants of inter firm relationships in agriculture value chains: A SEM approach across rice processing perspective in Haryana

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ABSTRACT

This research paper focuses on the development of conceptual model to describe the central role of 'agriculture supply chain relationship quality' and its components in driving supply chain performance and sustenance of inter firm relations. The model was testing using data from agriculture sector specifically rice processing units in Haryana. The study provides practical implications to decision makers with insights of enhancing supply chain performance. Supply chain decision makers will be able to benefit from the findings of this study by fostering supply chain relationships with supply chain members and ensuring supply chain performance.

Keywords: supply chain relationship quality, supply chain performance, supply chain sustenance, rice processing units, agriculture value chains, Haryana.

Background: Inter firm relationships in agriculture

Inter firm and inter organizational relationships are of paramount importance to business organizations as it helps firms to safeguard their market posturing and increase their likelihood of resilience, survival and sustenance with evolution of product market fit (Hutchinson & Singh, 2012). Given the increasing level of growing competition, supply chain operations have become a major instrument of corporate strategy. Consequently, supply chain researchers have focused on understanding the supply chain relationships and supply chain performance constructs and the respective determinants. Although supply chain 'relationship quality' construct per se has remained one of the most researched areas, it is nevertheless the least understood and most contentious areas of supply chain in agriculture perspective. Notwithstanding this difficulty, the steady rise in inter firm sourcing and rising dependence on number of inbound and outbound sourcing firms, has necessitated the need to seek an understanding of critical drivers of supply chain 'relationship quality' as a research construct. In line with this, several academic studies have underlined the core variables that directly or indirectly affect the relationship quality in supply chain perspective. Inter firm relationships are the backbone of exchanges and sustainable exchange of products, value and money as well as information. Essentially the relationships constitute the series of market transactions and business-related interactions between a seller and buyer that are for value creation purpose and not accidental in nature (Fischer, 2009). The core characteristics as evaluated in literature involve focus on (a) a patterned sequence of market transactions and other business-related interactions, (b) an existing internal link between the individual transactions, (c) sells as engaging in the specific task related investments in order to create and maintain the relationship. The inculcation of sustainability in such relationships is sought to breed relationship quality and relationship stability. Relationship stability is being interpreted as non-coercive and coercive behavior and past chain experiences that collectively constitute the diverse dimensions of inter-personal (inter managerial) variables namely commitment, satisfaction and trust with the participating business partner. Relationship stability encompasses the existence of mutual dependence, conflict resolution capacity and a positive collaboration spirit with the business partner (Fischer, 2009). Relationship quality in association with relationship stability is widely being observed in literature as promoting the sustainable relationships.

Theoretical perspective

Relationships in business theoretical terms are interpreted as relatively long-term association across two or more parties (agents or firms) that are formalized and institutionalized and handled on professional and rational basis. Different social sciences theoretical paradigms have dealt with relationships in detail. Psychological attachment proposition argues for following a drive to start and maintain social relationships with others and addresses the need for stable and sustainable mutual relationships. Social exchange theory calls for relationships to be interpreted in context of exchanged benefits in terms of material and corporate gains. Equity theory identifies as advocating the maximization of rewards to relating parties in terms of value creation. The theory further postulates that relating parties strive for equity between the inputs which they usually bring to the aforesaid relationship.

The sustainable inter firm relationships as a research construct hence emphasizes inter group (inter enterprise) relationships as prevalent amongst associating parties. Relationships as matter of research identifies as multi-dimensional construct with ill-defined contours and dimensions. Finding a definition about such ill-defined research construct is firstly about agreeing to identify the inherent components that collectively built up the research construct. In such cases, as per literature review, emphasis needs to be placed upon the theoretical specification of the relationships across the construct's dimensions as evident in literature.

Scholars on subject argue that while dealing with such research constructs in empirical perspective, measurement related issues need to be clarified and determination of the relative importance of each individual component should be assessed within the larger dimensional perspective (Cucagna & Goldsmith, 2017). Scholars on subject argue that despite the importance of 'inter firm relationships' to agriculture processing companies engaged in rice processing; the research extensiveness is scattered and non-convergent. Supply chain scholars observe that despite the benefits of inter firm relationships to organizations with regard to supply chain management; this is still considered as challenging and several research efforts have been expended into exploring a variety of supply chain relationship management themes including how the firms could boost inter firm relations in supply chain management.

Review of existing theoretical models

Regarding ways of improving rice processing (agriculture processing) firm's supply chain levels, researchers have examined several important variables including trust (Fischer, 2009), commitment (Klimas & Stanczyk, 2023), specific investments (Tsoulfas & Trivellas, 2023) and formalization (Braun & Bitsch, 2023). It can therefore be said that these studies have played a critical role in advancing knowledge on the probable determinants of supply chain relationship quality and inter firm relationship sustenance. Nevertheless, the quest for a better understanding of the determinants of supply chain relationship quality is still underway as many issues have still been left unaddressed. Consequently, the sections that follow next collectively paint a picture of the possible determinants of sustainable inter firm relationships from a literature-based assessment of the supply chain, relationship quality, relationship governance and strategic procurement literatures that are spread over various agriculture value chain propositions.

A review of agriculture supply chain literature (Trinekens, 2011) suggests that an overriding theoretical paradigm that is often adopted by researchers interested in examination of the probable determinants of 'sustainable inter firm relations' across agriculture firms is the structure- conduct – performance (S-C-P) model of industrial organization. Porter's industrial organization emphasizes five forces as determining industrial competitiveness.

Other microeconomic theories sought to link the agriculture firm derived fit that is being sought with different dimensions of dependencies vis a vis information, product, knowledge, information and money. The summary frameworks that have been developed by supply chain researchers have primarily drawn upon the conservation of resources, relational and social capital exchanges and transactional cost models. There is no doubt that these models are supportive of the inherent dynamics that seem to drive the relations in agricultural market exchanges yet the theoretical approaches adopted in past fail to justify the achievement and retention of sustenance in inter firm exchanges and mutual dependencies especially in rice processing value chains.

Despite the dominance of the SCP model and other logistics and operations management models in advancing academic and intellectual understanding of supply chain performance in agricultural perspective, many theories have received considerable attention in agriculture supply chain research literature. The firm behavioral theory, strategic management theory, conservation of resources, social and relational capital theory do account for some fraction of explanation of association between agriculture supply chains, collaborating partners and stakeholders like farmer, logistics, supplier, quality check and quality certification. Another view point is from the relational capital perspective as proposed by Styles and Ambler (2000), imbibing a historical mixture of inputs from rational, behavioral, bounded rationality paradigms. Another school of thought is with regard to aligning marketing needs and propositions with supply chain strategy and modeling the effect of organizational inter relational aspects and inter firm exchanges on depth and quality of

relationship. International business and international marketing however propose an altogether different proposition emphasizing the communication between supply chain partners operating in market ecosystem as essential for relationship depth and quality. Internationalization theory Kimseng et al. (2020). however, advocates the case for gradual incremental knowledge acquisition, sharing, conservation and codification as part of bi-directional exchanges between agriculture supply chain members.

Another section of ideology proposes focus on industrial organizational prospects that call for accommodation of external pressures for firm-based learning with supply chain partners and scope for adaptation to uncertain business conditions. The resource-based value ideology stresses the role of exchanges and inter-firm resource pooling as basis for competitiveness and eventual economic prosperity and achievement of corporate interests in capitalist economic propositions. The inter firm resource advantage theory calls for weaving and sustaining the collaborative and shared advantage with collective action across organizations and firms with resource synchronization and syncing (Uddin, 2017). This study; hence draws upon the resource-based value and inter firm resource advantage theories in exploring the inter-organizational relational mechanism and consequences for agriculture firm performance in terms of supply chain vitality (Adetoyinbo & Mithofer, 2023).

On one hand the theories like resource-based advantage and resource-based values seek to link inter firm scattered economic and strategic resources to performance and sustainability of mechanisms to exchange the resources; yet on other side these theories emphasize the centrality of organizational socio-cultural embedded processes that extend to supply chain dynamics; while discussions on performance. In similar aspect, this research argues that agriculture supply chain relationship quality and its components have complex social and cultural elements that are often inter linked, overlapping and synced in nature and scope. The tacit dimensions seek to ensure composite and complex nature that recognize as embedded in organizational systems and decision-making structures.

Finally, the scholars on subject put forth the idea that benefits that agriculture processing firms derive from such inter firm resources, inter firm exchanges and enabling supply chains are immense vis a vis the interfaces involved. As such, contingency influences form elements and aspects outside the supply chain and outside the organizations (participating in agriculture supply chains) are nominal and expected. Drawing from contingency theory of firm behavior, it is absolute essential to consider the external technology derived, bias centered and supplier development influences as enacting upon the inter firm exchanges, relationship quality, extent of depth of inter firm resource sharing and seeking collective performance. From the lens of institutional theory, the emphasis is on examination of influences that seek to promote survival and legitimacy of organizational practices, variables like organizational culture for resource sharing, extent of mutual interests, social environment, regulation notions, economic incentives and pressures from environment. Institutional logic also seems to shape supply chain capability to access, exchange and leverage inter firm economic resource in agriculture value chains and supply chains (Glover et al., 2014). The rationale seeks to focus organizational energies on execution of selective policies that are consistent with dominant logic and seek solutions in institutionalized manner.

Thus, any academic study on exploration of relationships in inter firm perspective need to consider the aspects of moderation, mediation and control exerted by external actors and agents while seeking sustainable inter firm exchanges in agriculture scenario (rice processing in this case). Overall, the agriculture supply chain ingrained relationship quality aspects, relation governance aspects and relation stability aspects collectively hinge on propensity to access, to allocate and leverage the strategic inter firm resources over the supply chain in seamless manner (Karjalainen et al., 2021). Especially with regard to rice processing industry this could involve focus on leveraging resources and competencies that are spread over the entire agriculture processing value chain while reaching out to customer in domestic and export markets.

Given this discussion above, does the agriculture supply chain respond similarly as with regard to non-agriculture supply chain? In association, does the relationship determination in agriculture supply chains while inter firm resource seeking; depends on same antecedents as those prevalent in manufacturing and service industries or not. This study draws upon extant literature to seek answer to this question. Barney argues that agriculture firm's internal social and cultural processes are unique organizational resources (Duschek, 2004).

Especially in agriculture sector and in rice processing industry in particular, this could involve focus on market assets, production, milling assets and expertise, customer assets, relational and social capital derived assets, structural expertise and unique linkage with customers; constitute some of the identifiable assets in agriculture supply chains that are spread across farmer cooperatives (growing expertise and land assets), across rice millers, across rice refining setups (processing assets, industrial capacities, warehouses, logistics), across transporters and marketers and local retail shop owner (market assets). Thus the performance of supply chains in rice processing industries and associated supply chains rely on the inter firm assets and competencies that are brought together in supply chain and relations are sustained over a period of considerable time (Barrett & Reardon, 2020).

Given the benefits that agriculture firms derive from such inter firm collaborations and exchanges, the sustenance is rather complex to attain and maintain in different agriculture commodities like rice, other food grains, pulses, tropical fruits, oilseeds and other commercial crops segment. In view of the advantages that agriculture firms derive from inter firm resource usage and inter firm exchanges and alliances, the supply

chains are evolving and more and more agriculture commercialization is seeking supply chaining from 'farm to fork' in reach out to customer. The review of transformational processes in agriculture processing setups reveal that innovative agriculture firms have recognized the significance of inter firm resources (Madhok & Tallman, 1998) and sought to organize, re- allocate and revitalize their strategic usage over time. Most of the formalized and institutionalized internal processes and decisions are aimed at mobilizing and leveraging the shared inter firm strategic resources across the supply chain (Wittmann et al., 2009).

Challenges in rice processing sector

For many rice processing firms, this chaining of resources is the result of multiple years of negotiation, experience and risk assessment yet for some this entails failures and successes, experiential learning as well as coping with uncertain business environment (Karjalainen et al., 2021). Although many agriculture firms seek to leverage resources in inter firm mode yet a plethora of such rice processing organizations are actually able to realize the corporate interests and corporate objectives of ensuring performance over the supply chain. It is therefore not surprising to note that antecedents of sustainable inter firm relations in agriculture (rice processing in particular) needs extensive research attention and that 'quality' in relations across firms is a source of competitiveness and sustained performance of agriculture supply chain indeed (Frankowska & Cheba, 2022).

In fact, a section of scholars argues that agriculture firms that fail to effectively leverage the supply chain resources, inter firm resource bases and fail to mobilize inter firm resources should expect poor relationships and consequences vis a vis performance. A major assumption is that supply chain relations and inter firm relations are key to leveraging scattered and dispersed economic resources in rice processing industry.

In studying variables that drive 'sustenance' in inter firm 'exchanges' and subsequent consequences for 'performance', prior studies have emphasized the relationship as imbibing two major viewpoints: dimensional view and aggregate perspective. It is vital to note here that dimensional view constitutes focus on separate study of each contributing dimension whereas aggregate studies underlines focus on analysis of research construct as a whole.

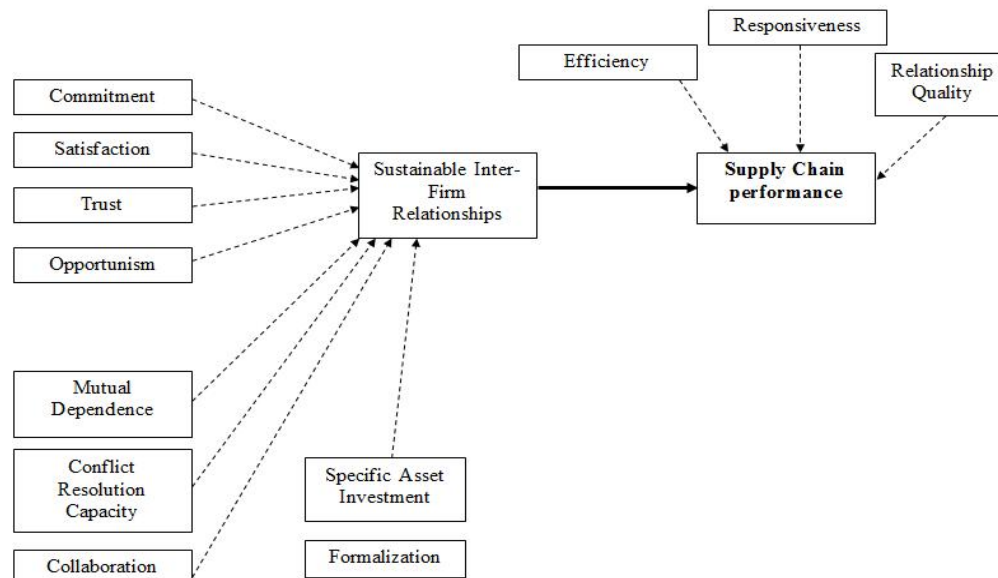
Assessment from dimensional viewpoint

A major section of this study analyses the research construct with dimensional viewpoint approach and lays focus on identification, classification and assessment of linkages between dimensions as shaping the wholesome phenomenon. The requirement of securing 'sustenance' in supply chain or sustenance in inter firm exchanges stems from multiple dimensions that separately and distinctively contributes towards working and operationalization of aforesaid research construct. In line with extant literature (Leonidou et al., 2013), (Qian(a) et al., 2023), (Dyer & Singh, 1998), the study classifies the contributing dimensions in three broader categories: factors that influence relations(commitment, satisfaction, trust, opportunism), factors that influence governance(specific assets, formalization), factors that influence stability(mutual dependence, conflict resolution, collaboration) of aforesaid exchanges at inter firm level in agriculture supply chains. In fact inter firm exchanges and their sustenance has always remained under cloud in agriculture as produce is perishable in nature and shelf life needs corrective management.

Research hypothesis and model

This section focuses on the development of conceptual model to describe the central role of 'agriculture supply chain relationship quality' and its components in driving supply chain performance and sustenance of inter firm exchanges and relations. Drawing upon resource based and contingency theories of firm behavior as the core theoretical frameworks, the conceptual connection between agriculture firm's 'inter firm sustainable relations' and scope for 'supply chain performance' in 'rice processing' arena is being presented. A review of agriculture supply chain literature (Trinekens, 2011) suggests that an overriding theoretical paradigm that is often adopted by researchers interested in examination of the probable determinants of 'sustainable inter firm relations' across agriculture firms is the structure- conduct – performance (S-C-P) model of industrial organization. Finally, the scholars on subject put forth the idea that benefits that agriculture processing firms derive from such inter firm resources, inter firm exchanges and enabling supply chains are immense vis a vis the interfaces involved. As such, contingency influences form elements and aspects outside the supply chain and outside the organizations (participating in agriculture supply chains) are nominal and expected. For many rice processing firms, this chaining of resources is the result of multiple years of negotiation, experience and risk assessment yet for some this entails failures and successes, experiential learning as well as coping with uncertain business environment (Karjalainen et al., 2021). A major section of this study analyzes the research construct with dimensional viewpoint approach and lays focus on identification, classification and assessment of linkages between dimensions as shaping the wholesome phenomenon. The requirement of securing 'sustenance' in supply chain or sustenance in inter firm exchanges stems from multiple dimensions that separately and distinctively contributes towards working and operationalization of aforesaid research construct. In line with extant literature (Leonidou et al., 2013), (Qian(a) et al., 2023), (Dyer & Singh, 1998), the study classifies the contributing dimensions in three broader categories: factors that influence relations(commitment, satisfaction, trust, opportunism), factors that influence governance(specific assets, formalization), factors that influence stability (mutual dependence,

conflict resolution, collaboration) of aforesaid exchanges at inter firm level in agriculture supply chains. In fact, inter firm exchanges and their sustenance has always remained under cloud in agriculture as produce is perishable in nature and shelf life needs corrective management. In line with RELQUAL scale development literature (Atrek et al., 2014), (Palmatier et al., 2006), (Hutchinson & Singh, 2012), the elaborate research model is presented in sections above.



Accordingly, the hypotheses have been summarized as under:

- H1: There is significant impact of 'commitment' on 'sustainability' of inter firm relationships
- H2: There is significant impact of 'satisfaction' on 'sustainability' of inter firm relationships
- H3: There is significant impact of 'trust' on 'sustainability' of inter firm relationships
- H4: There is significant impact of 'opportunism' on 'sustainability' of inter firm relationships
- H5: There is significant impact of 'mutual dependence' on 'sustainability' of inter firm relationships
- H6: There is significant impact of 'conflict resolution capacity' on 'sustainability' of inter firm relationships
- H7: There is significant impact of 'collaboration' on 'sustainability' of inter firm relationships
- H8: There is significant impact of 'specific assets investment' on 'sustainability' of inter firm relationships
- H9: There is significant impact of 'formalization' on 'sustainability' of inter firm relationships
- H10: There is significant impact of 'sustainability' of inter firm relationships on supply chain 'performance'

Methods, approach and instrumentation

Phase 1: Item Generation & Item Refinement

A deductive approach as specified by Hinkin was leveraged to generate the pool of items to capture the inter-firm relationship dynamics (Larcker & Formell(a), 1981). The deductive approach is recommended on account of availability of significant theoretical basis to screen out the relevant items from construct domains as mentioned in extant literature. The conceptualization was guided by several quantitative and empirical papers and a pool of eleven factors with 45 sub scale items. The dimension of 'commitment' was operationalized with aid of items from two broad scales (Hutchinson & Singh, 2012), (Qian et al., 2023); items for dimension 'Satisfaction' was again operationalized with aid of two preexisting scales (Hutchinson & Singh, 2012), (Qian et al., 2023). Subsequently the dimension of 'Trust' was formulated with items from scale (Hutchinson & Singh, 2012), (Qian et al., 2023); whereas the dimension of 'Opportunism' in relationship quality in agriculture value chains insisted on items from scale (Lado et.al., 2008). Respectively the dimension of 'Mutual Dependence' was sought to be operationalized with items from scale (Hutchinson & Singh, 2012), (Fischer, 2009); 'Conflict Resolution' from items of scale (Song & Dyer, 2006), 'Specific Assets' from items of scale (Hutchinson & Singh, 2012), (Qian et al., 2023), 'Formalization' from items of scale (Hutchinson & Singh, 2012), 'Coordination' from items of scale (Hutchinson & Singh, 2012) and subsequently dimension of 'Supply Chain Performance' was operationalized with items from scale (Qian et al., 2023). The dimension of 'Supply chain relationship quality' was sought to be operationalized with scale items from scales (Vanichchinchai & Igel, 2011), (Boon & Wong, 2017) respectively. Relationship quality in agriculture value chain (Chen & Paulraj, 2004) figures as the binding element in the flow of influence. The pilot testing was undertaken and content validity was ascertained (Fornell & Larcker, 1981).

Phase 2: Sampling technique and sample size

The literature on sampling technique in 'organization marketing studies' and 'bounded rationality', 'individual studies' calls for the selection of the technique that is simple and effective in order to reach out to maximum possible respondents with divergent viewpoints (Tsui et al., 1993). The current research hence relied on the simple random sampling method so as to realize the potential of the technique in reaching out to respondents with diversity of opinions in random manner. The random sampling methodology facilitated the increase in the representativeness of the samples and eliminated or decreased the scope for the voluntary response bias. The methodology led to the increase in representativeness of the sample hence chosen for the research exercise. The research inclined to randomly chose managers engaged in agriculture value chain firms across Haryana and NCR as sample that matches study setting and satisfies the conditions set in research-based unit of analysis. The sampling technique borrows from the earlier studies as well as dominant literature on the subject matter. In order to make the results more generalizable, the sample data was collected from across six different types of suppliers' catchment areas, in order to bring in diversity and heterogeneity in responses. A valid and complete sample of 70 responses was obtained from a variety of respondents with different rice consumption backgrounds. The respondents identified themselves as the individuals engaged in agriculture supply chains, managers, suppliers or the decision-making positions.

Phase 3: EFA & CFA Factorial validity and model specification

The researcher conducted a confirmatory factor analysis to assess the extent to which the hypothesized relationships deem to fit to the data patterns observed in the dataset. We examined and evaluated the high order model and compared it with the alternatives.

Analysis

Reliability Assessment

The reliability assessment is vital for the evaluation of the internal consistency of the responses collected from Likert scaling instrument. The reliability is deemed essential to ascertain the nature of responses that have been received. The existing literature identifies that internal reliability analysis is crucial for the ascertainment of the data based internal consistency. As advocated in the existing literature, Cronbach alpha figures as the most prominent tool for the achievement of internal reliability assessment. The responses exhibited a collective reliability measure of 0.964 with 45 loading sub scale items which points to satisfactory reliability across scale items.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.964	.965	45

Reliability of scale items was ascertained by assessing the internal consistency of the items representing each factor using Cron Bach's alpha measure. The 45-item instrument reported a high reliability of 0.964, far exceeding the minimum threshold of 0.80 devised for basic organizational research and organizational studies. The reliability of each factor was reported as follows: commitment=0.973, satisfaction= 0.814, trust=0.903, opportunism=0.971, mutual dependence=.872, conflict resolution=0.915, collaboration=0.942, specific assets=0.960, formalization=0.793, inter firm relationship quality=0.977, performance=0.933. The Bartlett test of data sphericity revealed a p-value of 0.000(<0.05) which stands for satisfactory presence of statistically significant variance cross the data collected with regard to scale representing factors. Of the factors extracted, inter firm 'specific assets' dominated the variance with reported variance of 36 per cent. This translates into notions that inter firm relationships in agriculture value chains are indeed influenced and impacted by relationship specific assets. Such inter firm resources and assets seem to award sustainability to inter-firm relationships in long run perspective. The next factor extracted 'relationship quality' asserted 15 per cent variance followed by factors: 'Commitment', 'Opportunism', 'Mutual Dependence', 'Trust', 'Conflict Resolution', 'Satisfaction' and 'Performance'.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings ^a
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1=Factor 'Specific Assets'	19.109	36.055	36.055	19.109	36.055	36.055	11.960

2=Factor 'Relationship Quality'	8.122	15.325	51.379	8.122	15.325	51.379	9.089
3= Factor 'Commitment'	6.416	12.106	63.485	6.416	12.106	63.485	10.115
4= Factor 'Opportunism'	3.521	6.644	70.129	3.521	6.644	70.129	7.913
5= Factor 'Mutual Dependence'	2.024	3.818	73.947	2.024	3.818	73.947	10.109
6= Factor 'Trust'	1.701	3.210	77.157	1.701	3.210	77.157	8.037
7= Factor 'Conflict Resolution'	1.504	2.838	79.994	1.504	2.838	79.994	5.927
8= Factor 'Satisfaction'	1.317	2.486	82.480	1.317	2.486	82.480	5.014
9= Factor 'Performance'	1.025	1.933	84.413	1.025	1.933	84.413	9.940
10=Factor 'Collaboration'	1.009	1.810	86.223	1.009	1.810	86.223	8.304
11=Factor 'Formalization'	1.007	1.504	87.727	1.007	1.504	87.727	4.193

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Discriminant and convergent validity assessment

	PERF	COMMIT	SATIS	TRUS	OPPOUR	SPECASS	FORM	MUTDEP	COLLAB	CONRES	RELQUAL
PERF	0.911										
COMMIT	0.283	0.896									
SATIS	0.355	0.069	0.793								
TRUS	0.462	0.209	0.513	0.840							
OPPOUR	0.228	0.293	0.189	0.314	0.922						
SPECASS	0.732	0.361	0.341	0.497	0.239	0.897					
FORM	0.767	0.298	0.329	0.505	0.242	0.832	0.876				
MUTDEP	0.587	0.299	0.334	0.357	0.098	0.680	0.732	0.938			
COLLAB	0.315	0.094	0.503	0.564	0.309	0.345	0.234	0.167	0.879		
CONRES	0.712	0.354	0.311	0.541	0.229	0.825	0.718	0.669	0.259	0.929	
RELQUAL	0.226	0.034	0.462	0.528	0.356	0.306	0.172	0.102	0.754	0.299	0.946

The research constructs were observed as exhibiting considerable convergence and discriminant validity as illustrated in table. This stands for CR of all considered research constructs as being greater than the benchmark measure of 0.7 performance as exhibiting 0.936, inter-firm relationship quality as exhibiting 0.977, formalization as exhibiting 0.820, specific asset as exhibiting 0.961 and collaboration as exhibiting 0.969). The respective AVE measures as observed were greater than benchmark limit of 0.05 and AVE was further observed as greater than MSV estimates, corresponding to achievement of the $ASV > MSV > ASV$. A measurement model was built and frequently used goodness of fit indices were examined; “chi-square divided by degree of freedom (v^2/df)”, “goodness of fit index (GFI)”, “adjusted goodness of fit index (AGFI)”, PCLOSE, “comparative fit index” and finally “root mean square error of approximation (RMSEA)”. The results of the CFA were examined and the results revealed an overall good model fit with the observed data; ($v^2 = 147.216$, $df = 80$, $v^2/df = 1.840$, $p < 0.001$, $GFI = 0.93$, $AGFI = 0.94$, $NFI = 0.92$, $CFI = 0.94$, $TLI = 0.91$, $RMSEA = 0.05$, $PCLOSE = 0.523$). The results also met the suggested range of “average variance extracted (AVE)” by Fornell and Larcker (1981). The AVE value of all the nine factors was above 0.5

H	Path Relationships			Coeff	Outcome
H1	Inter firm Relationship Quality	<---	Commitment	.113	Accepted
H6	Inter firm Relationship Quality	<---	Conflict Resolution	.105	Accepted
H7	Inter firm Relationship Quality	<---	Collaboration	.659	Accepted
H8	Inter firm Relationship Quality	<---	Specific Assets	.161	Accepted
H5	Inter firm Relationship Quality	<---	Mutual Dependence	.138	Accepted
H4	Inter firm Relationship Quality	<---	Opportunism	.156	Accepted
H3	Inter firm Relationship Quality	<---	Trust	.115	Accepted
H9	Inter firm Relationship Quality	<---	Formalization	.104	Accepted
H2	Inter firm Relationship Quality	<---	Satisfaction	.100	Accepted
H10	Supply Chain Performance	<---	Inter firm Relationship Quality	.217	Accepted

4. Analysis

4.1 Reliability Assessment

The reliability assessment was conducted to evaluate the internal consistency of the Likert scale-based instrument used in this study. Assessing internal reliability is essential to ensure that the observed responses are consistent and accurately reflect the underlying constructs. As widely advocated in the literature, Cronbach's alpha is the most commonly employed measure for internal reliability assessment.

The collective reliability coefficient of the 45-item instrument was **0.964**, indicating excellent reliability and well above the commonly accepted threshold of 0.80 for organizational research. Factor-wise reliability coefficients were also satisfactory: commitment = 0.973, satisfaction = 0.814, trust = 0.903, opportunism =

0.971, mutual dependence = 0.872, conflict resolution = 0.915, collaboration = 0.942, specific assets = 0.960, formalization = 0.793, inter-firm relationship quality = 0.977, and performance = 0.933.

Furthermore, the Bartlett's test of sphericity yielded a p-value of 0.000 (< 0.05), confirming statistically significant variance across the dataset and justifying the use of factor analysis. Among the extracted components, "Specific Assets" accounted for the largest share of variance (36%), followed by "Relationship Quality" (15%) and "Commitment" (12%). This suggests that firm-specific tangible and intangible assets play a dominant role in sustaining inter-firm relationships in agricultural value chains, particularly in long-term collaborative contexts.

4.2 Total Variance Explained

Component	Initial Eigenvalues	% of Variance	Cumulative %	Extraction Sums of Squared Loadings	% of Variance	Cumulative %
Specific Assets	19.109	36.055	36.055	19.109	36.055	36.055
Relationship Quality	8.122	15.325	51.379	8.122	15.325	51.379
Commitment	6.416	12.106	63.485	6.416	12.106	63.485
Opportunism	3.521	6.644	70.129	3.521	6.644	70.129
Mutual Dependence	2.024	3.818	73.947	2.024	3.818	73.947
Trust	1.701	3.210	77.157	1.701	3.210	77.157
Conflict Resolution	1.504	2.838	79.994	1.504	2.838	79.994
Satisfaction	1.317	2.486	82.480	1.317	2.486	82.480
Performance	1.025	1.933	84.413	1.025	1.933	84.413
Collaboration	1.009	1.810	86.223	1.009	1.810	86.223
Formalization	1.007	1.504	87.727	1.007	1.504	87.727

Extraction Method: Principal Component Analysis

4.3 Convergent and Discriminant Validity

Discriminant and convergent validity were examined to assess the distinctiveness and coherence of the latent constructs. All constructs demonstrated **Composite Reliability (CR)** values above 0.70 (e.g., performance = 0.936; inter-firm relationship quality = 0.977; specific assets = 0.961; collaboration = 0.969; formalization = 0.820).

The Average Variance Extracted (AVE) for all factors exceeded 0.50, indicating good convergent validity. Furthermore, AVE values were consistently higher than their respective Maximum Shared Variance (MSV), confirming discriminant validity in line with the Fornell Larcker criterion.

The confirmatory factor analysis yielded excellent goodness-of-fit indices:

- $\chi^2 = 147.216$, $df = 80$, $\chi^2/df = 1.840$, $p < 0.001$
- GFI = 0.93, AGFI = 0.94, NFI = 0.92, CFI = 0.94, TLI = 0.91
- RMSEA = 0.05, PCLOSE = 0.523

These values confirm an acceptable and robust model fit with the observed data.

4.4 Hypotheses Testing

Hypothesis	Path Relationship	Coefficient	Outcome
H1	Commitment → Relationship Quality	0.113	Accepted
H2	Satisfaction → Relationship Quality	0.100	Accepted
H3	Trust → Relationship Quality	0.115	Accepted
H4	Opportunism → Relationship Quality	0.156	Accepted
H5	Mutual Dependence → Relationship Quality	0.138	Accepted
H6	Conflict Resolution → Relationship Quality	0.105	Accepted
H7	Collaboration → Relationship Quality	0.659	Accepted
H8	Specific Assets → Relationship Quality	0.161	Accepted
H9	Formalization → Relationship Quality	0.104	Accepted
H10	Relationship Quality → Supply Chain Performance	0.217	Accepted

All hypothesized paths were significant, indicating that each relationship determinant exerts a measurable influence on overall relationship quality, which in turn positively impacts supply chain performance.

4.5 Discussion

The findings reveal that **not all relationship dimensions contribute equally** to sustaining inter-firm relationships in agriculture value chains. While collaboration emerged as the strongest predictor of relationship quality, factors such as commitment and conflict resolution exerted relatively moderate effects. This aligns with prior evidence (e.g., Braun Bitsch, 2023; Wittmann et al., 2009) that relationship determinants can have differentiated impacts in agri-business settings.

The dominance of specific assets indicates that tangible and intangible resource commitments between firms play a decisive role in relationship stability. This supports earlier arguments by Madhok & Tallman (1998) that resource specificity enhances inter-firm dependency and longevity of collaboration. However, opportunism—despite its typically negative connotation—also showed a significant influence, suggesting that strategic self-interest may coexist with collaborative arrangements in agricultural supply chains.

The results complement earlier findings (e.g., Atrek et al., 2014; Uddin, 2017) by illustrating that governance mechanisms alone are insufficient. Instead, **a balanced mix of relationship quality, trust, and governance dimensions is essential for sustainable performance**, particularly in perishable commodity sectors like rice processing, where time sensitivity and quality preservation are critical.

4.6 Implications

Methodological Implications:

This study advances the methodology for examining inter-firm relationship dynamics in agriculture by focusing on firm-level functional behaviors in a sector-specific context. The discriminant validity assessment applied here provides a more rigorous statistical basis than many earlier studies, addressing concerns noted by Klein & Rai (2009) and Mohr et al. (1996) regarding the complexity of validating inter-firm constructs.

Managerial Implications:

Managers in the agri-processing sector should **prioritize relationship-specific assets and collaborative mechanisms** while carefully managing opportunism and conflict resolution. Strategic attention to relationship quality can enhance both relationship longevity and overall supply chain performance. Decision-makers should design governance structures that **balance trust, collaboration, and formalization**, ensuring stability without stifling flexibility.

Discussions

The research sought to examine the relationships between specific dimensions of inter firm relationship dynamics and inter-firm relations stability and subsequent performance. A summary of the inter firm relationships in agriculture scenario revealed that only limited research has been undertaken on association between supply chain relationship determinants and resultant inter firm relationship stability and sustenance. Consequently, this study extended knowledge on the inter-firm relationship quality antecedents by predicting the inter firm relationships with plethora of dimensions. In this way the study sought to address the central caveat in Braun & Bitsch, (2023) that the dimensions of inter firm relationships in agriculture might predict the sustainability and supply chain performance differentially (Wittmann et al., 2009). The recent studies in firm wide and cross firm access to mutual organizational resources and relationship specific tangible and intangible assets (Madhok & Tallman, 1998) have actually shown that some of the inter firm relationship determining dimensions are detrimental to relationship sustainability as well as to performance (Duschek, 2004) . As the results of this specific study on rice processing show, not all the individual dimensions positively drive inter firm relationship stability and sustenance. Some of the constituent dimensions like collaboration might be more statistically significant in driving the phenomenon whereas the counterparts like 'Commitment' and respective 'Conflict Resolution' abilities may just hinge on the thresholds. In many ways, these contradictory results and observations complement the previous results in firm wide and inter- firm derived relationships in agriculture value chains and vindicate that impact of dimensions may vary considerably (Braun & Bitsch, 2023) . In particular, Atrek et al., (2014) report that while relationship quality and stability aspects and associated factors may be dominant yet governance aspects may be less significant (Wittmann et al., 2009) . According to authors (Uddin, 2017) implementing supply chain and inter firm relationship's philosophy to agriculture value chains, seem to explore and emphasize the intangible aspects as well. In sum it can be concluded that the supply chain inter-firm relationships and sustenance and penchant for performance is more complex than the resource-based value theory. The manner in which value across supply chain maps and binds the participating firms is however more complex than the theoretical overlapping. This is because, agriculture commodities as possessing perishability element often focus on enhancement of shelf life and ensuring flow in faster and optimum manner within time thresholds advised. This study hence addressed an important lapse in the agriculture sector inter firm sustenance in terms of relations by showing that firm-based decision makers need to be selective with respect to the relationship dimensions and scope for manipulation need to encompass focus on balancing relationship quality with stabilization and governance mechanisms as well.

Implications

In methodological terms, this study introduced a novel approach to the study of inter firm relationship dynamics in agriculture sector. Unlike the prior inter firm relationship and their sustenance imperative, throughout this academic study, respondents were consistently reminded to focus on the behaviors of their rice processing functional units. This research practice has enabled this research to develop an agriculture sector specific measures and structural models of inter firm relation dynamics in agriculture sector especially the rice processing export-oriented industry. The measures that were developed and the structural relations that were subsequently examined reflect upon the ethos and the underlying dynamics of inter firm relationship quality, stability determination aspects and governance aspects from point of view of inducing sustenance in agriculture supply chains. This identifies as an improvement on extant literature and tends to knowingly or unknowingly rely more on managerial perceptions to predict the sustenance in inter firm perspective. Another methodological implication that can be deduced from the research study is the method in which scale-based discriminant validity is being tested and examined. A closer look at literature on subject revealed the incidence of discriminant validity assessment of the 'inter firm relationship' construct as being complex, typically hard and generally problematic in nature. High profile 'inter firm relationship' dynamics and sustenance studies have advocated the discriminant validation assessment as confusing (Klein & Rai, 2009) and have not attempted the discriminant validity of 'inter firm relationships' with aid of rigorous statistical methods (Mohr et al., 1996).

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