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Relationship and information management activities of cold storage warehouses with its stakeholders: A study in Guntur district of Andhra Pradesh

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Abstract
Cold chains are essential for extending the shelf life and reducing transport bottlenecks during peak period of production. The present study was conducted to examine the relationship and information management activities of Cold Storage Warehouses (CSW) with its stakeholders in Guntur district of Andhra Pradesh. 45 cold storage warehouses were selected adopting a snow ball sampling method. 180 farmers and 60 traders were randomly interviewed for research investigation. The results revealed that the customers storing in CSW in Guntur were majorly farmers who occupied 160 thousand tonnes capacity of cold storage space followed by traders and processing industries. The major attributes that influenced CSW selection by the stakeholders was proper temperature maintenance and regulation, followed by transportation facilities in case of traders and advice by commission agents on cold storage warehouse choice in the case of farmers. Farmers showed higher loyalty than traders. Hence if CSW gave priority to farmers over other customers in providing storage space, both the CSW and farmers would benefit. Word of mouth, mobile calls and SMS were commonly used modes of communication in these cold storage warehouses.

Keywords: cold storage warehouses, cold chains, customer relationship management, chilli cold storages

Introduction
Cold chains are essential for extending the shelf life, period of marketing, avoiding over capacity, reducing transport bottlenecks during peak period of production and maintenance of quality of produce. The development of the cold chain industry has an important role to play in reducing the wastages of the perishable commodities and thus providing remunerative prices to the growers [6]. The key activities in cold storage warehouses were observed to be aggregation, sorting, cooling and packaging [7].

Cold storage capacity in Andhra Pradesh was observed to be 901 thousand metric tonnes. The gap in existing and required cold storage capacity in Andhra Pradesh was 1423 thousand metric tonnes [2]. Guntur chilli yard being the largest chilli market in Asia influences the domestic and international prices of chillies. Therefore many cold storage warehouses were found concentrated in the district.

The present study was conducted to examine the relationship and information management activities of Cold Storage Warehouses (CSW) with its stakeholders.

Review of Literature
Mishra *et al.* (2007) examined the profile of different commodities stored and composition of users group in the selected cold storage units in Hyderabad. He reported that cold storage user groups included farmers and traders and farmers' share was higher in all the selected cold storage units. Medium and small farmers were not utilizing the storage facilities mainly because of higher storage charges, poor financial background and lack of awareness among the farmers regarding the benefits of storage. He suggested that farmers should be encouraged to store their produce by advancing loans either on pledge of produce in the cold storage or on pledge of cold storage receipts in organized financial institutions [5].

Reddy (2013) in his paper on "Problems of Red Chili Growers and Cold Storage Units- A Case Study of Guntur District" listed the problems faced by chilli growers and cold storage units and suggested that the objective of safeguarding the interests of chilli growers are at

stake, therefore an in depth study in this matter can clear all the ambiguities and show the way to come out of the problems which ultimately help the chilli growers in the district [9].

Sahara *et al*. (2011) investigated the farmer and trader relationship in the chilli markets with respect to modern (supermarket channel) and traditional supply chains in West Java, Indonesia. They segmented chilli farmers into clusters based on their perceived relationship with buyers in terms of trust, satisfaction and commitment. Four distinct clusters of farmers were identified. Cluster 1 was characterized by a low level of satisfaction, commitment and a moderate level of price satisfaction. Farmers in cluster 2 had low levels of trust, satisfaction and price transparency. Farmers in cluster 3 had a relatively high relationship with their buyers. Farmers in cluster 4 perceived high levels of trust, but moderate levels of commitment, satisfaction and price satisfaction. Their study revealed that the majority of farmers belonged to cluster 3 (45 percent). Farmers in this cluster sold the chillies to supermarket channels. In order to maintain good relationship with farmers in this cluster, traders should provide more accurate price information and offer price based on quality parameters of chilli [11].

Materiels and Methods

The Guntur district was purposively selected for the present study because Guntur chilli market is one of largest chilli market in world and influences the domestic and international prices of chillies. Demand for cold storage of chillies in Guntur district has promoted the cold storage warehouse industry for bulk storing of red and dry chillies. There are 77 operational cold storage warehouses in Guntur. 45 cold storage warehouses were selected adopting snow ball sampling method (Chain referral sampling). The selected units were classified into small, medium and large sized cold storage warehouse based on the installed capacity. Four chilli farmers from each cold storage warehouse totaling to 180 farmers and 60 traders were randomly interviewed for research investigation.

Conventional analysis was used to analyse customers based storage pattern in cold storage warehouses, capacity utilization by different customer groups and modes of communication used by the cold storage warehouses. To investigate the relationship among the variables and determine the factors considered by the farmers and traders for selecting a particular cold storage for storing their chillies, factor analysis using principal component extraction method was applied. Net Promoter Score was used to study the customer loyalty of sample CSW. Thirteen statements were framed to capture the relationship of farmers with the CSW owners. Two empirical probit models for predicting the loyalty of farmers were estimated with loyalty and recommending attitude as dependent variables using the SPSS package.

Results and Discussion

The various customers of CSW were identified and concentration of each customer category with respect to the number and capacity utilization was observed. The Relationship management of sample CSW with its customers was analyzed and presented under following sub-headings:

1. Customer Relationship Management
2. Information Management

Customers of Cold Storage Warehouses

The primary customers of CSW in Guntur were farmers, traders and processing industries (ITC, Reliance, Indian Products Ltd etc.). All CSW did not have all three customer groups. Therefore different customers of CSW were analysed and presented in Table 1.

Table 1: Storage Pattern in Cold Storage Warehouses based on the Customers'

S. No	Customer Category	Number	Percentage
1	Farmers only	11	24.44
2	Traders only	5	11.12
3	Farmer+Trader	23	51.11
4	Farmer+ Processing industries	4	8.89
5	Farmer+Trader+ Processing industry	2	4.44
	Total	45	100

Table 1, shows that out of 45 CSW, 24.44 percent of CSW had only farmers as their customers. Majority of CSW (51.11 percent) had both farmers and traders as their customers. About 11.12 percent of CSW had traders alone as their customers. These 11.12 percent of CSW preferred traders alone as their customers because they had a contract based storage agreement with the traders for certain units of storage space (storage space reservation), where traders entered into an agreement with the CSW to store their produce for a certain period of time irrespective of capacity utilization. Few CSW had processing industries as customer group which was again a form of contract storage.

The capacity of cold storage warehouses utilized by various customer groups was analysed and presented in Table 2.

Table 2: Capacity Utilization by different Customer Groups (in tonnes)

Category of CSW	Capacity Utilized			Total Capacity utilized
	Farmers	Traders	Processing Industries	
Small	24950 (69.83)	10780 (30.17)	-	35730
Medium	46746 (55.15)	36173 (42.68)	1845 (2.18)	84764
Large	88687 (66.22)	39649 (29.60)	5592 (4.18)	133928
Total	160383	86602	7437	254422

(Figures in parentheses indicate percentage to row total)

From Table 2, it could be interpreted that farmers were the majority customer group for small, medium and large sized CSW occupying 69.83, 55.15 and 66.22 percent of the capacity respectively. Traders were the second concentrated group occupying 30.17, 42.68 and 29.60 percent of the capacity in small, medium and large sized CSW respectively followed by processing industries who occupied only 2.18 and 4.18 percent of the capacity in medium and large sized CSW respectively. It could be concluded that, on a whole the Cold storage warehouse industry in Guntur was utilized by farmers extensively followed by traders. It could be seen from the Table 2, that the farmers used small and large sized CSW more extensively compared to the medium sized CSW whereas it was traders whom have utilized the medium sized CSW more extensively.

1. Customer Relationship Management

Customer relationship management in CSW with its stakeholders was analysed by assessing the attributes

considered by the stakeholders in the selection of a CSW and by measuring the loyalty of the stakeholders towards the CSW. Attributes considered by farmers and traders for selecting a CSW were analysed, ranked and presented here.

a. Attributes Considered by the Farmers for Selecting a Cold Storage

Farmers either tend to store in the same CSW every year or change from unit to unit based on certain factors related to the quality of the produce at the end of storage, maintenance of CSW and proximity of the unit. Eleven such important attributes considered by the farmers in selecting a cold storage for storing their produce were evaluated on a point likert scale ranging from most important to not important. Based on the farmer's responses, the data were analysed using PCA (Principal Component Analysis). Principal Component Analysis aims at reducing a large set of variables to a small set that still contains most of the information on the large set. Each principal component is a linear function of all the variables. Traditionally, prescribed Principal Component Analysis is performed on the symmetric *covariance* matrix or in the symmetric *correlation* matrix. These matrices can be calculated from the data matrix. The Eigen values are computed from the correlation matrix. The components with Eigen value greater than one were selected. In order to reduce the number of factors and enhance interpretability, the factors were rotated. The rotation increased the quality of interpretation of the factors. There were several methods of the initial factor matrix to attain simple structure of the data. The Varimax rotation was one such method to attain better results for interpretation and it was employed and the results are given in Table 3.

Table 3: Extraction Communalities for Attributes Considered by the Farmers in Selecting a Cold Storage Warehouse

S. No	Attributes	Extraction	Rank
1	Based on the advice of commission agents	0.870186	1
2	Frequent temperature maintenance and regulation	0.850367	2
3	Nearness to the chilli market yard	0.830152	3
4	Security measures adopted	0.784715	4
5	Based on quantity stored	0.742036	5
6	Cost of storing per bag	0.684425	6
7	Duration of storage	0.653699	7
8	Nearness to the farm	0.640677	8
9	Labour availability	0.635925	9
10	Transportation facilities	0.627407	10
11	Insurance facilities	0.282647	11
Extraction Method: Principal Component Analysis. KMO Value- 0.605 Bartlett's Test of Sphericity Chi-Square value - 450.768, Probability value- 0.000			

The extraction communalities are presented in Table 3. Small values (< 0.5) indicated variables that do not fit well in the factor solution and should possibly be dropped from the analysis. But in the above case all the variables had communalities of more than 0.5 except for the fourth attribute i.e. insurance facilities. Insurance facility was provided as a default by all the cold storage warehouses and therefore not considered as a distinguishing factor by the farmers for making their CSW choice.

The five most important attributes considered by the farmer for selecting a cold storage for storing their produce were advice of the commission agents, frequent temperature maintenance and regulation at CSW, proximity to the chilli market yard, security measures adopted and installed in the CSW and quantity stored

Advice of commission agents to the farmers, to whom the farmers approached for selling the chillies, was the major attribute that influenced the farmer decision on storage and choice of CSW. Frequent temperature maintenance and regulation at CSW maintained the quality of chillies during the period of storage. Proximity to the chilli market yard was preferred by farmers because it reduced transportation efforts and cost. Security measures in CSW were essential to ensure product safety and security. Farmers who stored larger quantities of chillies took utmost care in the selection of the CSW than the farmers who stored smaller volumes.

b. Farmers Perceived Relationship with Cold Storage Warehouses Management

Relationship management is defined as the infrastructure that enables the delineation of an increase in customer value, and the correct means by which to motivate customers to remain loyal, indeed to buy again [1], which in case of warehouses, was to visit again for storing the produce and referring the CSW unit to co-farmers. Therefore primary qualitative data on farmer's loyalty, willingness to refer the CSW unit and different services rendered by the CSW unit were collected. Thirteen statements were framed to capture the relationship of farmers with the CSW owners. Those 13 statements are listed below in Table 4. Farmer's relationship with CSW management was analysed and the impact of their relationship on farmer's loyalty and referring attitude was studied using probit model. Two probit models were executed with loyalty and recommending attitude as dependent variables. The results of the probit models are presented in Table 5 and 6 respectively.

Table 4: Statements used for Measuring Relationship Management

S. No	Statements	Variable measured
1.	Do you store your produce in the same cold storage warehouse every time?	Loyalty (L)
2.	Are you willing to refer this particular CSW to others?	Recommending attitude (RA)
3.	How long you have been storing in the same CSW?	Consistent storing behavior (CSB)
4.	Is the CSW always willing to provide storage space whenever you approach them?	Space availability (SA)
5.	Do the CSW, owners provide you references and help you with, agreements with buyers?	CSW aid- buyers (BA)
6.	Do the cold storage owners help you with Insurance?	CSW aid- insurance (IA)

7.	Do the CSW owners help you with Loan/ pledge finance?	CSW aid- pledge finance (PFA)
8.	Do the CSW owners help you with hamali?	CSW aid- hamali (HA)
9.	Do the cold storage owners provide you informal information on when to sell the produce?	Selling advice (SAD)
10.	Is Information on fetching price of the produce in the market provided by the CSW management?	Price information (PI)
11.	Do the CSW owners help in contracting relationship with Traders?	CSW aid – trader contacts (TC)
12	Do the CSW owners help in contracting relationship with processors?	CSW aid – processor contacts (PC)
13.	Do they aid in final settlement for selling the produce?	Final settlement (FS)

Table 5: Loyalty of Farmers towards Cold Storage Warehouses; A Probit Analysis

Variable	Coefficient	t-statistic
constant	0.5439	0.2568***
CSB	1.1549	2.4563***
SA	3.0531	2.7866***
BA	8.0233	1.5703 ^{NS}
IA	1.8335	1.2957***
PFA	6.7545	1.8058 ^{NS}
HA	5.0445	1.2290 ^{NS}
SAD	1.5180	1.4114***
PI	1.0087	0.9310***
TC	7.4168	0.8336 ^{NS}
PC	6.9362	0.8848 ^{NS}
FS	0.3546	0.2409***

*Evaluated at the mean, Mean of Loyalty = 0.678, Correct Prediction = 97.80 %

McFadden's pseudo-R^2 = 0.86664 Likelihood ratio test: Chi-square (11) = 196.096***

From Table 5, it can be inferred that the prediction was 97.80 per cent correct and the McFadden's pseudo R^2 (coefficient of determination) was 0.866 which was greater than 0.5, therefore indicating a good model fit. 86.67 per cent of variation in dependent variable loyalty was explained by the independent variables. Likelihood ratio or odds ratio, given by the formula (P/1-P) where P is the probability of dependent variable being zero and (1-P), is the probability of dependent variable being one, is tested by chi-square test, with a chi square value of 196.096 which was significant at 1 per cent level. Greater the likelihood ratio, greater was the probability of farmers being loyal to that particular CSW unit. Independent variables significant at 1 per cent level were Consistent storage behavior, CSW willingness to provide storage space, aiding in insurance facility, advice on when to sell the produce, price information and helping farmers with the final settlement. These variables had a positive influence on dependent variable loyalty i.e. storing in the same CSW every time, while variables such as helping in agreement with buyers, assisting in obtaining pledge finance, providing hamali for loading and unloading, helping with trader and processor contacts were observed to be non-significant. The probit equation for predicting the loyalty of farmers is given below:

Loyalty = 0.5439 + 1.1549 CSB +3.0531 SA +1.8335 IA + 1.5180 SAD + 1.0087 PI + 0.3546 FS

From the above equation it could be inferred that willingness of CSW to provide storage space was a major factor that influenced the loyalty of the farmers.

Table 6: Recommending Attitude of Farmers towards Cold Storage Warehouses; A Probit Analysis

Variable	Coefficient	t-statistic
const	17.238	0.1120***
L	6.5993	1.7213**
CSB	0.6054	2.2264**
IA	5.0809	1.0085^{NS}
PFA	10.2254	2.0295^{NS}
SAD	2.2073	1.7696 **
PI	6.1967	1.2299^{NS}
FS	9.1553	1.8171*

*Evaluated at the mean,Mean of Recommending Attitude = 0.500, Correct Prediction = 96.1%

McFadden's pseudo-R^2 = 0.8909 Likelihood ratio test: Chi-square (7) = 221.308***

From Table 6, it could be concluded that the prediction was 96.1 per cent correct and the McFadden's pseudo R^2 was 0.8909 which was greater than 0.5, therefore indicating a good model fit. About 89.08 per cent of variation in dependent variable Recommending Attitude of farmers was explained by the independent variable. Likelihood ratio test, chi square value was 196.096 which is significant at 1 per cent level. Greater likelihood ratio showed a greater probability of farmers in recommending that particular CSW where he stored to other farmers. Independent variables such as loyalty, consistent storing behavior, selling advice by CSW owners were significant at the 5 per cent level and final settlement variable was significant at 10 per cent level, while the other remaining variables such as the assistance of CSW owner's in stock insurance, pledge finance and price information were not significant. The probit equation for predicting the loyalty of farmers in terms of recommending attitude is given below:

Recommending attitude = 17.238 + 6.5993 L + 0.6059 CSB + 2.2073 SAD + 9.1553 FS

From the equation it could be inferred that among significant variables, final settlements, Selling advice and loyalty have more influence in recommending attitude of the farmer.

c. Attributes Considered by the Trader for Selecting a Cold Storage

The attitude of the traders towards storage and attributes they considered before making a storage decision in a cold storage warehouse had a significant influence on farmer's storage decision (Table 3). Hence factors influencing storage decision of the traders (exporters and commission agents) were analysed using Principle Component Analysis and presented in Table 7.

Table 7: Extraction Communalities for Attributes Considered by the Traders in Selecting a Cold Storage Warehouse

S. No	Attributes	Extraction	Rank
1	Transportation facilities	0.874	1
2	Frequent temperature maintenance and regulation	0.825	2
3	Based on quantity stored	0.790	3
4	Storage space availability	0.773	4
5	Cost of storing per bag	0.724	5
6	Duration of storage	0.714	6
7	Nearness to the chilli market yard	0.682	7
8	Labour availability	0.666	8
9	Value-addition facilities	0.648	9
10	Nearness to the farm	0.634	10
11	Insurance facilities	0.591	11
12	Security measures adopted	0.490	12
Extraction Method: Principal Component Analysis. KMO Value- 0.497 Bartlett's Test of Sphericity Chi-Square value - 301.491, Probability value- 0.000			

The extraction communalities are presented in Table 7. Small values (< 0.5) indicated variables that did not fit well in the factor solution and should possibly be dropped from the analysis. But in the above case, all the variables had communalities of more than 0.5 except for the fourth attribute i.e. insurance facilities. Insurance facility was provided as a default by all the cold storage warehouses and therefore not considered as a distinguishing factor by the traders for making their CSW choice.

The five top rankings attributes considered by the traders for selecting a cold storage for storing produce were: transportation facilities provided by CSW, frequent temperature maintenance and regulation at CSW which maintained the quality of chillies during storage, quantity of chillies stored as traders storing larger quantities of chillies preferred reputed CSW known for proper maintenance and facilities with lower rents and storage space availability to accommodate the chilli bags, storage space availability in the CSW, cost of storing per bag and duration of storage.

Net Promoter Score (NPS)

Customer loyalty is often a better predictor and an indicator of a company's or an industry's growth, than customer satisfaction alone. Loyalty is the willingness of someone (a customer, an employee, a friend) to make an investment in order to strengthen a relationship [10]. Loyalties of customer a group, in CSW in Guntur is explained using Net Promoter score model and the results are presented in Table 8.

Table 8: Net Promoter Score for Customer Groups of Cold Storage Warehouses

Customer Group	Promoters	Detractors	Net Promoter Score
Farmers	72.59	37.75	34.84
Traders	69.26	44.38	24.88
Processing Industries	100.00	-	100.00
Average	80.62	27.38	53.24

A scoring of above +10% is considered "good"; score of above +50% is "excellent" as formulated by Satmetrix systems, one of the originators of the NPS methodology. From Table 8, it could be interpreted that the NPS values for 'Processing industries' was higher with 100 percent promoters (100.00 percent NPS value) who preferred to store in the same CSW every year followed by the farmers who showed 72.59 percent of promoters with an NPS value of 34.84 percent. The net promoter score of the traders was low (24.88 percent), which showed that the traders were not loyal in CSW preference for chillies storage.

Services Offered by Cold Storage Warehouses

Service offering by the CSW attracts the customer groups for preferring particular CSW and adds competitive advantage to the warehouses. Therefore based on the response of owners of CSW, various services offered to their customers were enquired. The various services offered by CSW included maintaining proper cooling temperature in CSW to extend the keeping quality of the customers produce; aiding in insurance facility; assisting in obtaining pledge finance; information about the market, price and demand through mobile messages, letters (two in every month from August onwards) and word of mouth; advice on appropriate time of selling the produce; helping farmers with final settlement; helping in agreement with buyers; providing hamali for loading and unloading and helping with trader and processor contacts.

2. Information Management

Modes of Communication used by Cold Storage Warehouse Owners

Understanding the modes of communication can give an insight on successful information dissemination modes adopted by the CSW. Therefore, the different modes of communication adopted are presented in Table 9.

Table 9: Modes of Communication used by the Cold Storage Warehouses

S. No	Mode of communication	Number	Percentage to total
1.	Word of mouth	168	44.68
2.	Telephone/mobile	133	35.37
3.	SMS	75	19.95
	Total	376	100

Table 9, shows that the major mode of communication used by CSW owners to communicate was word of mouth communication (44.68 percent) followed by telephone/ mobile calls (19.95 per cent).

Summary and Conclusions

The customers storing in CSW in Guntur were farmers, traders and processing industries. However the major customers were the famers. Around 160 thousand tonnes of capacity was utilized by sample farmers in the sample CSW which was higher than the capacity utilized by traders and processing industries. The major attributes that influenced CSW selection by the stakeholders was proper temperature maintenance and regulation which was a pre-requisite in

maintaining the quality of chillies, followed by transportation facilities in case of traders since they transported and stored chillies in bulk quantities unlike the farmers and in the case of farmers the advice by commission agents on CSW choice occupied an important place. Recommending attitude i.e. willingness of customers to recommend a CSW to their peers, determined the loyalty of the stakeholders towards CSW. Farmers showed higher loyalty than traders. Hence if CSW gave priority to farmers over other customers in providing storage space, both the CSW and famers would benefit, as famers were more loyal. This way CSW could indirectly support farmers who are considered as important backbone of agriculture in India. Word of mouth, mobile calls and SMS were commonly used modes of communication in CSW in Guntur.

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