Managing Different Elements of Cold Chain Management for Overall Profitability in Selected Rajasthani Retail Stores

[1]Krishna Goti, [2]Dr. Alpa Joshi
[1]Research Scholar, Dept. of Commerce,
Atmiya University, Rajkot
[2]Associate Professor, Dept. of Commerce,
Atmiya University, Rajkot

Abstract

The economy of India is now one of the economies that are increasing at one of the highest rates in the world, and it is also the country that produces the most of a variety of agricultural products. Infrastructure for the supply chain, including world-class ports and logistics, is the recipient of significant new investments. Because it is the second biggest consumer market, it offers great chances to marketers. Although India generates more than 400 million metric tons of perishable goods annually, most of this output is wasted because the country's supply chain infrastructure is inadequate. In this particular research project, we picked several retail establishments in Rajasthan to investigate the results of implementing various cold chain management techniques. In addition to the milk and poultry products it produces, Rajasthan has a great lot of potential to become the nation's principal food processing centre because of the agro-climatic qualities of its region and the range of soil types it provides for agricultural development. The potential for exporting goods produced by agricultural and food processing exists. Rajasthan is characterized as an area that mostly produces agriculture and has a huge labour pool. Amounts of Rs. 50,000 crore or more in food, especially fruits and vegetables, die yearly in Rajasthan due to a lack of suitable cold storage and warehousing facilities.

Key Words: Cold Chain, Infrastructure, Management, Perishables, Wastage, food processing, inadequate, technology, Nascent, opportunity.

Introduction

India is one of the biggest agricultural product producers, but the cold chain supply is still in its infancy, leading to food and other resource losses. These losses from the agriculture industry alone have been estimated to be as high as US$8 to $15 billion annually. Due in significant part to the increased yields attained as a consequence of the Green Revolution, India's agriculture and food processing industries have been growing and undergoing a dramatic shift. Along with this, producing fruits and vegetables has made considerable advancements. India has been expanding quickly over the past two decades, and it has been observed that there is an increase in the demand for high-quality meals and a move toward horticulture products. The population of India's spending and consumption patterns changed significantly as a result of this and the country's rising urbanization. It is commonly known that the absence of well-organized and well-functioning supply chains is a significant factor in the high number of losses that occur in the perishable food industry. The traditional methods of the food supply chain were not able to keep up with the swift shifts in population patterns that were occurring. A significant quantity of food is lost or thrown away in India; this includes 4.615.9% of fruits, 5.2% of inland fish, 10.5% of sea fish, 2.7% of beef, and 6.7% of chicken. It was estimated in 2014 that losses in agricultural production would amount to 92,651 crores, while it was estimated that losses in fruits, vegetables, meat, fish, and milk would amount to 50,473 crores yearly. It was necessary to have an adequate and efficient cold chain infrastructure from the farm gate all the way to the consumer to halt the significant losses in the supply chain for perishables. The fact that just 75% of available cold storage space is being utilized on average shows that India's cold chain industry is not sustainable. (Opportunities in India's Cold Chain Industry, Ministry of Food Processing Industry, 2014.)

Emerging Trends in Cold Chain

The emphasis in the cold supply chain is now on an end-to-end cold chain rather than merely product storage. The goal is to maintain a cold supply chain while ensuring that items reach customers in their original form, size, texture, flavour, and colour. The current tendency is to update old stores with better, more advanced machinery, new energy-efficient storage technologies, contemporary packaging facilities and equipment, etc. Instead of the usual single commodity storage, there is potential for the establishment of multifunctional cold storage. Integrated cargo complexes are being planned at major airports in India, which will be equipped to handle all kinds of goods, including perishables (Opportunities in Cold Chain Sector in India, Ministry of food processing industry, 2014).

Challenges

Despite this, India still has a significant problem regarding inadequate food processing, cold chain logistics, and storage. The government of India has been a primary impetus behind the growth of the cold chain industry. It has implemented various grant and subsidy programs to encourage private investment in the sector. Recent developments have made it possible for foreign direct investment (FDI) to make up one hundred percent of the capital for cold chain investments in India. India's current cold chain is primarily made up of regionally based, rather small private businesses. The following are the principal difficulties:

- Poor quality cold storage infrastructure

- Lack of standards and procedures in facility construction and operation

- Labourers' lack of knowledge regarding the handling of temperature-sensitive goods

- High fuel prices and maintenance power outages

The cold chain preserves the freshness and safety of frozen and chilled goods. Reducing food temperatures, i.e., above -1oC to below ambient temperatures, is what "chilling" food products are meant. This prevents the microbiological, physical, chemical, and metabolic processes linked to food spoiling and degradation, leading to food items' short-term preservation. Food safety and quality are sustained for extended periods at chilled temperatures, typically between 0°C and +5°C. At these temperatures, microorganism development happens slowly, and food spoilage and degradation processes are significantly hindered (seafood.oregonstate.edu.pdf.com).

Opportunity

The Planning Commission of India and the Indian government have stated plans to promote and enhance the cold chain. The primary areas of development emphasized include fundamental infrastructure, environmentally friendly technology, standards and protocols, enabling laws, and specialized technical skills. The first step toward the industry's advancement was taken when, in the most recent Union Budget, the government of India acknowledged the cold chain industry as a subsector of the infrastructure sector. It has committed more resources to the construction of new cold storage facilities. The private sector is encouraged to expand its cold chain operations by implementing various cutting-edge technological solutions.

The largest obstacle was raising the initial funds necessary to build a cold chain unit. But with careful planning, the government may encourage additional PPP projects in this area, boosting India's cold chain business expansion.

Future Prospects

It is anticipated that Foreign Direct Investment (FDI) in Retail will soon be permitted, as numerous international food and retail brands are interested in entering the Indian market. In addition, the government is supporting a

measure that would call for the construction of additional cold chain and storage facilities to cut down on the amount of wasted food. The Indian cold chain industry is anticipated to grow at a compound annual growth rate (CAGR) of 28% over the next three years and 2017; the market size may reach $13 billion in 2017. Due to the changing lifestyle of Indian consumers and the future expansion of the road and rail infrastructure, international businesses have a significant opportunity to participate in the Indian cold chain industry. In this area, the government can act as a catalyst. For the transportation and storage of commodities that need to be kept at specific temperatures, cold chains have now been integrated into supply chain management systems worldwide.

The following list includes some potential actions that the government may take:

- Offering the necessary assistance, such as reducing finance costs to construct cold chain infrastructure facilities.

- Supporting campaigns to raise consumer awareness of cold chain facilities' value and inform consumers.

- State governments can promote the construction of cold storage facilities by offering subsidized electricity rates, as electricity makes up a sizable amount of operational expenses.

- Supporting more advanced and effective cooling techniques lengthens perishable goods' shelf life (Kulkarni Sateesh, 2016).

Research Methodology

Objectives of the Study:

Managing several areas of Rajasthan's chosen retail outlets' cold chain for overall profitability

Research Type

 In a systematic inquiry, inductions and deductions are both conceivable. We have utilized induction and deduction research study techniques in the current investigation.

Research Design

Because there has been very little previous research on the topic of the current study, which is about Cold Chain Management specifically in Rajasthan (India), at selected outlets, the exploratory type of research was used in the first step of the study. This was followed by the descriptive type of research used in the subsequent steps of the study.

Sampling Techniques

The two main types of sampling techniques are probability sampling and nonprobability sampling. Snowball and judgmental sampling, both nonprobability types, were used in the current study.

Procedure for Data Collection

Primary data were gathered by having the store managers of several locations in Rajasthan fill out questionnaires.

Sample Size

From 94 retail/store managers, 112 respondents for the current study were selected. They were questioned, and they responded to questionnaires.

Methodology

Using the proper statistical methods, the information gathered through surveys was examined. A master data sheet was created after the completed surveys had been coded. Across all, 112 questionnaires were gathered from 94 different stores in Rajasthan where the study was conducted. The information was tallied and categorized according to independent and dependent factors. The acquired data's summary statistics were presented methodically. After that, some different null hypotheses were formulated to ascertain the effect of particular independent variables on the effectiveness of cold chains for the distribution of frozen food items. There have been many hypotheses formulated and examined. Statistical tests, regression, multicollinearity, and VIF (Variation Inflation Factor) analysis will be utilised throughout the analysis. The Likert scale with five points was applied.

Analysis of Effectiveness of various aspects of management of Cold Chain for profitability in selected retail Store

A cold chain contains several components necessary for handling perishables and can potentially increase the store's profitability. The ensuing factors have been narrowed down and given further consideration. This part determines whether or not all employees, including store managers, assistant managers, and/or the person in charge of the shop's second in command, are happy with the level of effectiveness that has been maintained. These factors, which include managing air quality levels such as carbon dioxide, oxygen, and humidity, temperature control, management of product storage according to shelf life, electricity consumption, time temperature indicator, displays and marketing, transportation management system (refrigerated transport), supply chain management, insulated shipping container, and food processing (freezing of certain products), explain how effectively a cold chain is managed in a retail setting.

Table 1. Consolidated Mean values for the Variables of Effectiveness

SL. No.		Mean value out of 5	Std. Deviation
1	**Management of Air quality levels like carbon dioxide, oxygen, humidity**	**3.60**	**0.88**
2	Temperature Control	2.80	1.27
3	Management/Storage as per the Shelf Life of the Product	3.19	1.00
4	**Electricity consumption**	**3.69**	**1.34**
5	Time-temperature indicator	3.23	0.92
6	Displays and Marketing	3.17	1.16
7	**Transportation management system (Refrigerated transport)**	**3.91**	**1.25**
8	Supply chain Management	3.43	1.17
9	Insulated shipping container	3.30	1.29
10	Food processing (freezing of certain processed food)	3.08	1.27
11	Training to the Staff involved in Cold chain management	2.78	1.22
12	**Technical Ability of the Staff handling cold chain aspects**	**3.76**	**1.27**

	Overall Effectiveness of the cold chain in your store	4.29	0.88

The responses of the employees working in the store were ambiguous regarding the mean values of the factors linked to the effectiveness of a cold chain. The management of the cold chain in retail stores is most effective regarding the transportation management system (refrigerated transport), with a mean value of 3.91. This is followed by the technical proficiency of the staff handling the cold chain, which has a mean value of 3.76, electricity consumption, which has a mean value of 3.69, and the management of air quality levels such as carbon dioxide, oxygen, and humidity, which has a mean value of 3.91. In addition, the mean values for insulated shipping containers and supply chain management showed promise, coming in at 3.30 and 3.43, respectively.

Impact of Effective Cold Chain Management on Profitability of the Store:

It has been discovered and discussed which elements of a cold chain influence a store's profitability. To check the significance of those variables, Multiple Regression (stepwise) has been applied with dependent variables – **Overall Effectiveness of the cold chain management in your store.** The related hypotheses were formulated. There were 11 of these theories. **All alternative hypotheses were directional hypotheses.**

Test for Multicollinearity

Multicollinearity is a concern since there shouldn't typically be so significant correlations between two independent variables. Utilizing the Variance Inflation Factor (VIF) value, multicollinearity was examined. In this study, VIF was computed using SPSS, and variables having more than three VIF values were eliminated. Using the other independent variables and one independent variable as the dependent variable, the VIF is computed. This procedure is continued until each independent variable has received turn-by-turn treatment as a dependent variable. Each variable has a dependent and independent role in the cross-VIF computation. One independent variable was used as the dependent variable in the VIF computation, leaving the other independent variables to be used only as independent variables.

It only displayed the results of two aspects before the procedure was halted due to two variables, EFF 4 and EFF 9, having VIF values greater than 3. (4.92, 4.86 and 4.2 and 4.22, respectively). It demonstrates the multicollinearity and significant correlation between EFF4 and EFF9. Between these two variables, there is a strong correlation (r =.765), which is extremely significant. VIF has been discarded since EFF4's value is greater. The procedure of rechecking VIF for the remaining variables was carried out after deleting EFF 4.

Stepwise Multiple Regression Analysis:

We utilized stepwise regression, as well as regression models in which the selection of the predictive variables was automated. Using the stepwise regression model's algorithm, each independent variable is considered one at a time as it is added. It began with one, which explained maximum variation in the **"Overall Effectiveness of the cold chain management in your store"** (the dependent variable) and continued to add more independent variables to the regression, one by one. Once the regression model was refined, variables stopped being added, and the model was checked at each stage for the best fit (Paul et al., 2016). Five stages of the forward stepwise regression were necessary to achieve model optimization for how the benefits of a cold chain impact the earnings of retail establishments.

According to the model summary, five steps were done to optimize the model and its output. In the fifth phase, the R square value is found to be.411 and indicates that the model accounts for around 41% of the variance, which is quite a considerable amount. The modified R Square value is a little lower. However, that is also acceptable.

It was determined using the ANOVA statistics if the independent variable substantially influenced the dependent variable. The value in the signature column is.000, which is below the threshold of p -.05.

As a result, independent factors significantly affect the dependent variable. With the value in sig. Column (e) is also added with .000, which means that it is significant when the five independent variables, namely predict the dependent variable **- Electricity consumption, Management/Storage as per the Shelf Life of the Product, Displays and Marketing, Supply chain Management, Technical Ability of the Staff handling cold chain aspects**. The dependent variable is -**Overall Effectiveness of the cold chain in your store.** Out of the total of 11 independent factors, the coefficients table indicated the five variables above as having a substantial impact on the dependent variable. Other factors were noted in the omitted factors or factors that did not significantly affect the earnings of retail establishments.

Results of the Hypotheses testing:

Only five factors had a meaningful impact on the dependent variable.

Ho 2 Effective Electricity consumption has no impact on Overall Effectiveness of a Cold Chain in the Retail Store

Ha 2 Effective Electricity consumption has a positive impact on Overall Effectiveness of a Cold Chain in the Retail Store

The value of the significant column is.005, which is lower than the value of "p" when comparing results at a significance level of 5%. As a direct consequence, the alternative hypothesis is chosen to be true, whereas the null hypothesis is chosen to be false. Because of this, it is feasible to conclude that an increase in the Effectiveness of Overall Cold Chain Operations at a Retail Store is Caused by an increase in the Effectiveness of Effective Electricity Consumption.

Ho 3 Effective Management/Storage as per the Shelf Life of the Product has no impact on Overall Effectiveness of a Cold Chain in the Retail Store

Ha 3 Effective Management/Storage as per the Shelf Life of the Product has a positive impact on Overall Effectiveness of a Cold Chain in the Retail Store

The value of the significant column is.005, which is lower than the value of "p" when compared at a significance level of 5%. (.05). As a direct consequence, the alternative hypothesis is chosen to be true, whereas the null hypothesis is chosen to be false. As a result, it is possible to conclude that successful display and marketing contribute to the cold chain's overall effectiveness in a retail setting.

(Variable 4 was dropped due to Multicollinearity, hence the hypothesis has not been formulated here for variable 4)

Ho 6 Effective Displays and Marketing through Cold chain has no impact on Overall Effectiveness of a Cold Chain in the Retail Store

Ha 6 Effective Displays and Marketing through Cold chain has a positive impact on Overall Effectiveness of a Cold Chain in the Retail Store

The value of the significant column is.005, which is lower than the value of "p" when compared at a significance level of 5%. (.05). As a direct consequence, the alternative hypothesis is chosen to be true, whereas the null hypothesis is chosen to be false. As a result, it is possible to conclude that effective display and marketing contribute to the cold chain's overall effectiveness in a retail setting.

Ho 8 Effective Supply chain Management has no impact on Overall Effectiveness of a Cold Chain in the Retail Store

Ha 8 Effective Supply chain Management has a positive impact on Overall Effectiveness of a Cold Chain in the Retail Store

The value of the significant column is.005, which is lower than the value of "p" when compared at a significance level of 5%. (.05). As a direct consequence, the alternative hypothesis is chosen to be true, whereas the null hypothesis is chosen to be false. As a result, it is possible to conclude that successful display and marketing contribute to the cold chain's overall effectiveness in a retail setting.

Ho11 Effective Training to the Staff involved in Cold chain management has no impact on Overall Effectiveness of a Cold Chain in the Retail Store

Ha11 Effective Training to the Staff involved in Cold chain management has a positive impact on Overall Effectiveness of a Cold Chain in the Retail Store

The value validates the assumption that there is no difference between the two groups beneath the significant column is.400, which is higher than the value of "p" at the 5% significance level. Therefore, it is feasible to claim that excellent training for staff members participating in cold chain management does not influence consumers who enter a shop since these customers do not participate in the management of the cold chain. Customers who enter a store do not touch the cold chain.

Ho12 Effective Technical Ability of the Staff handling cold chain aspects has no impact on Overall Effectiveness of a Cold Chain in the Retail Store

Ha12 Effective Technical Ability of the Staff handling cold chain aspects has a positive impact on Overall Effectiveness of a Cold Chain in the Retail Store

The value of the significant column is.005, which is lower than the value of "p" when compared at a significance level of 5%. (.05).

As a direct consequence, the alternative hypothesis is chosen to be true, whereas the null hypothesis is chosen to be false. As a result, it is possible to conclude that successful display and marketing contribute to the cold chain's overall effectiveness in a retail setting.

Conclusion

The sector of the economy that will be the primary driver of economic expansion in the years to come will be the food processing industry, which has a growth rate of 13.7%. As a result of the fact that the typical Indian spends more than half of his income on food, the food processing industry in India is poised to enter an era fraught with the possibility of enormous growth. Consumer tastes and inclinations have changed noticeably, not just in metropolitan regions but also in rural ones. Due to its diverse climatic circumstances, Rajasthan produces a wide range of fruits, vegetables, poultry, milk products, and other food items. As a result, the retailers can purchase a wide range of items locally, store them, and then sell them when necessary, utilizing their cold chains. The study has determined five factors that substantially impact a retail store's profitability to have better cold chain management. Utilization of electricity, product administration and storage according to shelf life, displays and marketing, supply chain management, and technical expertise possessed by staff members handling issues about the cold chain are some of the things that fall under this category. Thus, there is a chance to improve the cold supply chain since customer tastes are changing quickly, and consumers' awareness of nutrition and high-quality foods is expanding.

References

1. Kulkarni Sateesh (2016), Cold Chain Industry in India – Present Status and Future Prospects,

Thursday,10 March,2016,08:00AM (IST)

2. Opportunities in Cold Chain Sector in India, Ministry of food processing industry, http://mofpi.nic.in /sites/default/files/OpportunitiesinColdChainSectorinIndia.pdf

3. Paul J et al. (2016). Impact of Service Quality on Customer Satisfaction in Private and Public Sector Banks,35 (5), International Journal of Bank Marketing, June 2016.

Websites

1.   http://www.thehindu.com/todays-paper/tp-national/tp-newdelhi/rajasthan-has-huge-potential-to-become-food-processing-hub/article4423687.ece

2.   http://seafood.oregonstate.edu/.pdf%20Links/Managing-the-Cold-Chain-for-Quality-and-Safety.pdf)