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Factors influencing shrinkage of vegetables in select retail outlets in Coimbatore city, Tamil Nadu

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ABSTRACT

The Indian retail industry can be divided into two sectors viz organized and unorganized. India wastes fruits and vegetables every year equivalent to the annual consumption of the United Kingdom. In the present study six organized and ten unorganized stores located in various parts of Coimbatore city of Tamil Nadu were selected to analyse factors responsible for shrinkage of selected vegetables and find out the correlation among the procurement, sales and shrinkage of vegetables. It was found that major factors that influenced shrinkage of vegetables were quality of the vegetables, improper handling of vegetables by the employees and lack of good storage facilities. Both organized and unorganized stores had positive relationship with sales and shrinkage on procurement; higher the procurement higher were the sales and shrinkage and vice versa.

Keywords: Vegetables; shrinkage; factors; procurement; sales; retail stores

INTRODUCTION

India is the second largest producer of vegetables next to China (http://www.fao.org/india/fao-in-india/india-at-a-glance/en/). But the real challenge begins after the production. More than 72 per cent of the vegetables and fruits are wasted every year in the absence of proper storage and other infrastructure facilities and retailing (Anon 2008). The sector is constrained by widespread fragmentation in the supply chain, low productivity levels and huge postharvest losses arising out of inadequate storage, cold chain and transport infrastructure, logistics and supply chain management. According to the industry estimates 25 to 30 per cent of fruits and vegetables and five to seven per cent of food grains in India get wasted. India loses about 35-40 per cent of the produce due to improper postharvest management, a loss estimated at Rs 40,000 crore per year. India wastes fruits and vegetables every year equivalent to the annual consumption of the United Kingdom (Krishna 2017).

The Indian retail industry can be divided into two sectors viz organized and unorganized. Unorganized or traditional retailing refers to the traditional formats of low cost retailing namely the local Kirana shops, owner-manned general stores, Paan/Beedi shops, convenience stores, hand-cart and pavement vendors etc and organized retail typically means large scale chain stores which are corporatized, apply modern management techniques and are very likely to be self-service in nature. The traditional retailing of vegetables is not very much organized. It amounts to 97 per cent of the total market and is extremely localized and highly fragmented with large number of intermediaries (Rajkumar and Jacob 2010).

In Tamil Nadu lack of adequate on-farm processing facilities has resulted in the loss of Rs 8,100 crore worth of fruits and vegetables in the post-harvest stage a year (Anon 2014). These post-harvest losses are incurred at various stages which include loss due to handling at retailing. Thus an attempt was made to find out factors influencing shrinkages of vegetables in order to manage it and

ensure zero shrinkage. Shrinkage is the term that constitutes of wholesale and retail losses in terms of quantity and value.

Goswami and Mishra (2009) carried out a study to find out if the Indian consumers were likely to move from traditional Kirana stores to large organized retailers while shopping for groceries. Buzby et al (2015) found that a certain amount of food in supermarkets is deemed unusable (food loss) because of moisture loss, spoilage and other causes. Viswanadham (2013) analysed the deficiencies in the Indian supply chain in the food retail. The most important problem associated with the Indian food industry is the inefficient supply chain as a result of which about 20 per cent of the food produce worth Rs 10,000 crore is wasted. Dalwadi et al (2010) identified key store attributes influencing consumers' perceptions using factor analysis. Factor analysis was used to determine the factors which customers keep in mind while purchasing apparels from organized retail outlet (Lahiri and Samanta 2010). Ali et al (2010) used factor analysis to identify consumer responses on 17 market attributes which were reduced to five sets of related factors through principal component analysis. Factor analysis was carried out to analyse the decision variables pertaining to traditional retail store and modern retail store (Zameer and Mukherjee 2011). Anon (2011) opined that focus on supply chain improvement based on a replenishment-based model rather than a forecast-based mode enables companies to increase sales by 20 to 30 per cent in three to six months. Various sources of fruit wastages in retail outlets in Chennai were analysed. Lack of cold storage was considered as primary reason for maximum wastage. Secondly more number of distribution channels was creating problem of more damage and price increase (Arivazhagan et al 2012).

METHODOLOGY

The present study was conducted to analyse factors responsible for shrinkage and examine the in-store shrinkage controls for selected vegetables at organized and unorganized retail stores located in various parts of Coimbatore city, Tamil Nadu. Six organized stores were selected based on the volume of business, store location and handling of major vegetables viz carrot, brinjal, bhendi, cabbage, cauliflower, hybrid tomato, country tomato, bitter gourd and snake gourd and customer density and the shrinkage were analysed. All these stores catered to the daily needs of the customers from regular groceries to fresh food and weekly top-up shopping. The total operational space of the organized store ranged between 3,200 and 44,000 sq ft. Ten unorganized stores were selected in a diameter of 1 km within the location of organized stores. Data on daily procurement, sales and shrinkage volume were collected from each sample retail store for a period of one month. The stores were visited at different timings daily to collect the information regarding procurement, sales and shrinkage. Shrinkage volume was collected by visiting every retail store next day morning after 11 AM. Factor analysis was adopted to examine the retailer's perception on factors influencing shrinkage in selected vegetables. Correlation analysis was done to find the relationship between volume of procurement, sales and shrinkage of vegetables.

RESULTS and DISCUSSION

Descriptive analysis on procurement, sales and shrinkage

The data on procurement, sales and shrinkage were analyzed in terms of mean, standard deviation and coefficient of variation to summarize the data in a meaningful way. the data in Table 1 show that the average procurement of vegetables/day by the organized stores was 1,385.85 kg as against 1,058.10 kg by the unorganized stores. Coefficient of variation on procurement was 11.10 per cent in organized stores and 8.13 per cent in unorganized stores. The standard deviation on procurement was 153.86 kg in organized stores and 86.02 kg in unorganized stores. The average sales of organized stores were 1249.04 kg as against unorganized stores with 998.43 kg. Coefficient of variation on sales was 11.66 per cent in organized stores and 8.21 per cent in unorganized stores. The standard deviation on sales was 145.67 kg in organized stores and 81.99 kg in unorganized stores. The average shrinkage of organized stores was 135.47 kg as against unorganized stores with 58.20 kg. Coefficient of variation on shrinkage was 10.04 per cent in organized stores and 12.81 per cent in unorganized stores. The standard deviation on shrinkage was 13.60 kg in organized stores and 7.46 kg in unorganized stores. The unorganized stores had highest variation on shrinkage irrespective of low standard deviation.

The mean, standard deviation and coefficient of variation on sales and shrinkage value of vegetables by organized and unorganized stores were estimated and the results are furnished in Table 2.

Table 1. Mean, standard deviation (SD) and coefficient of variation (CV) for procurement, sales and shrinkage volume

Volume	Procurement		Sales		Shrinkage	
	OS	UOS	OS	UOS	OS	UOS
Mean (kg)	1,385.85	1,058.10	1,249.04	998.43	135.47	58.20
SD (kg)	153.86	86.02	145.67	81.99	13.60	7.46
CV (%)	11.10	8.13	11.66	8.21	10.04	12.81

OS: Organized stores: UOS: Unorganized stores

Table 2. Measures of central tendency- sales and shrinkage value of vegetables by organized and unorganized stores

Volume	Sales		Shrinkage	
	OS	UOS	OS	UOS
Mean (Rs)	42,768.38	37,412.70	5,094.51	2,286.10
SD (Rs)	6,501.74	3,951.26	480.42	368.21
CV (%)	15.20	10.56	9.42	16.10

OS: Organized stores: UOS: Unorganized stores

It can be seen in Table 2 that average sales value of organized stores was Rs 42,768.38 as compared to Rs 37,412.70 in unorganized stores. The standard deviation of sales value among different organized stores was Rs 6,501.74 and Rs 3,951.26 in unorganized stores. The coefficient of variation was measured as 15.20 per cent in organized stores and 10.56 per cent in unorganized stores. The average shrinkage value was high in organized stores with Rs 5,094.51 as compared to Rs 2,286.10 in unorganized stores. The deviation of shrinkage value across the stores was Rs 480.42 in organized stores and Rs 368.21 in unorganized stores. The variation among stores was 9.42 per cent in organized stores and 16.10 per cent in unorganized stores.

Organized and unorganized stores' perception on factors influencing shrinkage in selected vegetables

To understand the factors influencing shrinkage in selected vegetables the perception of the management towards shrinkages was studied. A set of 12 formulated statements was analysed using a five-point scale from strongly agree to strongly disagree. An exploratory factor analysis was performed to reduce the 12 statements by grouping them into various factors. Similar factors were grouped under each attribute as perception on quality with two statements loaded under it, perception on handling practices with four statements grouped under it, perception on storage facility with two statements and perception on price and forecasting with two statements grouped under it. The results are presented in Table 3.

One of the major factors that influenced shrinkage of vegetables in organized and unorganized stores was quality of the vegetables reaching the stores from the market. Majority of the stores lacked good storage facility to store vegetables. Improper handling of vegetables by the employees at both back-end and front-end handling by customers were adding to the shrinkage of vegetables in organized and unorganized stores in Coimbatore city. The variation in price and unexpected fall in forecasting also influenced shrinkage of vegetables. The Eigen values were examined and all factors with an Eigen value greater than one were kept for further examination. The factor loadings explained the correlation of each variable with the respective factors. The factors were selected from groups of statements that had a factor loading over 0.5.

Correlation among volume of procurement, sales and shrinkage of vegetables

The correlation between procurement and sales, sales and shrinkage and shrinkage and procurement for each vegetable was estimated and the results are presented in Table 4. Except snake gourd, all other vegetables had a positive relationship between procurement and sales. Vegetables such as carrot, bhendi and tomatoes had 'r' values greater than 0.5 implying higher the procurement more will be the sales. However the brinjal had strong positive relationship in unorganized stores whereas moderate relationship in organized stores. Bitter gourd had only weak relationship in both organized and unorganized stores.

In case of relationship between sales and shrinkage almost all the vegetables (except carrot) in unorganized stores had only negative relationship implying that higher the sales, lesser will be the shrinkage. In organized stores vegetables like brinjal, bhendi, cabbage and bitter gourd had positive relationship. Both organized and unorganized stores however had weak and very weak relationship between shrinkage and procurement across the selected vegetables.

The correlations between procurement and sales, sales and shrinkage and shrinkage and procurement were further estimated for all the vegetables put together handled by both organized and unorganized stores. The results are presented in Table 5.

Table 3. Factors influencing shrinkage in vegetables

Factor	Statement	Factor loading
Quality	Is the arrived quantity of vegetables ensured for quality and standard?	0.798
	Is proper packaging done while procuring from source?	0.593
Handling practices	Shrinkage occurs due to over-stocking and piling.	0.893
	Is proper temperature maintained in the storage facility?	0.753
	Handling of vegetables by labour causes damage.	0.583
	The way of handling vegetables by the customers also causes shrinkage.	0.773
Storage facilities	Shrinkage is due to lack of storage facility.	0.816
	Do you have enough space for storage?	0.873
Price and forecasting	Does variation in price influence shrinkage?	0.913
	Is the shrinkage due to improper forecasting?	0.575

Table 4. Correlation coefficient between procurement and sales, sales and shrinkage and shrinkage and procurement

Vegetable	Procurement and sales		Sales and shrinkage		Shrinkage and procurement	
	OS	UOS	OS	UOS	OS	UOS
Carrot	0.6915	0.5624	-0.1949	0.2927	-0.2670	0.4845
Brinjal	0.3272	0.9094	0.9988	-0.0038	0.3506	-0.0023
Bhendi	0.6641	0.6285	0.1330	-0.0264	0.3892	0.0702
Cabbage	0.2295	0.2213	0.1966	-0.3152	0.3457	-0.1996
Cauliflower	0.4311	0.5858	-0.1378	-0.2510	-0.3432	-0.1688
Tomato (H)	0.5836	0.5499	-0.2343	-0.1850	-0.1306	0.3036
Tomato (C)	0.5205	0.6743	-0.2003	-0.2465	-0.2938	-0.0731
Bitter gourd	0.1882	0.1625	0.0267	-0.0736	-0.1778	0.3473
Snake gourd	-0.0171	0.2991	-0.2290	-0.2740	0.0753	-0.2037

OS: Organized stores, UOS: Unorganized stores, H: Hybrid, C: Country

Table 5. Correlation coefficient among volume of procurement, sales and shrinkage in vegetables

Component	Organized stores	Unorganized stores
Procurement and sales	0.5998	0.5862
Sales and shrinkage	-0.2180	-0.0517
Procurement and shrinkage	0.1949	0.2186

The relationship between procurement and sales was positive and there was strong relationship in both organized and unorganized stores with 'r' value 0.5998 and 0.5862 respectively. This implies that sales and procurement are highly dependent on each other. The strength of relationship between sales and shrinkage however was weak in organized stores with 'r' value -0.2180 followed by very weak (-0.0517) in case of unorganized stores. The relationship between procurement and shrinkage had very weak relationship but positively correlated in case of both organized stores (0.1949) in unorganized stores (0.2186).

The implications of the above analysis were that both organized and unorganized stores had positive relationship with sales and shrinkage on procurement and higher the procurement higher the sales and shrinkage and vice versa. The organized stores forecasted their demand based on previous year or weekly sales whereas unorganized stores forecasted based on previous day. The promotional strategies followed by both organized and unorganized stores had increased their sales volume but less attention was given to reduce the shrinkage.

CONCLUSION

One of the major factors that influenced shrinkage of vegetables in organized and unorganized stores was quality of the vegetables reaching the stores from the market. Majority of the stores lacked good storage facility to store vegetables. Improper handling of vegetables by the employees at both back-end and front-end handling by customers were adding to shrinkage of vegetables in organized and unorganized stores in Coimbatore city. The variation in price and unexpected fall in forecasting had also influenced shrinkage of vegetables. It could be concluded from the study that organized stores had a high shrinkage volume compared to unorganized stores irrespective of their management practices and standard in business. The relationship between procurement and sales was positive and strong in both organized and unorganized stores which implies that sales and procurement were highly dependent on each other. The strength of relationship between sales and shrinkage was weak in organized stores followed by very weak in case of unorganized stores. The relationship between procurement and shrinkage had very weak relationship but positively correlated in case of both organized stores and unorganized stores.

REFERENCES

Ali J, Kapoor S and Moorthy J 2010. Buying behavior of consumers for food products in an emerging economy. British Food Journal **112(2):** 109-124.

Anonymous 2008. 72 per cent of India's fruit, vegetable produce goes waste. Daily News and Analysis (DNA), 12 May 2008.

Anonymous 2011. Supply chain must 'get' as much 'focus' as marketing. BusinessLine, The Hindu 21 April 2011.

Anonymous 2014. TN postharvest losses at Rs 8,100 crore: Assocham. Business Standard, 14 July 2014.

Arivazhagan R, Geetha P and Parthasarathy R 2012. Analysis of sources of fruit wastages in retail outlets in Chennai, Tamil Nadu, India. International Journal of Trade, Economics and Finance **3(3):** 199-204.

Buzby JC, Bentley JT, Padera B, Ammon C and Campuzano J 2015. Estimated fresh produce shrink and food loss in US supermarkets. Agriculture **5:** 626-648.

Dalwadi R, Rathod HS and Patel A 2010. Key retail store attributes determining consumers' perceptions: an empirical study of consumers of retail stores located in Ahmadabad (Gujarat). SIES Journal of Management **7(1):** 20-34.

Goswami P and Mishra MS 2009. Would Indian consumers move from Kirana stores to organized retailers when shopping for groceries? Asia Pacific Journal of Marketing and Logistics **21(1):** 127-143.

http://www.fao.org/india/fao-in-india/india-at-a-glance/en/ (Retrieved: 12.10.2020)

Krishna P 2017. India wastes as much food as United Kingdom consumes: study. BusinessWorld, 27 Aug 2017.

Lahiri I and Samanta PK 2010. Factors influencing purchase of apparels from organized retail outlets. The IUP Journal of Marketing Management **9(1-2):** 73-87.

Rajkumar P and Jacob F 2010. Business Models of Vegetable Retailers In India. Great Lakes Herald **4(1):** 31-43.

Viswanadham N 2013. The food supply chain in India: untapped comparative advantage. Paper presented in Workshop on Sustainable Food Security through Technological Interventions for Production, Processing and Logistics 5 Oct 2013, Indian Institute of Technology, Kharagpur, West Bengal, India.

Zameer A and Mukherjee D 2011. Food and grocery retail: patronage behavior of Indian consumers. South Asian Journal of Management **18(1):** 119-134.