



Research Article

ASSESSMENT OF SHRINKAGE OF VEGETABLES IN SELECT UNORGANISED RETAIL OUTLETS OF COIMBATORE CITY

V.M. INDUMATHI^{1*}, B. NAVANEETHAM² AND M. MALARKODI³

¹ICAR-Krishi Vigyan Kendra, Vamban, Pudukkottai, 622303, Tamil Nadu Agricultural University, Coimbatore, 641003, Tamil Nadu, India

²Karunya University, Karunya Nagar, Coimbatore, 641114, Tamil Nadu, India

³Directorate of Agribusiness Management, Tamil Nadu Agricultural University, Coimbatore, 641003, Tamil Nadu, India

*Corresponding Author: Email - induarm@tnau.ac.in

Received: October 02, 2020; Revised: October 26, 2020; Accepted: October 27, 2020; Published: October 30, 2020

Abstract: Fruits and Vegetables are rich in vitamins, minerals and are excellent sources of fibers. They are essential food items for human consumption for healthy lifestyle. The loss at retailer's level does not add value to neither the retailer nor consumer. Shrinkage is the term that constitutes wholesale and retail losses in terms of quantity and value. Ten unorganized stores in Coimbatore City were selected based on the volume of business, store location and handling of major vegetables. Percentage analysis was worked out to study the volume of procurement, sales and shrinkages in selected vegetables in individual stores. Carrot and Tomatoes were the mostly sold vegetables with respect to procurement in unorganized stores. The unorganized stores had showed less than 10 percent shrinkage on every vegetable except bitter gourd. The daily average sale of unorganized stores was 998.43 kg and the daily average shrinkage was 58.20 kg.

Keywords: Shrinkage, Unorganised stores, Fruits, Vegetables, Procurement

Citation: V. M. Indumathi, *et al.*, (2020) Assessment of Shrinkage of Vegetables in Select Unorganised Retail Outlets of Coimbatore City. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 12, Issue 20, pp.- 10314-10317.

Copyright: Copyright©2020 V. M. Indumathi, *et al.*, This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Academic Editor / Reviewer: Avinash Sharma, Gauri Sankar J P Jena, Dr B. S. Vyakarnahal

Introduction

The intake of fruits and vegetables has risen substantially in recent years across the world as the consumers awareness about hygiene and food safety is increasing day by day. Their economic importance has also increased and high labor intensity in the production of fruits and vegetables makes them important from the employment angle as well. Increase in area allocation under horticultural crops has often been suggested as a measure for agricultural diversification, increased employment and income. The Indian retail industry can be divided into two viz. organized and unorganized sectors. Unorganised retailing may be referred to conventional low cost shops like petty shops, convenience stores, hand cart / pavement vendors, mom and pop stores general provision stores etc. These stores are not registered and hence do not pay taxes. The unorganized stores had relatively lower operational space. The space ranged between 800 and 3,100 sq. ft. and the space allotted for vegetables was as low as 30 sq. ft. and as high as 2,800 sq. ft. The employees engaged were not professionally trained. The stores sold mostly grocery apart from vegetables.

These post-harvest losses are incurred at various stages, which include loss due to handling at retailing. The loss at retailer's level is important as it goes as waste unfit for consumption. Such loss does not add value to neither the retailer nor consumer. Thus, shrinkage is the term that constitutes wholesale and retail losses in terms of quantity and value and this study focuses to find out the procurement, sales and shrinkage of unorganized retail outlets in Coimbatore city.

Review

Buzby *et al.*, (2014) [1] studied on Estimated Fresh Produce Shrink and Food Loss in U.S. Supermarkets found that shrink estimates for 24 fresh fruits and 31 fresh vegetables in U.S. supermarkets in 2013 and 2014; and retail-level food loss. Deliya *et al.*, (2012) [2] discussed fresh produce procurement at various collection centers located close to the farms in the producing regions.

Most of the procurements done locally i.e. close to the city being services both to minimize transit time in order to preserve freshness as well as reduce cost. Arivazhagan *et al.*, (2012) [3] analyzed various sources of fruit wastages in retail outlets in Chennai. Lack of cold storage is considered as primary reason for maximum wastage followed by a greater number of marketing channels and increase in price. Third major reason is that, unsold wastage. Due to all the above reasons, total wastage from the retail outlets were estimated around 23 percent. Ministry of Food Processing Industry (MOFPI), Government of India says that without a strong and dependable cold chain, a vital sector like F&V processing industry, which is based mostly on perishable products, cannot survive and grow. Even at current level of production, wastage in F&V is estimated at 35%, major reasons being inadequate storage, transportation, cold chain facilities and other infrastructure support facilities. Vishwanadham (2010) [4] analyzed 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 percent of the food produce worth Rs. 10,000 crores are wasted.

Material and Methods

Data on daily procurement, sales and shrinkage volume was collected from each sample retail store for a period of one month. The stores were visited at different timings on daily basis to collect the information regarding procurement, sales and shrinkage. Procurement data was collected during forenoon while the sales value was collected during the closure timing of stores. Shrinkage volume was collected by visiting every retail stores next day morning after 11A.M. Ten unorganized stores were selected based on the volume of business, store location and handling of major vegetables viz. carrot (CA), brinjal (BJ), bhendi (BH), cabbage (CAB), cauliflower (CAU), hybrid tomato (TH), country tomato (TC), bitter gourd (BG) and snake gourd (SG).

Table-1 Procurement of vegetables by unorganized stores (Kg)

Vegetables	Name of stores										Total
	MPN	ASR	OF	VMS	SPN	WS	SS	MPS	DVM	SRI PN	
Carrot	501.50	62.00	334.00	46.50	625.00	93.00	75.50	117.00	394.00	550.00	2798.50
	(7.49)	(7.64)	(5.31)	(4.23)	(10.82)	(11.41)	(9.63)	(8.60)	(7.87)	(13.21)	(8.53)
Brinjal	302.50	93.00	268.00	77.50	397.50	93.00	80.50	105.00	342.00	524.50	2283.50
	(4.52)	(11.45)	(4.26)	(7.04)	(6.88)	(11.41)	(10.27)	(7.72)	(6.83)	(12.60)	(6.96)
Bhendi	217.00	93.00	269.45	77.50	390.00	93.00	81.50	120.50	286.50	398.00	2026.45
	(3.24)	(11.45)	(4.28)	(7.04)	(6.75)	(11.40)	(10.40)	(8.86)	(5.72)	(9.56)	(6.18)
Cabbage	1359.00	65.00	720.00	77.50	460.00	95.00	141.00	102.00	270.00	515.00	3804.50
	(20.30)	(8.00)	(11.45)	(7.04)	(7.96)	(11.66)	(17.98)	(7.50)	(5.40)	(12.37)	(11.60)
Cauliflower	1124.00	65.00	617.00	77.50	400.00	95.00	75.00	121.00	195.00	240.00	3009.50
	(16.79)	(8.00)	(9.81)	(7.04)	(6.92)	(11.66)	(9.56)	(8.89)	(3.90)	(5.76)	(9.18)
Tomato (H)	1286.00	155.00	2100.00	310.00	2000.00	155.00	161.00	360.00	1800.00	950.00	9277.00
	(19.21)	(19.09)	(33.39)	(28.17)	(34.62)	(19.02)	(20.54)	(26.46)	(35.97)	(22.82)	(28.28)
Tomato (C)	1434.00	155.00	1647.00	310.00	1000.00	155.00	136.00	324.00	1500.00	775.00	7436.00
	(21.42)	(19.09)	(26.19)	(28.17)	(17.31)	(19.02)	(17.35)	(23.81)	(29.97)	(18.61)	(22.67)
Bitter Gourd	213.50	62.00	179.00	46.50	170.00	18.00	19.00	55.50	107.00	111.00	981.50
	(3.20)	(7.64)	(2.85)	(4.23)	(2.94)	(2.21)	(2.42)	(4.08)	(2.14)	(2.67)	(2.99)
Snake Gourd	256.50	62.00	155.00	77.50	335.00	18.00	14.50	55.50	110.00	100.00	1184.00
	(3.83)	(7.64)	(2.46)	(7.04)	(5.80)	(2.21)	(1.85)	(4.08)	(2.20)	(2.40)	(3.61)
Total	6694.00	812.00	6289.45	1100.50	5777.50	815.00	784.00	1360.50	5004.50	4163.50	32800.95
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Sale of selected vegetables by organized and unorganized stores

Table-2 Sale of vegetables by unorganized stores (Kg)

Vegetables	Name of stores										Total
	MPN	ASR	OF	VMS	SPN	WS	SS	MPS	DVM	SRI PN	
Carrot	449.00	62.00	315.03	46.50	622.00	93.00	71.85	115.03	372.00	507.20	2653.61
	(7.22)	(7.67)	(5.52)	(4.23)	(11.18)	(11.58)	(9.59)	(8.59)	(7.89)	(12.83)	(8.57)
Brinjal	259.20	93	231.62	77.50	364.00	91.50	77.10	104.60	325.50	499.99	2124.01
	(4.17)	(11.51)	(4.06)	(7.06)	(6.54)	(11.40)	(10.29)	(7.82)	(6.91)	(12.64)	(6.86)
Bhendi	180.40	92.20	234.03	77.50	361.00	91.45	80.14	119.25	269.50	395.00	1900.47
	(2.90)	(11.41)	(4.10)	(7.06)	(6.49)	(11.39)	(10.70)	(8.91)	(5.72)	(9.99)	(6.14)
Cabbage	1310.70	65.00	633.74	77.50	433.00	95.00	139.25	101.00	263.00	489.65	3607.84
	(21.11)	(8.04)	(11.10)	(7.05)	(7.78)	(11.83)	(18.59)	(7.55)	(5.58)	(12.38)	(11.66)
Cauliflower	1027.10	65.00	522.49	77.50	359.00	90.00	67.25	121.00	179.20	218.35	2726.89
	(16.52)	(8.04)	(9.15)	(7.05)	(6.45)	(11.21)	(8.98)	(9.04)	(3.80)	(5.52)	(8.81)
Tomato (H)	1221.50	153.80	1972.82	309.50	1971.00	152.00	150.95	353.00	1693.00	912.00	8889.57
	(19.65)	(19.03)	(34.56)	(28.16)	(35.43)	(18.93)	(20.15)	(26.38)	(35.93)	(23.06)	(28.72)
Tomato (C)	1371.40	154.75	1525.95	308.90	960.00	154.00	129.50	320.50	1413.00	743.40	7081.40
	(22.06)	(19.15)	(26.73)	(28.11)	(17.26)	(19.18)	(17.28)	(23.95)	(29.99)	(18.80)	(22.88)
Bitter Gourd	179.10	61.70	152.74	46.50	160.00	18.00	18.80	49.00	94.76	100.35	880.95
	(100.00)	(100.00)	(2.68)	(4.23)	(2.88)	(2.25)	(2.50)	(3.66)	(2.01)	(2.54)	(2.85)
Snake Gourd	217.10	60.80	119.66	77.50	333.00	17.90	14.40	55.00	102.20	88.61	1086.17
	(3.49)	(7.52)	(2.10)	(7.05)	(5.99)	(2.23)	(1.92)	(4.10)	(2.17)	(2.24)	(3.51)
Total	6215.50	808.25	5708.08	1098.90	5563.00	802.85	749.24	1338.38	4712.16	3954.55	30,950.90
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Figures in parentheses indicate percentage to total sales quantity

These unorganized stores were of store type kirana stores (ASR, VMS, MP, SS, and WS) and procurement was mainly from nearby assembly/wholesale markets viz. Anna market and TK market. The stores for fruits and vegetables namely MPN, SRI PN, DVM, SPN and OF procure from more sources like MGR, ADM, MTP and TK markets. Percentage was worked out to study the volume of procurement, sales and shrinkages in selected vegetables in individual stores.

Results

Procurement of selected vegetables in unorganized stores

The major markets in and around Coimbatore city are Mettupalayam market for carrot and cabbage, TK market for bitter gourd and snake gourd, MGR market for majority of the selected vegetables like tomatoes, cauliflower, brinjal and bhendi. Alandurai market is preferred for tomatoes. Unorganized stores procured selected vegetables from various markets but eliminated suppliers and agents. Few unorganized stores procured from Anna market due to time constraint and distance. Forecasting of unorganized stores was based on previous week's sales and week days. The details of procurement pattern of unorganized stores are presented in [Table-1]. Unorganized stores have shown wide variations in procurement pattern. It could be observed from [Table-1] that the range of

procurement of selected vegetables across the stores starts with 784 kg (2.39 percent) in SS and ends up with the highest procurement of 6694 kg (20.40 percent) in MPN to add up to a total procurement of 32800.95 kg of selected vegetables. MPN and OF caters with the highest procurement of 6694 kg and 6289.45 kg of selected vegetables respectively followed by SPN and SRI PN with 5777.5 kg and 5004.5 kg.

Table-3 Average Sales Value and Volume of vegetables by Unorganized stores

Vegetables	Unorganised Stores	
	Avg. Sales Value	Avg. Sales Volume
Carrot	14586(12.58)	265.40(8.57)
Brinjal	10502(9.05)	212.40(6.86)
Bhendi	10129(8.73)	190.10(6.14)
Cabbage	13565(11.70)	360.80(11.66)
Cauliflower	12566(10.83)	272.70(8.81)
Tomato (H)	31833(27.45)	889.00(28.72)
Tomato (C)	3189(2.75)	708.10(22.88)
Bitter Gourd	16439(14.17)	88.10(2.85)
Snake Gourd	3171(2.73)	108.60(3.51)
Total	115979(100.00)	3095.10(100.00)

Table-4 Shrinkage volume of vegetables in unorganized stores (Kg)

Vegetables	Name of the Stores										
	MPN	ASR	OF	VMS	SPN	WS	SS	MPS	DVM	SRI PN	Total
Carrot	52.41 (11.11)	0.00 (0.00)	18.89 (3.37)	0.00 (0.00)	2.60 (1.23)	0.00 (0.00)	3.65 (11.04)	1.67 (8.22)	21.66 (7.53)	43.05 (21.04)	143.93 (7.97)
Brinjal	43.20 (9.16)	0.00 (0.00)	35.11 (6.27)	0.00 (0.00)	33.60 (15.85)	1.65 (15.35)	3.10 (9.38)	0.40 (1.97)	16.03 (5.57)	25.11 (12.28)	158.20 (8.76)
Bhendi	36.17 (7.67)	0.80 (21.62)	34.43 (6.14)	0.00 (0.00)	28.30 (13.35)	1.25 (11.63)	1.21 (3.66)	0.75 (3.69)	16.41 (5.71)	3.00 (1.47)	122.32 (6.77)
Cabbage	48.15 (10.22)	0.00 (0.00)	86.71 (15.47)	0.00 (0.00)	26.80 (12.64)	0.60 (5.58)	1.75 (5.29)	0.00 (0.00)	6.75 (2.35)	24.37 (11.91)	195.13 (10.81)
Cauliflower	96.21 (20.40)	0.00 (0.00)	94.44 (16.85)	0.00 (0.00)	40.60 (19.13)	4.00 (37.21)	7.20 (21.78)	0.00 (0.00)	15.19 (5.28)	18.90 (9.24)	276.54 (15.32)
Tomato (H)	61.74 (13.09)	1.40 (37.84)	120.52 (21.51)	0.50 (31.25)	28.70 (13.52)	3.00 (27.90)	9.45 (28.59)	7.00 (34.45)	106.86 (37.15)	37.98 (18.57)	377.15 (20.89)
Tomato (C)	61.20 (12.98)	0.25 (6.76)	109.45 (19.53)	1.10 (68.75)	39.90 (18.83)	0.25 (2.33)	6.40 (19.36)	3.50 (17.22)	86.43 (30.05)	30.78 (15.05)	339.26 (18.79)
Bitter Gourd	34.05 (7.22)	0.30 (8.10)	26.64 (4.75)	0.00 (0.00)	9.60 (4.51)	0.00 (0.00)	0.29 (0.90)	6.50 (31.99)	11.90 (4.14)	10.11 (4.94)	99.40 (5.50)
Snake Gourd	38.43 (8.15)	0.95 (25.68)	34.19 (6.11)	0.00 (0.00)	2.00 (0.94)	0.00 (0.00)	0.00 (0.00)	0.50 (2.46)	6.43 (2.23)	11.25 (5.50)	93.75 (5.19)
Total	471.56 (100.00)	3.70 (100.00)	560.38 (100.00)	1.60 (100.00)	212.10 (100.00)	10.75 (100.00)	33.06 (100.00)	20.32 (100.00)	287.66 (100.00)	204.55 (100.00)	1805.68 (100.00)

Figures in parentheses indicate percentage to total shrinkage quantity

Table-5 Shrinkage value of vegetables in unorganized stores (Rupees)

Vegetables	Name of stores											Total
	MPN	ASR	OF	VMS	SRI PN	DVM	MP	SS	SPN	WS		
Carrot	2569	0	1171	0	2325	1119	100	204	146	0	7634	
	(15.57)	(0.00)	(4.59)	(0.00)	(29.68)	(11.49)	(10.87)	(14.60)	(1.77)	(0.00)	(10.76)	
Brinjal	1814	3	2036	0	1256	801	24	155	1512	92	7693	
	(11.00)	(1.67)	(7.98)	(0.00)	(16.03)	(8.22)	(2.60)	(11.07)	(18.34)	(19.07)	(10.83)	
Bhendi	1411	45	2238	0	165	846	50	61	1358	70	6244	
	(8.55)	(26.77)	(8.77)	(0.00)	(2.11)	(8.68)	(5.37)	(4.32)	(16.47)	(14.44)	(8.81)	
Cabbage	1685	0	3902	0	926	236	0	61	937	24	7771	
	(10.22)	(0.00)	(15.29)	(0.00)	(11.82)	(2.42)	(0.00)	(4.37)	(11.37)	(4.95)	(10.91)	
Cauliflower	3770	0	5666	0	851	729	0	346	1946	180	13488	
	(22.86)	(0.00)	(22.20)	(0.00)	(10.86)	(7.48)	(0.00)	(24.69)	(23.60)	(37.14)	(18.95)	
Tomato (H)	1920	70	4774	20	874	3727	350	373	994	112	13214	
	(11.64)	(41.83)	(18.70)	(37.74)	(11.15)	(38.24)	(37.97)	(26.64)	(12.05)	(23.11)	(18.74)	
Tomato (C)	1235	8	2748	33	716	1710	100	192	968	6	7716	
	(7.49)	(4.48)	(10.77)	(62.26)	(9.14)	(17.55)	(10.85)	(13.71)	(11.74)	(1.29)	(10.96)	
Bitter	1090	9	1279	0	384	417	283	8	335	0	3805	
Gourd	(6.61)	(5.38)	(5.01)	(0.00)	(4.90)	(4.27)	(30.70)	(0.59)	(4.06)	(0.00)	(5.39)	
Snake	999	33	1710	0	338	161	15	0	50	0	3306	
Gourd	(6.06)	(19.87)	(6.70)	(0.00)	(4.31)	(1.65)	(1.63)	(0.00)	(0.61)	(0.00)	(4.66)	
Total	16,493	168	25,524	53	7835	9746	922	1400	8246	484	70,871	
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	

Figures in parentheses indicate percentage to total shrinkage value

It is also observed that unorganized stores showed very high interest on procurement of tomatoes contributing to 19.02 percent in WS and 34.62 percent in SPN and very low on procurement of gourds contributing only 2.20 percent in DVM and 7.4 percent in ASR. VMS and MPS had a procurement of 1100.5 kg and 1360.5 kg of selected vegetables respectively. VMS had prime importance over tomatoes constituting about 56.34 percent and MPS with 50.27 percent of tomatoes. Thus, unorganized stores had also least importance over procurement of gourds. The unorganized stores owned as single ownership and most of the procurement decisions were based on customers and week days. The essential vegetables were procured to maintain their regular customers. The store MPN had tomato, cabbage and cauliflower to its major procurement pattern. The vegetable like carrot and other vegetables were given lesser importance. The store ASR next to tomato had brinjal and bhendi as its second major procured vegetable followed by other vegetables. The store OF had a significant procurement of cabbage and cauliflower besides tomato but had a minimal procurement of gourds. Unorganized stores such as VMS, SS and WS had shown above average total procurement on every vegetable equally next to tomatoes. The store DVM had a total procurement of 5004.5 kg of vegetables constituting 15.3 percent of total procurement of vegetables by unorganized stores. Apart from tomato, carrot and brinjal were followed with high procurement quantity. The store SRI PN had more

than 10 percent share in procurement across all vegetables except cauliflower and gourds. Majority of the stores procured gourds however in lesser quantity than other vegetables. It could be observed that unorganized stores were very keen in ensuring the availability of common vegetables in the store.

The details regarding vegetables sold by the unorganized stores (store wise) are furnished in [Table-2]. The total sale in unorganized stores was 30950 kg ranging from 6215.57 in MPN to 749.24 kg in SS. It could be observed that the store MPN had sales percentage of more than 20 in both country tomato (22.06 percent) and cabbage (21.09 percent) followed by hybrid tomato (19.65 percent) and cauliflower (16.52 percent). ASR had weighty sales on brinjal and bhendi with 11.51 percent apart from tomatoes. The store SS had low sales percentage of 1.92 in snake gourd. Gourds had been the least contributor to total sales of the stores. Superior among the ten unorganized stores are MPN, OF and SPN whose sales volume is the highest followed by DVM and SRI PN. ASR had 19 percent of share in tomatoes followed by 11 percent in brinjal and bhendi, 8 percent in cabbage and cauliflower, 7 percent in carrot and gourds. Sales for VMS range from 4 percent in carrot and bitter gourd to 28 percent in country and hybrid tomatoes. OF had the lowest sale on gourds followed by brinjal and bhendi. SPN had a total sale of 5563 kg, hybrid tomato (37 percent) and country tomato (17 percent) had high sales followed by carrot (11.18 percent).

SRI PN had a total sale of 3954 kg with 41.80 percent of tomatoes and 37 percent of carrot, brinjal and cabbage. No specific offers and discounts were available in the unorganized stores irrespective of availability of credit in certain stores.

Average Sales Value and Volume of vegetables by Unorganized stores

The details regarding sales value of vegetables sold by unorganized stores are furnished in [Table-3]. The average sale value of organized stores was Rs.1,15,979 by unorganized stores. Among the different vegetables, hybrid tomato constituted 24.23 percent of the total value of vegetables sold by the unorganized stores followed by carrot (16.04 percent) and cabbage (12.35 percent) respectively. Brinjal (7.11 percent) followed by snake gourd (3.57 percent) and bitter gourd (8.67 percent) were the minimum sold out volume and valued vegetables by these stores. Unorganized stores were observed capable of maximizing their return with the proper procurement of required quantity or even fix a certain target for day-to-day sales which varied on weekends. Carrot had been the most valued vegetable among unorganized stores. Brinjal and bhendi had also contributed eventually to the sales by unorganized stores.

Among the different vegetables, hybrid tomato constituted 27.45 percent of the total value of vegetables sold by unorganized stores followed by carrot (12.58 percent) and cabbage (11.70 percent) respectively. Brinjal (9.05 percent) followed by snake gourd (2.73 percent) were the minimum sold out volume and valued vegetables by these stores.

Shrinkage of selected vegetables in unorganized stores

Maintaining a low shrinkage rate allows to stick to quality customer service. Retail shrinkage is the portion of procurement that gets lost without being added to sales. Keeping shrinkage rate low is critical to success in the business. Zero waste refers to waste management that focuses on restructuring procurement and sales pattern to reduce waste. Zero waste provides guiding principles for continually working towards eliminating wastes. Understanding the volume of shrinkage is essential to suggest a control measure which varies from store to store. The details regarding volume of shrinkage of vegetables by the organized stores are furnished in [Table-4].

Shrinkage is of least concern in major unorganized stores. It could be observed from Table 4 that unorganized stores had total shrinkage volume of 1805.698 kg. The store OF had highest shrinkage with 570.38 kg (31.59 percent), followed by MPN with 471.56 kg (26.11 percent) and DVM with 287.66 kg (15.93 percent). Lowest shrinkage was weighted in VMS with 1.6 kg (0.08 percent) followed by ASR with 3.7 kg (0.20 percent) of total shrinkage in unorganized stores. VMS had ensured zero shrinkage in majority of the vegetables. MPS and ASR had ensured zero shrinkage in cabbage and cauliflower. Zero shrinkage in snake gourd was obtained in WS and SS. The store ASR had maintained zero shrinkage in carrot and brinjal followed by WS in bitter gourd and carrot.

Unorganized stores are mainly concerned with insufficient selling space. Most of the vegetables are piled up and dumped so closely leading to shrinkage of vegetables. Zero shrinkage was a common sight across various unorganized stores. The stores ASR, VMS and WS had achieved zero shrinkage in three vegetables followed by MPS and SS with two vegetables. No special strategies were implemented rather than "sell maximum". Zero shrinkage is obtained by various unorganized stores as they follow procurement only after sale and the required quantity is obtained from nearby market which is very accessible.

The detail regarding value of shrinkage vegetables by the unorganized stores are furnished in Table 5. It could be observed that in unorganized stores the loss of value due to shrinkage amounted to Rs.70,871. The stores OF and MPN had highest shrinkage value of 36.01 percent and 23.27 percent respectively. The lowest of shrinkage value was observed in the stores VMS and ASR with 0.07 percent and 0.23 percent. The store DVM had high shrinkage value from tomatoes (55.79 percent). Zero shrinkage value was observed in MP on cabbage and cauliflower. Less than 5 percent shrinkage value was seen in carrot and gourds in SPN. Zero percent shrinkage value was seen in carrot and gourds in the store WS.

Conclusion

The daily average procurement of vegetables by all the unorganized stores was 1058.10 kg. The daily average sale of unorganized stores was 998.43 kg and the daily average shrinkage was 58.20 kg. The daily average sales value of unorganized stores was Rs. 37412.70. The percentage share of sales to procurement (all vegetables) in unorganized stores was 94.36 percent. Carrot and Tomatoes were the mostly sold vegetables with respect to procurement in unorganized stores. The unorganized stores had share of more than 90 percent of sales on every selected vegetable procured. The percentage share of shrinkage on procurement volume indicates 5.50 percent in unorganized stores. The unorganized stores had showed less than 10 percent shrinkage on every vegetable except bitter gourd (10.12 percent).

Application of research: The high value vegetables such as tomatoes and carrots had shown less shrinkage percentage with respect to sales in unorganized stores.

Research Category: Agribusiness Management

Acknowledgement / Funding: Authors are thankful to ICAR-Krishi Vigyan Kendra, Vamban, Pudukkottai, 622303, Tamil Nadu Agricultural University, Coimbatore, 641003, Tamil Nadu, India

****Principal Investigator or Chairperson of research:** Dr V. M. Indumathi

University: Tamil Nadu Agricultural University, Coimbatore, 641003, India

Research project name or number: Research station study

Author Contributions: All authors equally contributed

Author statement: All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

Study area / Sample Collection: ICAR-Krishi Vigyan Kendra, Vamban, Pudukkottai, 622303

Cultivar / Variety / Breed name: Fruits and Vegetables

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Ethical Committee Approval Number: Nil

References

- [1] Buzby J.C., Bentley J.T., Padera B., Ammon C. and Campuzano J. (2015) *Journal of Agriculture*, 5, 626-648.
- [2] Deliya M., Thakor C., Parmar B. (2012) *Journal of Research in Commerce and Management*, 1, 40-57.
- [3] Arivazhagan R., Geetha. P and Parthasarathy R. (2012) *International Journal of Trade Finance and Economics*, 3(3).
- [4] Viswandhan N. (2010) *Food Supply Chain in India*.