

Food loss in supermarkets: What can supermarkets do to reduce food loss?

by

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WASTE NOT, WANT NOT:

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OUTLINE OF PRESENTATION

1. **Introduction**
2. **Methodology**
3. **Results and discussion**
4. **Conclusions and Implications**

INTRODUCTION

Food loss is an emerging issue in the food policy agenda due to its contribution to:

- financial losses
- food security issue
- waste of natural resource.

Food loss occurs along the entire food supply chain including:

- loss at farm level,
- loss at the wholesale and retail level,
- loss at the consumer level.

INTRODUCTION

Loss at the retail stage has a relatively small share on the total food loss:

- E.g., Gobel et al. (2012) and Jensen et al. (2011) reported that retail sector contributed to the food loss about 3% in Germany and 3.8% in Swedish.

Although the retail percentage loss is relatively low, the total loss volume was relatively high:

- 95-115 kg/year per capita in developed countries (FAO, 2011)
- 6-11 kg/year per capita in developing countries (FAO, 2011)
- 39,000 tons per year in Sweden (Jensen et. al, 2011)
- 4.4 million tons per year in the European Union (EC, 2010).

INTRODUCTION

Among retail markets, supermarkets have important roles in food chains:

- Located close to the end of the food chains
- In developing countries supermarkets are increasing significantly and making a significant contribution to national retail food sales.

In Indonesia, the number of supermarkets increased significantly in the period of 2009-2014.

Type of Outlets	Value Growth (%)	Number of Outlets (,000) in 2014	No. Outlets Growth (%)
	2009-2014 (CAGR)		2009-2014 (CAGR)
Convenience Stores	34.0	22.8	17.8
Hypermarkets	12.7	0.3	13.3
Supermarkets	15.0	1.4	5

Source: USDA GAIN Reports, 2015

The share of fresh food products to supermarket sales increased.

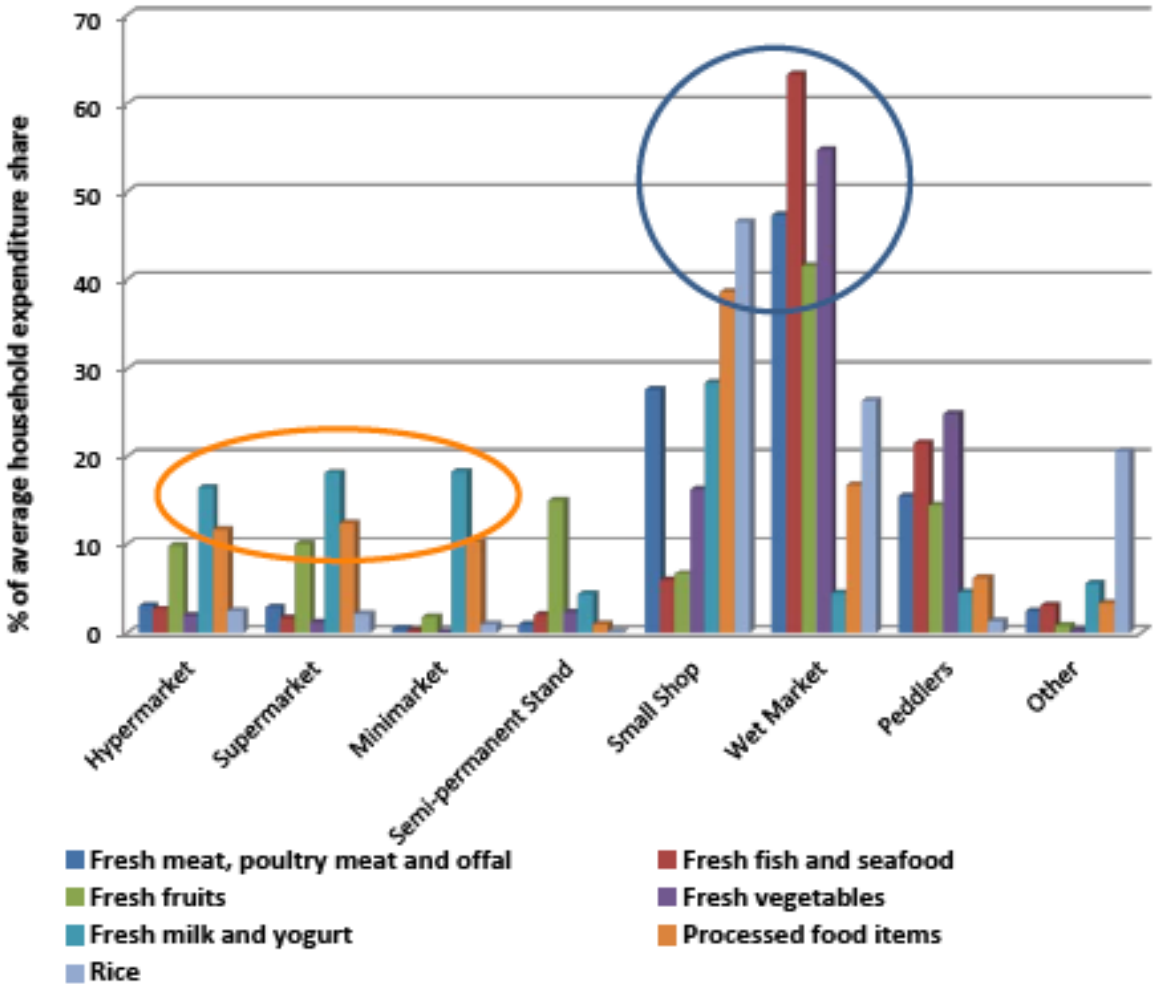
- In the three leading supermarkets in Indonesia, the contribution of FFVs to supermarket was about 15% in 2015 (Sahara, et al., 2015).

Average Share of Expenditures on Food in Various Retail Formats in Indonesia

Commodities	Hypermarket	Supermarket	Minimarket
Fresh Market and Poultry	3.1	2.9	0.5
Fresh Fish and Seafood	2.6	1.6	0.2
Fresh Fruit	9.8	10.0	1.7
Fresh Vegetables	1.9	1.1	0.1
Fresh Milk and Yogurt	16.4	18.1	18.3
Processed Food	11.7	12.4	10.2
Rice	2.4	2.0	0.9

Source: Toiba, Hery (2011)

Share of Food Expenditures by Product: Modern vs. Traditional Retail Outlets



Source: Toiba, Hery (2011)

Traditional

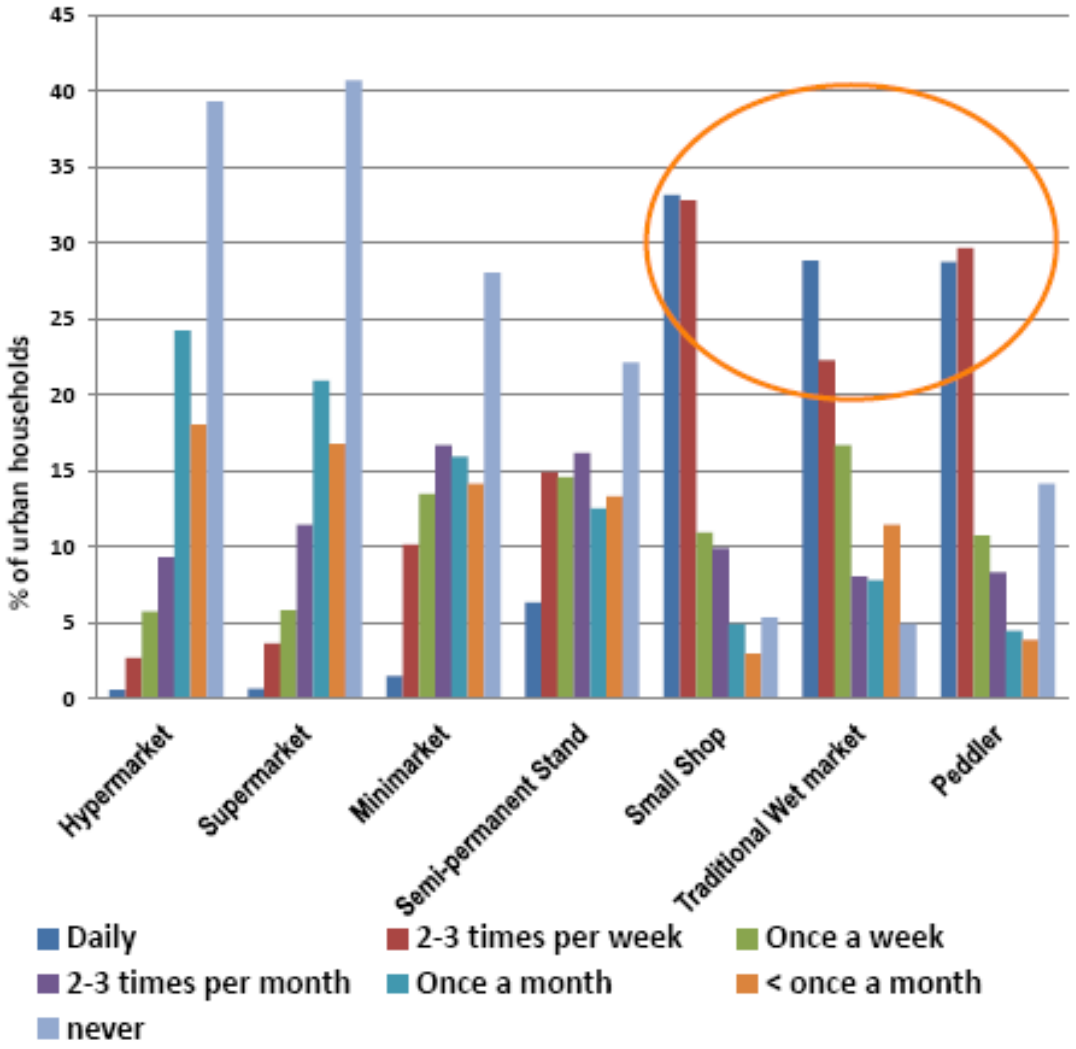
>40% expenditure on fresh meat, fish &FFV spent at wet market and

>14% at peddler

Modern

- < 10% expenditure on fresh produce & vegetables spent at modern food retailers (MFR)
- 20% expenditure on fresh fruits spent at MFR
- 52% expenditure on fresh milk and 35% processed foods at MFR

Food Shopping Frequency: Modern vs. Traditional Food Retail Formats



Heterogeneity in use of outlets

- Traditional
  - Small shops, wet markets & peddlers are used on ≥ weekly basis by most (>65%)
- Modern
  - 10% shop ≥ weekly at hypermarkets & supermarkets
  - 25% shop ≥ weekly at minimarkets

Source: Toiba, Hery (2011)

INTRODUCTION

It is expected that supermarkets' share of retail food sales will continue to increase along with:

- Rapid growth of per capita income
- Urbanization
- Liberalization in foreign direct investment

INTRODUCTION

Food loss in supermarkets can reduce profit and the products most susceptible to loss are fresh products including FFVs.

- From a microeconomics perspective:
  - examining the amount of fresh products that goes unsold in supermarkets is timely to understand where and how much food loss can be reduced to improve supermarket profitability (Bubzy, et al., 2015).
- From the macro perspective:
  - reducing food can contribute positively to the food availability and food security particularly in urban area as well as save in natural resource.

OBJECTIVE

This paper aims to:

- Review and estimate food loss in supermarkets focusing on fresh food products: meat, fruits, vegetables, and fish.

In this study, the term supermarket refers to modern food retailers, including hypermarkets, supermarkets and convenience stores.


METHODOLOGY



METHODOLOGY

Data

- A literature review: studies related to food loss at retail outlets, particularly supermarkets
- A case study in a leading supermarket chain in Indonesia.
  - Focusing on fresh products: fruits, vegetables, fish, and meat.

METHODOLOGY

- The case study:
  - Interview with the director of the fresh product department in the leading supermarket chain
- The leading supermarket is currently running 2 types of stores (Table 1):
  - Wholesale stores:
    - Refer to large stores where the main market segmentation dedicated for hotel, restaurant, catering, and other small retailers
    - Sell large number of products with lower prices compared to retail market
    - Data coverage: 27 months (January 2014-March 2016)
  - Retail stores.
    - Refer to hypermarket and department stores where the main market segmentation dedicated for households
    - The products sold are more various but with relatively small number in terms of quantity and value
    - Data coverage: 24 months (January 2014-December 2015)

2 METHODOLOGY

Table 1. Number of stores in the leading supermarket chain focused in the case study in 2014-2016

Types of store	2014	2015	2016
Wholesale store	24	24	25
Retail store			
- Hypermarket	13	13	14
- Department Store	1	3	2

2 METHODOLOGY

- The food loss calculation
  - The ratio between the value of food losses (unsold products) and total value of sales in each store running by the leading supermarket chain.

$$\text{Percentage of food loss} = \frac{\text{Value of food losses}}{\text{Total sale value}} \times 100\%$$


RESULTS AND DISCUSSION



3 RESULTS AND DISCUSSION

3.1 Review of food loss studies at the supermarket and retail levels

The definitions of food loss varies among the studies and are sometimes interchangeable with food waste (see Table 2).

As such, the estimates from the previous studies are not directly comparable

- leading to issue to perform precise comparisons across the studies.

Table 2. Review of previous studies

Author	Definition of food loss	Estimation	Main findings
Eriksson (2012): food loss at six supermarkets in the Uppsala-Stockholm region of Sweden.	The products discarded in the supermarkets, irrespective of whether they belonged to the supplier or the supermarket	Based on weight	• Food loss ranged from 1.3%-3%. • Tomato was the most wasted product followed by banana and lettuce
Bubzy et al. (2015): fresh produce shrink and food loss of US supermarkets	The produce that is delivered into supermarkets for sale but is not sold for any reason	Based on weight	• The shrink rate for individual fresh vegetable products: ranged from 2.2% for sweet corn to 62.9% for turnip greens. • The shrink rate for individual fresh fruit products: ranged from 4.1% for bananas to 43.1% for papayas. • The annual food loss for fresh vegetable and fruit products: 6.1 billion pounds and 5.9 billion pounds
FAO (2011): examined food losses in the entire food chain in developed and developing countries	The decrease in edible food mass throughout the part of the supply chain that specifically leads to edible food for human consumption	Based on weight	• Loss rate for fruits and vegetables was the highest which was above 10% in all countries, followed by waste at fish and seafood products and meat.

Table 2. Review of previous studies (cont...)

Author	Definition of food loss	Estimation	Main findings
Bond et al. (2013): examined food loss along the entire food chain in the UK	All food and drinks discarded throughout the entire food chain	Based on weight	Food losses within distribution and retail reached about 3% of total losses equivalent to 366,000 tones per year.
Lipinski et al., (2013): examined food loss in developed and developing countries	The edible parts of plants and animals produced or harvested for human consumption but not ultimately consumed by people	Based on weight then they converted them into calories	• By kcal (kilo calories), loss rate for fruits and vegetables contributed about 13% (100%=1.5 quadrillion kcal). • For meat products, loss rates based on weight and kcal were about 4% and 7%, respectively. • For fish and seafood commodities, loss rates based on weight and kcal were about 2% and 1%, respectively.

3 Results and discussion

3.2. Case study results

- **3.2.1. The flow of fresh products in the store**

There are four stages in which products flow before they can be sold to consumers: receiving, transiting, storing and displaying.

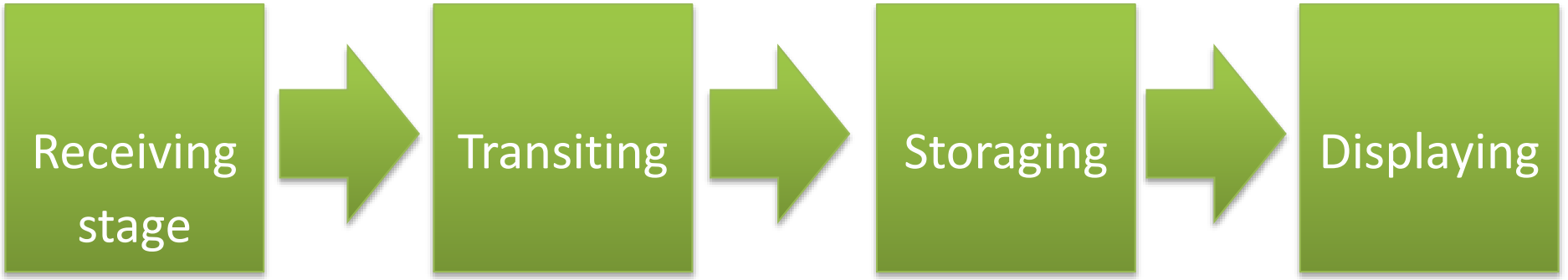


Figure 1. The fresh food flow in the stores

3 Results and discussion

3.2. Case study results

Receiving stage:

- Fresh food products are received at the distribution centre (DC)
- The DC can accomodate 35-40 tons of fresh food products per day: 60% vegetables, 30% fruits and 10% sea water products.
- The products received in the DC are checked and distributed to stores located in Jakarta, Bogor, Depok, Bekasi and Serang.

Figure 4. Activities at the distribution center of the leading supermarket chain

3 Results and discussion

3.2. Case study results

Transit area is available in each store. At this stage, the quality and quantity of the products is re-checked before placed into the storage room (Figure 5).

Figure 5. Transit area in one store running by the leading supermarket chain

Storage activity

Figure 6. Storage room in one store running by the leading supermarket chain

3 Results and discussion

3.2. Case study results

Displaying

Figure 7. Product displaying in one store running by the leading supermarket chain

3 Results and discussion

3.2.2 The causes of waste

Over order

Lack in performing the FIFO principle

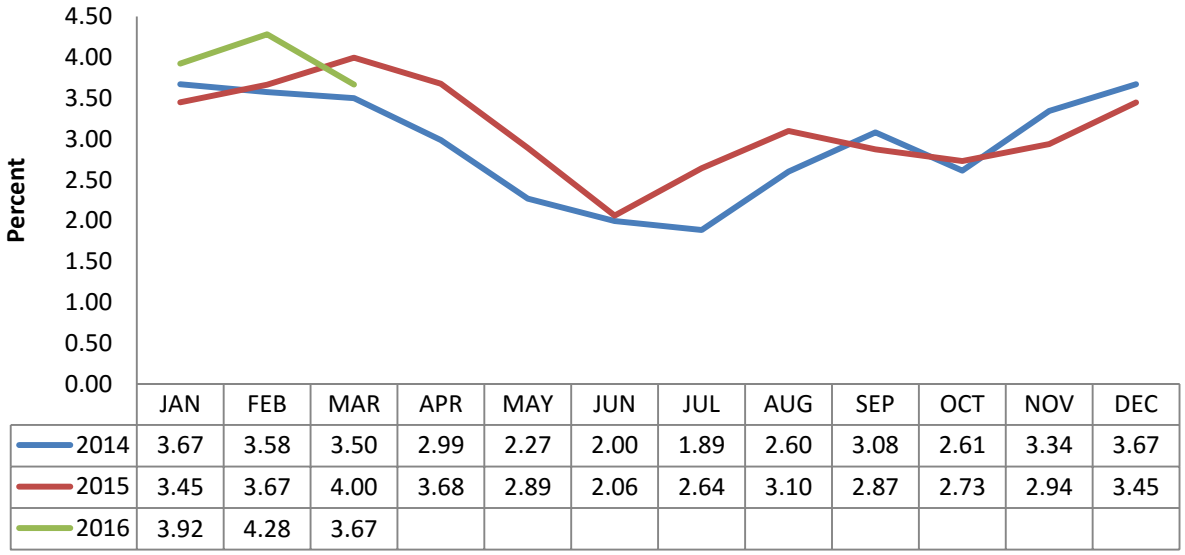
Failed to maintain temperature

Lack of staff ability to perform right quality check

Bad handling

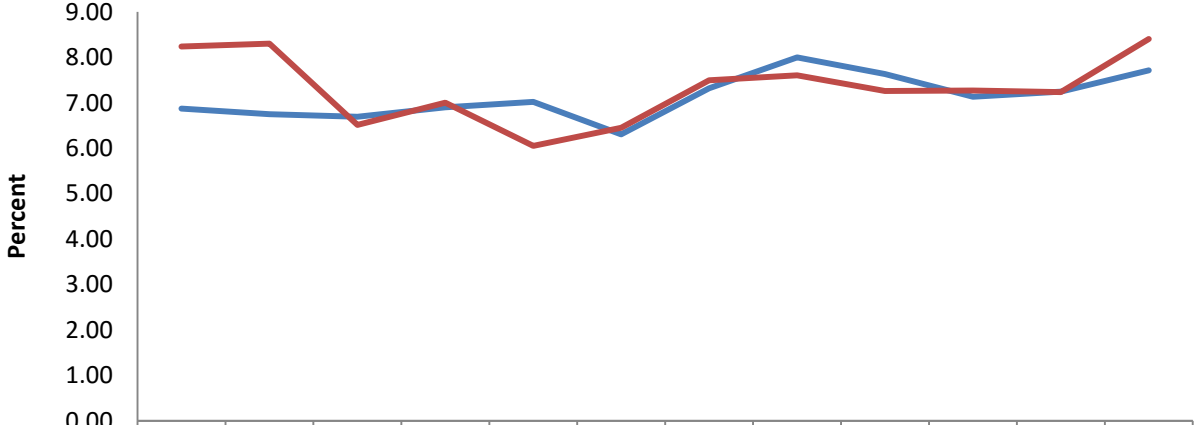
3 Results and discussion

3.2.3 Quantification of loss values



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	3.67	3.58	3.50	2.99	2.27	2.00	1.89	2.60	3.08	2.61	3.34	3.67
2015	3.45	3.67	4.00	3.68	2.89	2.06	2.64	3.10	2.87	2.73	2.94	3.45
2016	3.92	4.28	3.67									

Figure 8. Estimated losses of four fresh products in the wholesale stores (%)



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	6.87	6.75	6.69	6.90	7.02	6.30	7.32	8.00	7.63	7.13	7.25	7.71
2015	8.24	8.30	6.51	7.00	6.05	6.45	7.49	7.60	7.26	7.27	7.23	8.40

Figure 9. Estimated losses of four fresh products in the retail stores (%)

The average loss rates for fruit, vegetable, fish and meat in the wholesale stores ranged from 1.89% to 4.28% of their total sales (Figure 8).

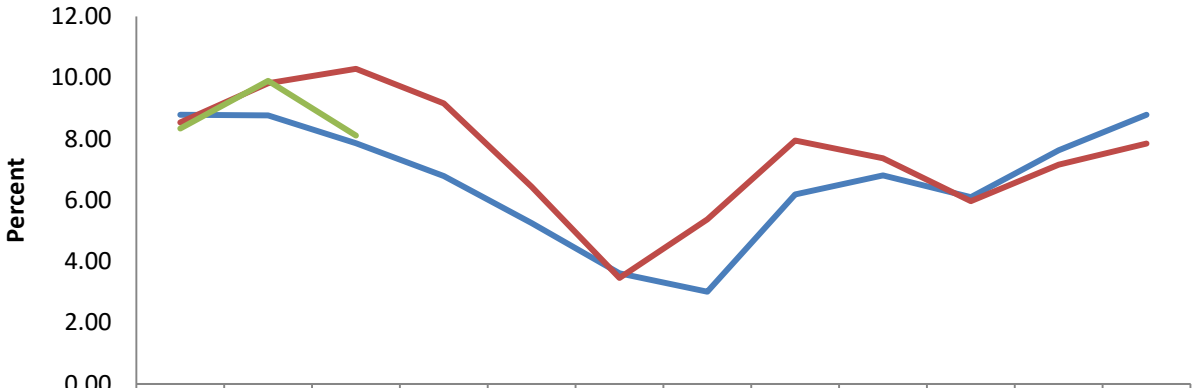
For retail stores, the average loss rates were higher compared to the wholesale stores, ranging from 6.05% to 8.24% (Figure 9).

Store policies: require retail stores to sell a range of products might explain higher rates in the retail stores than the wholesale stores.

In both stores, there was a month to month fluctuation with respect to the loss rates→ Month to month fluctuations in demand and supply .

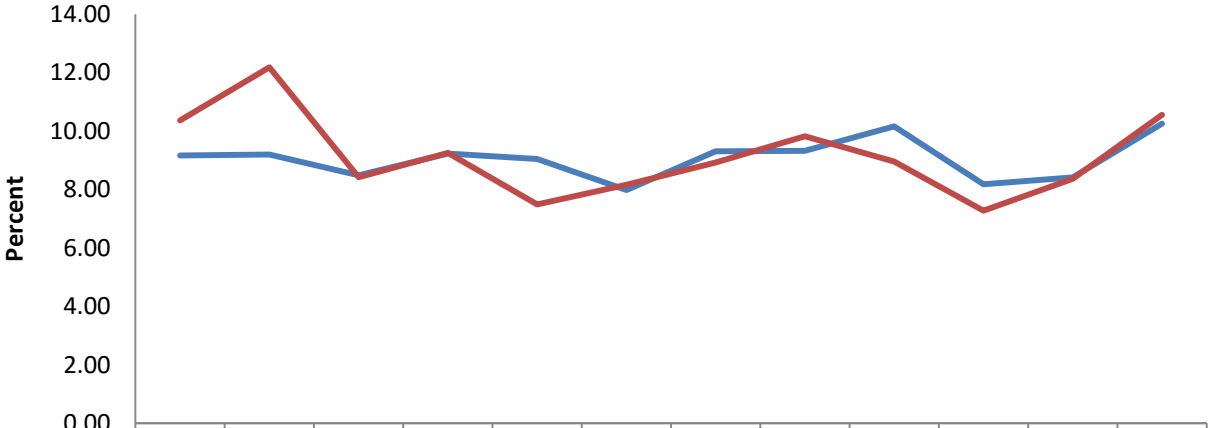
3 Results and discussion

3.2.3 Quantification of loss values



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	8.79	8.77	7.86	6.79	5.25	3.61	3.01	6.19	6.81	6.10	7.63	8.79
2015	8.54	9.82	10.29	9.16	6.44	3.46	5.37	7.95	7.37	5.97	7.16	7.85
2016	8.34	9.9	8.11									

Figure 10. Estimated losses of fruit products in wholesale stores (%)



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	9.17	9.20	8.49	9.23	9.05	7.98	9.31	9.33	10.16	8.18	8.42	10.26
2015	10.37	12.19	8.42	9.26	7.49	8.17	8.93	9.82	8.96	7.28	8.37	10.56

Figure 11. Estimated losses of fruit products in the retail stores (%)

Fruit products contribute to the highest level at loss rate.

The loss rates for fruit products were about 3.01%-10.29% in the wholesale stores (Figure 10) and 7.28%-10.56% in the retail stores (Figure 11).

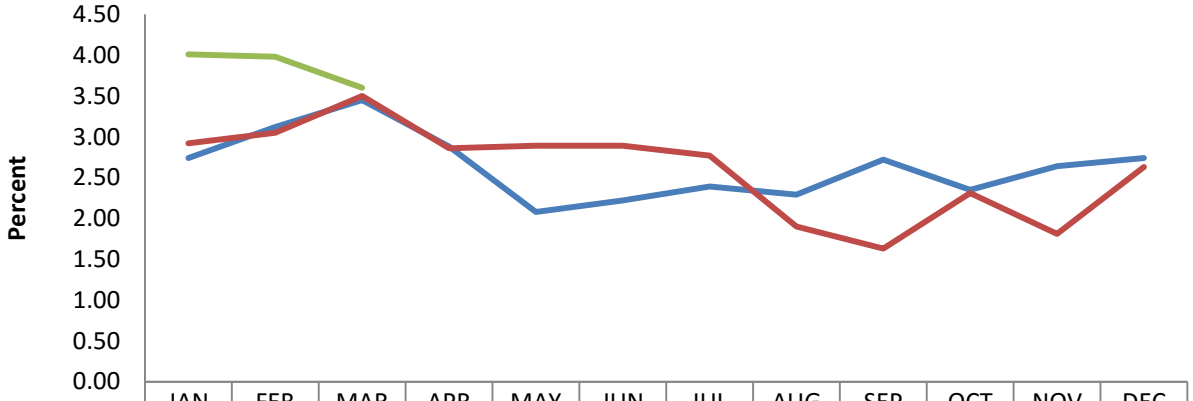
The majority of fruits include as soft fruit.

When consumers select fruits displayed by the stores, the probability of crushing and bruising of fruit commodity will increase.

Poor handling can also contribute to crushing and bruising of fruit products, increasing the number of fruit losses.

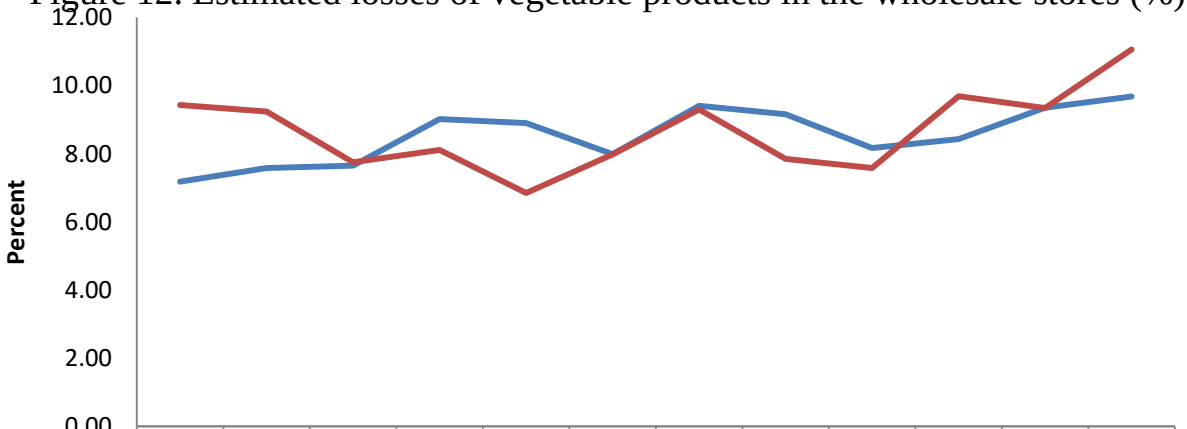
3 Results and discussion

3.2.3 Quantification of loss values



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	2.74	3.12	3.45	2.88	2.08	2.22	2.39	2.29	2.72	2.35	2.64	2.74
2015	2.92	3.05	3.50	2.86	2.89	2.89	2.77	1.90	1.63	2.31	1.81	2.63
2016	4.01	3.98	3.60									

Figure 12. Estimated losses of vegetable products in the wholesale stores (%)



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	7.18	7.58	7.65	9.02	8.90	7.99	9.41	9.16	8.17	8.43	9.35	9.68
2015	9.43	9.24	7.75	8.11	6.85	7.98	9.30	7.85	7.58	9.69	9.34	11.06

Figure 13. Estimated losses of vegetable products in the retail stores (%)

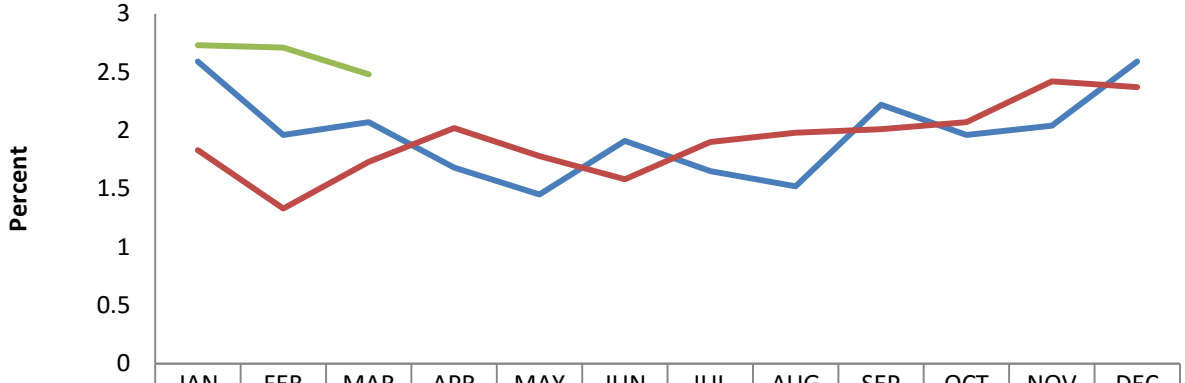
Loss rates for vegetable products varied from 1.81% to 4.01% in the wholesale stores (Figure 12) and from 6.85% to 11.10% in the retail stores (Figure 13).

Vegetable products, particularly leafy greens such as spinach, water spinach, and lettuce, are relatively more prone to have loss

Products such as tomatoes, chili, and green bean are usually sold in bunches and are not protected by packaging.

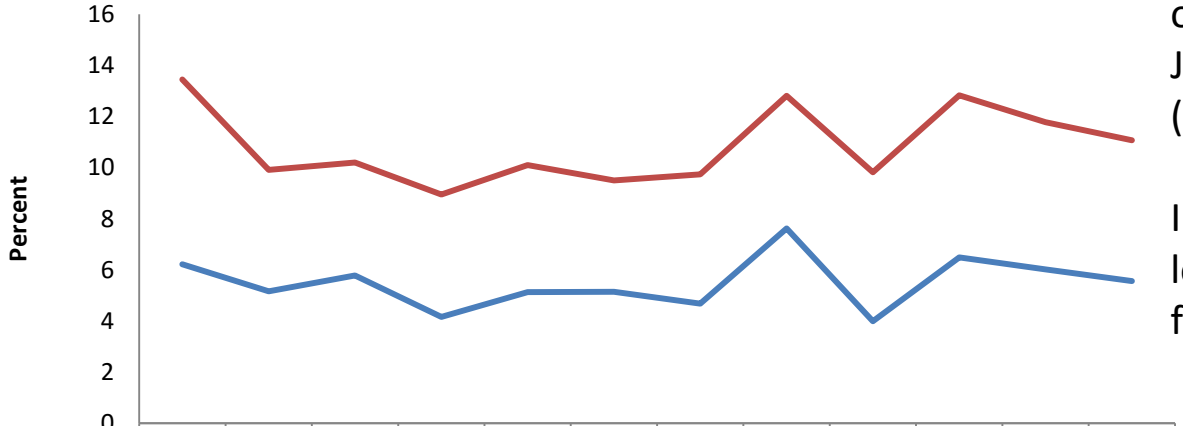
3 Results and discussion

3.2.3 Quantification of loss values



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	2.59	1.96	2.07	1.68	1.45	1.91	1.65	1.52	2.22	1.96	2.04	2.59
2015	1.83	1.33	1.73	2.02	1.78	1.58	1.9	1.98	2.01	2.07	2.42	2.37
2016	2.73	2.71	2.48									

Figure 14. Estimated losses of fish products in the wholesale stores (%)



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2015	7.23	4.75	4.42	4.79	4.97	4.36	5.06	5.19	5.83	6.34	5.76	5.51
2014	6.22	5.16	5.78	4.16	5.13	5.14	4.68	7.62	3.99	6.49	6.02	5.56

Figure 15. Estimated losses of fish products in the retail stores (%)

Fish has a relatively small share on food losses both in wholesale and retail stores.

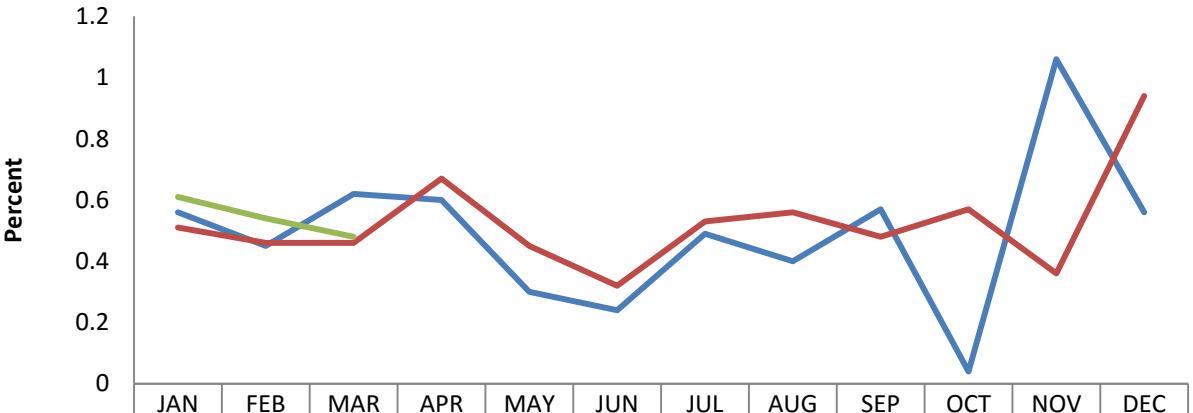
This is because fish products sold in both stores are mainly in the form of chilled fish (in retail stores) or frozen fish (in wholesale stores).

At the wholesale stores, fish loss rates ranged from 1.33% to 7.3% of total sale in the period of January 2014 to March 2016 (Figure 14).

In the retail stores, the average loss rates for fish products ranged from 3.99% and 7.62% (Figure 15).

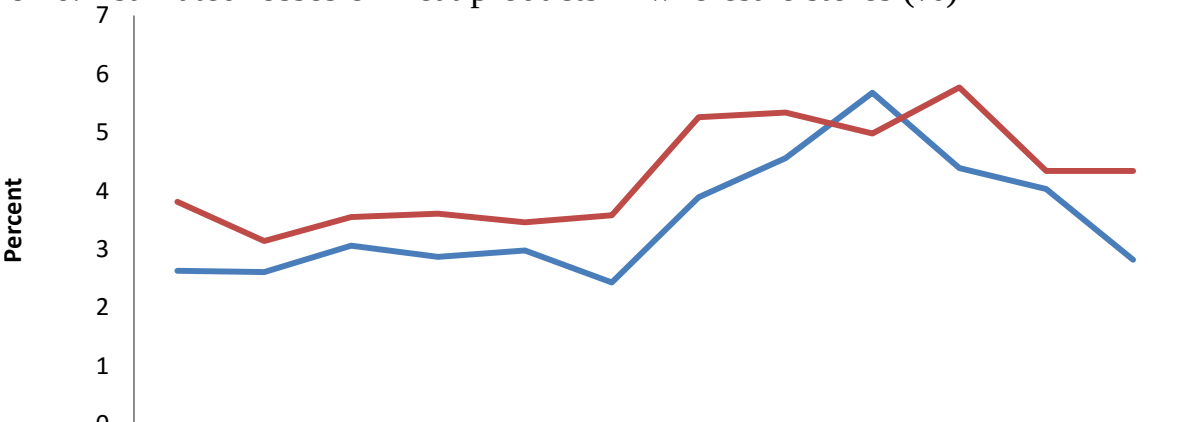
3 Results and discussion

3.2.3 Quantification of loss values



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	0.56	0.45	0.62	0.6	0.3	0.24	0.49	0.4	0.57	0.04	1.06	0.56
2015	0.51	0.46	0.46	0.67	0.45	0.32	0.53	0.56	0.48	0.57	0.36	0.94
2016	0.61	0.54	0.48									

Figure 16. Estimated losses of meat products in wholesale stores (%)



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	2.63	2.61	3.06	2.87	2.98	2.43	3.89	4.56	5.68	4.39	4.03	2.82
2015	3.81	3.14	3.55	3.61	3.46	3.58	5.26	5.34	4.98	5.77	4.34	4.34

Figure 17. Estimated losses of meat products in the retail stores (%)

Meat products had the smallest contribution to the loss rates in both stores.

The percentage loss rates on the value basis were about 0.24%-1.06% (Figure 16) in the wholesale stores and 2.43%-5.77% in the retail stores (Figure 17).

Compared to the wholesale stores, loss rates of meat products in retail stores was higher.

The wholesale stores focus on selling meat in frozen form, while the retail stores sell meat mainly in chilled form.


CONCLUSIONS AND IMPLICATIONS



CONCLUSIONS AND IMPLICATIONS

This study has reviewed food losses at the retail (supermarket) level in several countries and estimated the level of loss rates for four fresh products in a leading supermarket chain in Indonesia.

- The review indicates that the definitions of food loss varied considerably across the studies leading to issue in conducting precise comparisons across the studies.
- In general, fruit and vegetable products contribute to the highest share on loss rates at the retail (supermarket level).

In line with previous studies, this study demonstrates the highest loss rates for fruit and vegetable products in the wholesale and retail stores in Indonesia.

- Higher level of loss rates at the retail stores, compared to the wholesale store, related to the supermarket chain's policy requiring retail stores to sell a wider range of products.
- This study also identified factors contributing to the losses of fresh products including: over order, lack of quality check, temperature problem, bad handling, and lack to apply the 'first come, first out' principle.

CONCLUSIONS AND IMPLICATIONS

Some actions should be performed by the leading supermarket to prevent and reduce food losses :

- Manage and establish good ordering system based on historical sale for each store
- Improve space management at the display area
- Improve quality control at receiving area
- Improve handling at receiving, storage and display areas
- Maintain temperature at the receiving, storage and display areas
- Conduct training system for handling process
- Stick with 'first come, first out' principle.
- Improve in-store promotion strategy

The estimation of food losses in this study relies on the case study data in one leading supermarket chain in Indonesia, though we have covered all stores run by the leading supermarket chain (e.g., 40 stores in 2015).

- Future study is needed to include other supermarket chain in Indonesia. Currently, there are at least three leading supermarket chain in Indonesia and each of them operates several stores.


THANK YOU