A qualitative and quantitative analysis of vegetable pricing in supermarket

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Abstract. The purpose of this study is to analyze the variables affecting the determination of the sale price of vegetable which is constant over time in a supermarket qualitatively and quantitatively. It focuses on the non-organic vegetable with a fixed selling price over time such as spinach, beet, and parsley. In qualitative analysis, the sale price determination is influenced by the vegetable characteristics: (1) vegetable segmentation (low to high daily consumed); (2) vegetable age (how long it can last related to freshness); which both characteristic relates to the inventory management and ultimately to the sale price in supermarket. While quantitatively, the vegetables are divided into two categories: the leaf vegetable group that the leaves are eaten as a vegetable with the aging product \( a = 0 \) and the shelf life \( t = 0 \), and the non-leafy vegetable group with the aging group \( a = a + 1 \) and the shelf life \( t = t + 1 \). The vegetable age \( a = 0 \) means they only last for one day when they are ordered then they have to terminate. Whereas \( a + 1 \) is that they have a longer life for more than a day such as beet, white radish, and string beans. The shelf life refers to how long it will be placed in a shelf in supermarket in line with the vegetable age. According to the cost plus pricing method using full price costing approach, production costs, non-production costs, and markup are adjusted differently for each category. There is a holding cost added to the sale price of the non-leafy vegetable, yet it is assumed a 0 holding cost for the leafy vegetable category. The amount of expected margin of each category is correlated to the vegetable characteristics.

Keywords: perishable product, vegetable pricing, selling price, vegetable characteristics, cost plus pricing

1. Introduction
This study analyzes the variables affecting the determination of the sale price of non-organic vegetables with the characteristics of fixed selling prices throughout the year in supermarket in Yogyakarta. The initial observation (a 6-month sale-price observation of vegetables conducted in supermarket) found that some vegetables in the supermarket have a fixed sale price over time, such as water spinach and spinach. A fixed price means a constant sale price of vegetables which is not increasing nor decreasing in a long term. The determination of sale price of a product is an important decision that should be made by a company because the effect on demand and profitability. Company's decision in determining the price of vegetables may affect the development, existence, and its business setbacks [11]. While for consumers, a sale price is something they must sacrifice to get what they want, so it is greatly influence the consumer's decision to buy or not the products offered [1, 5, 12]. Thus, some variables will be
considered in determining a sale price of vegetables in supermarket including the perishability, the competitors - traditional markets as the main place providing vegetables, inflation - foodstuffs rose 1.56 percent in 2015 according to Badan Pusat Statistik (BPS) and so forth, in order to maintain the loyalty of consumers shopping vegetables in supermarket as well as making a profit.

Some modern vegetable stall businesses began to appear like Pak Tani with three branches, Ijo Royo-Royo, TOSAGA with two branches, and Warung Ibu Subur. However, these efforts have not been followed by a good method of determining a sale price of vegetables. Unfortunately, those business owners simply determine the price by increasing sum percentage from the purchase price without having any adequate informations how to formulate the sale price. Whereas the main business purpose is to gain benefit. Comparison of the selling price of vegetables in modern vegetable stalls are lower than the supermarkets. This study analyzes the variables influencing the determination of sale price in supermarket in order to provide a clear guide line for the modern vegetable stalls to formulate their sale price of vegetables. For further, if the determination of sale prices in supermarket could be applied at the modern stalls, their business processes would be optimized.

There is a research modelled an EOQ for the inventory management of perishables in small medium-sized grocery stores using a regression approach from the product’s holding, lifetime, and markdown policy. It recorded that managers frequently utilize markdown to stabilize demand when the products expiration date nears [7]. While in this sale price analysis study, the markdown policy is not applied in supermarket observed. Yet, the lifetime will be considered as one of the variables influencing the sale price determination. It is along with another research that formulates and analyzes an EOQ model with demand decreasing in the age of the product [6]. The optimal order cycle length incorporates consumer behavior towards freshness has been derived as the result. Related to consumer behavior, it is acknowledged that consumers will pick the fresher products between products with different ages [3]. It proposes mathematical models that are able to differentiate between different functions of the age dependent demand and/or products with or without a stamped best-before-date. The consumer behavior has been analyzed into three perspective: age dependent demand (ADD), customer’s eagerness for fresher products (CFP), and product quality risk (PQR). Therefore, based on those three researches of perishability, this study considers the lifetime and consumer behavior affecting the sale price of vegetables in supermarket. Furthermore, there is also a holding cost added in the sale price.

The vegetables price in traditional market is set as a constraint which is not included to the discussion. For instance, a research conducted in Nairobi, Africa provided a detailed analysis of the African Leaf Vegetables (ALV) market such as the promotional strategies of local NGOs and international organizations, increased health awareness, and improved presentation of ALVs in supermarkets and upmarket groceries [9]. There are a few researches employing a quantitative and qualitative analysis related to vegetables. Geneese valley of New York is an exporter of many agricultural products including a number of fruit and vegetable crops. By using questionnaires to collect data on crops, acreage, production volume of leading crops, market channels, and product flow from a total of 227 responses (205 responses are from fruit and vegetable growers, and 22 are from producers of small grains), this study analyzes the qualitative and quantitative measures of fruit and vegetable production in the Geneese valeey [13]. A qualitative analysis using Williamson’s governance structure is also employed to present which type of contractual relationships used by farmers in their business in Romania [2]. While the quantitative analysis using a probit models were used to perceive the determinants of the farmers’ market selling preference. The data is collected from 64 farmers and 6 processors in the S-E region of Romania. Another similar study is conducted in Netherlands using questionnaire analyzes fruit and vegetable supply chain between greengroceries and supermarkets. It shows a qualitative analysis to examines Dutch greengroceris position in the market, their competitivenes against supermarkets, as well as to point out changes in consumer habits and define trends in consuming fruit and vegetables. The quantitative method provides an exact statistics data to define ration, set up an order, show layers, examine the partterns and opinion of the average consumers [10]. Furthermore, a study analyzing the impact of supermarkets on traditional markets and retailers in urban centers in Indonesia has been conducted combining a quantitative and qualitative method [4]. The
quantitative evaluation uses the different-in-different (DiD) which records two time periods – before and after the treatment of an opening supermarket. Meanwhile, the qualitative evaluations is in the form of in-depth interviews with key informants.

In fact, the vegetables supplied in supermarket observed are directly from its suppliers with more than 10 suppliers in order to fulfill the vegetables demand in it. This paper employs a cost plus pricing method for the quantitative analysis which is relevant with the informations gained during the interviews with suppliers and supermarket observed. It is used to find the amount of each variables contributed in formulating the vegetable sale price such as a holding cost and markup. Moreover, in order to obtain the data for qualitative analysis, it does not provide a questionnaire neither to suppliers nor to supermarkets but depth interviews. This study contribution is to investigate a number of variables influencing the determination of vegetable sale price in supermarket using a quantitative analysis of cost plus pricing method and a qualitative analysis of depth interviews with suppliers, supermarkets, and other related parties such as department of agriculture in Yogyakarta. Its objective is to provide a better guide line for modern stalls in determining their vegetable sale price so that their business can be optimized.

2. Methodology

The object of research is non-organic vegetables sold in one national supermarket in Yogyakarta called supermarket X with 8 branches focusing on the fixed sale price vegetables group over time where the study was conducted. There are 24 samples identified as the vegetable group of the fixed sale price during the period of the study. The data collected are the sale price from suppliers to supermarket X and from supermarket X to consumers. However, due to the difficulties in obtaining the suppliers sale price data as it is confidential, the data needed can only be provided by one main supplier of supermarket X, called supplier A, supplying vegetables for the 8 branches of supermarket X in Yogyakarta including several branches of supermarket X in Solo, Magelang, Semarang, and it has established its vegetable supplying business since 2006 until today.

It is referred to Δh as the gap selling price between supplier A and supermarket X. For many kinds of perishable goods, the quality assessed by the consumer gradually decreases as items age. Therefore, one of the qualitative variables analyzed is the vegetables characteristic related to age (vegetable is an aging product). This study also considers another qualitative variable that is the vegetable segmentation defined by consumer behavior in buying vegetables in supermarket. These variables are concluded during the interviews with supplier A. The quantitative analysis of the variables in the determination of vegetables sale prices in supermarket using a method of cost plus pricing in which Δh (%) will be identified into some influenced variables.

Data processing are as follow. (1) Observation and data collection of vegetable sale price. Based on the preliminary interview to relevant parties in Yogyakarta such as government services market, department of agriculture, department of trade economy and cooperatives, and market seller at a main market Giwangan; and literature studies related to the pricing method, it is concluded that the sale prices of vegetables at supermarket approached by cost plus pricing method. There are 24 vegetables samples of fixed sale price in supermarket X. Vegetables price data is collected from one experienced supplier and one national supermarket as a representative of many suppliers and supermarkets in Yogyakarta. (2) Vegetables are classified into two categories based on morphological features: leaf vegetables and non-leafy vegetables [8]. Morphology is part of biology which studies the form and structure of organism and their specific structural features including aspects of the outward appearance such as shape, structure, colour, pattern, and size. The leaf vegetables or green vegetables are plant leaves eaten as a vegetable that spinach, water spinach, kenikir, and green mustard as the examples. While the non-leafy vegetables means the leaves are not consumed as the main course but their root or stalk. A coneshaped objects like corn is part of this category. According to the interviews with supplier A and supermarket X, there are different treatment between spinach and white radish dealing with the freshness, and the purchase order. Therefore, this study concludes that the vegetables sold in supermarket have their own considerations regarding the sale price. Thus, it is important to divide them into two categories based on their characteristics. First, leaf vegetables or vegetable greens with the
aging product (a) is 0 as their freshness will decrease fast so they cannot last for more than one day. Moreover, they have no shelf life (t=0), due to the high level of spoilage so supermarket always replaces the leaf vegetables every day. It means that they can only be sold at the shelf on the same day they purchased from supplier A. They must be terminated on the next morning by replacing them with the fresh new vegetables.

The second is the non-leafy vegetables with the aging group (a) is a+1 (they can last for more than one day) and their shelf life (t) is t+1. These vegetables will be placed at the shelf for more than one day (t+1) as their freshness can last than a day (a+1) from the day they are purchased. They are sold in packaging such as oyster mushroom and bean sprouts which have an expired date stucked on the packing, and in kilogram without packaging that have a random lifetime such as beet and white radish (there is no expired date). This classification is necessary because there will be different analysis of each category both quantitatively and qualitatively.

(3) Consumer behavior in buying vegetables in a supermarket. Each category of vegetable will be analyzed using consumer behavior approach regarding with the aging product and freshness level of the vegetables. Consumer behavior will also have an impact on safety stock of vegetables provided in the shelf and supermarket ordering method to supplier. (4) Determining the sale price using cost plus pricing analysis. It is used for the quantitative analysis where a gap sale price ($\Delta h$) between supplier A and supermarket X found. The variable identification of gap amount ($\Delta h$) for both vegetable categories is associated with the qualitative analysis of vegetable segmentation and vegetables age. This methodology can be seen clearly in Figure 1 below.

![Conceptual model](image)

**Figure 1.** Conceptual model.

3. Vegetable Segmentation in Supermarket

There is a belief among retailers, although it is not documented in research, that consumers do not like a rapid change in price [12]. Sometimes retailers do not alter the sale price consistently along with the change of supply prices from suppliers because a conventional retailer assumes consumers are not comfortable with a frequent price changes condition. This may not be entirely true, but these assumptions affect the decision made by some retailers. When a sale price alters, especially a decline in prices, retailers should not expect consumer purchasing behavior changes quickly. In order to create an effective changing price, consumers must feel the change and respond it. The aim of retailers are not only to maximize sales and profit for each department separately, but also for the entire store. There are many possibilities for substitution of goods between departments, such as frozen vegetables with fresh vegetables, retailers must determine the price and trade policies to benefit the business as a whole system, not just for one particular department.

Based on the observation of the vegetable sale price in 8 branches of supermarket X for 6 months (January – June 2015), it is found that a group of vegetables have the constant price during the observation, some others tend to be constant, and a few of them rapidly changed (including high value economic commodities) such as onions and chilli. This study focuses on the group of vegetables at a constant prices over time that the sale price does not change during the observation conducted. It shows that pakcoy, celery, and spinach are sold in a fixed price of Rp. 2950,-/150gr, and are placed in the same
shelf. Genjer leaf, green mustard, water spinach, and kenikir have the same fixed sale price of Rp. 1950,-/150gr which are sold together in another shelf.

The data is clustered to identify the characteristics similarity of each vegetable related to $\Delta h$. There are four clusters of vegetables. The first cluster consists of beet, kecipir, lencak, parsley, and long bean sprouts have a small $\Delta h$ (<30%) among the clusters. The fourth are white radish, oyster mushroom, and pakcoy have the highest $\Delta h$ for more than 80%. It can be concluded that these two clusters are kind of rarely consumed vegetable called special segmentation. However, the difference $\Delta h$ of both clusters can be caused by the sales price from supplier A. For example, between beet and kecipir, the average sale price from supplier A is up to Rp. 20,000, -/kg, so supermarket A only increases a little sale price which is less than 15% (9% and 13%). While the second cluster (green mustard, genjer leaf, kenikir, long beans sprouts, okra, string beans, peeled petai, short bean sprouts, chives, water spinach, and peeled pickled corn) have an average $\Delta h$ between 30-40%. Due to the characteristic of high consumed vegetable as a daily main course, and they represent a high daily demand, thus supermarket A has to be adjusted downwards to account for each vegetable. Consider this vegetable segmentation of each cluster, it can be concluded that supermarket A sale price is correlated to the sale price from supplier A with a various level of $\Delta h$.

4. Vegetable Age Influences Consumer Buying Behavior

According to the observation, there are some vegetables like green mustard, genjer leaf, water spinach, and kenikir are provided at the same shelf with the same sale price of Rp. 1950/150 grams, as shown in Table 1. Spinach, celery, and pakcoy are arranged on same shelf with the sale price of Rp. 2950/bunch of 150 grams. Referring to the variable of safety stock at shelf and spoilage risk, it has been discussed that the fixed sale price vegetable group is divided into two categories: (1) leaf vegetables, and (2) non-leafy vegetables.

In the case of spoilage, the leaf vegetable category has zero inventory because the declining freshness of the perishable product is aligned with the its age as it is kind of a high spoilage vegetable ($a=0, t=0$). In order to maintain customer satisfaction of freshness, the replenishment occurs every day. The remaining vegetables on the self before supermarket closes will be immediately discarded on the next morning. It is a removal of spoiled product which they will not be sold to consumers. All stock of vegetables ordered by supermarket A each day are assumed to meet consumer demand on day (t =0) [2]. This leaf category does not have a holding cost due to inventory is not provided. While the non-leafy category like beet and string beans, their age can last more than one day ($a+1$). Average age of vegetable is 4 days [6]. This information is proved by some of the vegetables packed like string beans listed an expired date in supermarket X. The consumer behavior to buy perishable product has a linear correlation with the shelf life of the product [2]. The desire of consumers to purchase a perishable product decreases along with the declining shelf life of the product (willingness to pay decreases). The vegetable purchased meets the demand on day t and still remains some stocks of vegetables on the shelf for the next $t + 1$ (vegetable age is $a + 1$). The non-leafy vegetables have an expected lifetime of expired stuck on the packaging (expiration date), and the others have a random lifetime sold in kilogram or without packaging. Therefore, they are assumed to have the holding cost ($t+1$). Here are the vegetables of each category shown in Table 1 and 2.

| Vegetables              | $H_{supp}$ | $H_{sm}$ | $\Delta h$ | $\Delta h$ % |
|-------------------------|------------|----------|------------|--------------|
| GREEN MUSTARD 150 GR    | 1,500      | 1,950    | 450        | 30           |
| GENJER LEAF             | 1,500      | 1,950    | 450        | 30           |
| KENIKIR 150 GR          | 1,500      | 1,950    | 450        | 30           |
| WATER SPINACH 150 GR    | 1,400      | 1,950    | 550        | 39           |
| SPINACH 150 GR          | 2,000      | 2,950    | 950        | 48           |
CELERY 150 GR       2,000  2,950  950  48
PAKCOY              1,500  2,950 1,450  97
CHIVES              2,850  3,950 1,100  39
PARSLEY             4,000  4,950  950  24

Table 2. Non-leafy vegetable category with $a + 1$ and $t + 1$.

| Vegetables                     | $H_{supp}$ | $H_{sm}$ | $\Delta h$ | $\Delta h\%$ |
|-------------------------------|------------|----------|-------------|-------------|
| STRING BEANS PCK 200 GR       | 2,000      | 2,690    | 690         | 35          |
| LONG BEAN SPROUTS PCK 200 GR  | 2,200      | 2,790    | 590         | 27          |
| LENCAK PCK 200 GR             | 2,500      | 2,990    | 490         | 20          |
| SHORT BEAN SPROUTS PCK 150 GR | 2,167      | 2,990    | 823         | 38          |
| LONG BEANS 200 GR             | 2,300      | 2,990    | 690         | 30          |
| PEELED PETAI 150 GR           | 2,500      | 3,390    | 890         | 36          |
| OKRA 150 GR                   | 3,000      | 3,990    | 990         | 33          |
| UNPEELED PICKLED CORN 250 GR | 2,500      | 3,990    | 1,490       | 60          |
| OYSTER MUSHROOM 250 GR        | 3,000      | 5,490    | 2,490       | 83          |
| PUMPKIN SIAM WHL              | 4,000      | 5,950    | 1,950       | 49          |
| PEELED PICKLED CORN 250 GR    | 5,000      | 6,990    | 1,990       | 40          |
| OYONG WHL                      | 7,000      | 9,950    | 2,950       | 42          |
| WHITE RADISH WHL              | 6,000      | 10,950   | 4,950       | 83          |
| KENIKIR WHL                    | 15,000     | 16,950   | 1,950       | 13          |
| BEET WHL                       | 22,000     | 23,950   | 1,950       | 9           |

5. Cost Plus Pricing Analysis

Sale price calculation using Cost Plus Pricing method with full cost pricing approach determines the sale price comprised production costs, non-production costs, and markup. This approach is considered relevant because based on interviews with supermarket X, it is known that the costs such as electricity and water are also taken into consideration in determining the sale price of all products including vegetables which these costs are overhead cost. However, the amount of these costs is not explained by supermarket.

The production costs are those costs incurred for processing raw materials into finished products. In this study, the sale price of vegetables from supplier A to supermarket X is treated as the raw material costs for supermarket X. Each supplier has to follow the regulations related to the vegetables ordered by supermarket X costs such as the packaging, the weight, barcode, and the size. For example, spinach is tied with a weight of 150 grams /bunch, string beans is packed with a weight of 200 grams /pack and stuck a barcode. The vegetables are ready to serve to the shelves once they arrive at supermarket every morning. Thus, it is concluded that supermarket X does not provide any direct labor costs. All vegetable demand is provided by suppliers so it is assumed direct labor cost at supermarket is 0. The overhead costs are vegetables checker salary, and electricity and water bills. The responsibility of a checker is to check each vegetable supplied from suppliers every morning, the number and the physical condition of vegetables in order to meet the quality standards of supermarket X. The checker also has to check the freshness and neatness of vegetables at their shelves regularly.

For non-production costs such as marketing cost, and general and administration, may be included in the calculation of the sale price. Unfortunately, this information is not obtained due to the confidential issues. Further, it is assumed 0. According to the full cost pricing approach, the sale price will be calculated as follows:
The sale price = Total Production Costs + Total Non-Production Costs + Markup \hspace{1cm} (1)

\[
Markup = \frac{(Expected\ profit \times (Production\ costs+Non-production\ costs)) + Non-production\ costs \times 100}{Production\ costs}
\hspace{1cm} (2)
\]

In determining the sale price using cost plus pricing method with full cost pricing approach, there is an expected profit added into it. This expected profit will be treated as a contribution margin rate (CMR) [6].

\[
CMR = \frac{(p - v)}{p}
\hspace{1cm} (3)
\]

Note:
CMR : Contribution margin rate
P : the sale price of vegetables in the supermarket
V : variable costs

5.1 Leaf Vegetable Category with \( a = 0 \) and \( t = 0 \)
The profit expected (CMR) is 30% obtained from the calculation of each vegetable. Because this category is a daily consumed vegetable that consumers have been familiar with them, marketing costs is not needed. Therefore, non-production costs is 0. There is some amount of markup added into the price of vegetables according to full cost pricing approach. Based on the calculation, the markup is as high as the CMR or the expected profit of 30%. Detailed calculation can be seen in Table 3.

Based on the calculation of CMR, pakcoy has the highest value of almost 50%. Within this category, green mustard and pakcoy are in the same family of brassicaceae (biology study) with pakcoy. Yet, demand of green mustard is more than pakcoy related to the taste, so it can substitute pakcoy for a main course. Both of them have the same supplier sale price of Rp. 1500, -/bunch. However, the \( \Delta h \) of the sale price to the end consumer is different. Pakcoy particularly highlighted in yellow in Table 5, it is found a difference amount of sale price (Rp. 1000) between the real sale price \( Hsm \) and the calculation of sale price using full cost pricing approach. While the other vegetables sale prices calculation using full cost pricing are close to the real sale price of supermarket (\( Hsm \)). This may be caused by vegetables segmentation whether they are consumed as a daily dish, or they are only for special purpose like parsley which is ordered about 5 bunches/day according to an interview with the supplier A. Most of parsley are served as a garnish instead. Considered the calculation results are close to supermarket price, it can be concluded that the variables of supplier’s sale price (\( Hsupp \)), CMR and Markup are taken into the determination of sale price in supermarket. It should be noted that supermarket applies a unique number to inform the sale price to consumers (Rp. 1,950, Rp. 2,950, Rp. 3,950 and Rp. 4,950).

5.2 Non-leafy Vegetable with \( a + 1 \) and \( t + 1 \)
Because there is stock on the shelf \((t + 1)\), a holding cost must be applied. It is suggested that a holding cost for perishable products is between 15% to 35% [6]. As described in the previous section, vegetables can last for 4 days, unless the freshness will be decrease. Holding cost is set equal to every period \( t+1 \) to each vegetable on the shelf. The coloured rows showed in Table 6 differentiate the holding cost adjusted to each vegetable. Meanwhile, the CMR is set at 10% in accordance with the amount suggested for retailers [6]. It is different from the previous category due to holding cost added into the sale price. If CMR is calculated more than 10% or at least as same as the leaf vegetables category of 30%, hence the sale price will be more expensive and it will have an impact on the sales of vegetables.

Generally, vegetables in packaging such as lencak, bean sprouts, and long beans have a 10% \( h \). While beet and kecipir who have an expensive raw materials cost (supplier sale price is in average of Rp. 18.000/kg) treated as a low daily consumed. This means that the vegetables are not being consumed by most people but a few so that the supermarket X does not order in large amount (based on interviews with supplier A). Supermarket X commits to provide vary vegetables representing a range of consumers.
from low daily consumed like beets to high daily consumed. Due to the expensive raw material cost as a low daily consumed, beets and kecipir are adjusted to only 10% holding cost. According to Table 4, white radish and oyster mushrooms are in the same cluster of price. Both of these vegetables have the same \( \Delta h \) of 45%. They are also a category of a low daily consumed vegetable, but the raw material price is quite cheap in average of Rp. 4,500, thus, supermarket X can add the highest \( h \) of 30%. It is relevant with the recommended holding cost of less than 35% [6]. The other vegetables of 20% \( h \) are part of high daily consumed vegetables and the raw material costs is around Rp. 2,500 to Rp. 7,000 (or the value of \( \Delta h \) range between 30% and 40%). The recommendation CMR is 10% for fresh products [6] applied to all vegetables within this category. For the markup estimation, beets and kecipir have no markup due to the expensive costs of raw materials, and they are a low daily consumed vegetable. Therefore, supermarket cannot set a higher markup dealing with an affordable sale price. By using the same consideration in determining the holding cost \( h \), white radish and oyster mushrooms are calculated in the highest markup of 40% among the vegetables. The other vegetables with markup of 20% is a high daily consumed vegetable category.

If we look at the reasons of adjusting \( h \) and markup, it shows a pattern of vegetable characteristics consisted of vegetable segmentation (low or high daily consumed vegetable) and the supplier sale price as the raw material costs (from cheap to expensive level). Within this category, there are two groups of vegetable segmentation. It is concluded that for the low consumed vegetable (beet, kecipir, white radish, and oyster mushroom), the highest amount of holding cost (30%) is added into the cheap raw material costs, vice versa. Even though, white radish is sold in kilogram, and oyster mushroom is in packaging of 250 gram. The highest markup (40%) is also added into the cheap raw material costs while the expensive raw material costs have no markup. For the high consumed vegetable, the amount of holding cost is adjusted between 10%-20%. It is incorporated with the 20% markup into the sale price. Finally, the full cost pricing approach has been provided a similar sale price as supermarket did. Table 5 and 6 show the calculation in detail.

**Table 3.** The determination of sale price of the leaf vegetable with \( a = 0 \) and \( t = 0 \).

| Vegetables          | Hsupp | Hsm | CMR \( (p-v)/p \) | Production Cost Raw Material | Non Production Cost | Markup % | Sale Price (Rp) | Price Gap (Rp) |
|---------------------|-------|-----|-------------------|-------------------------------|---------------------|---------|----------------|----------------|
| GREEN MUSTARD 150 GR| 1,500 | 1,950| 0.23              | 1,500                        | 0                   | 0.3     | 1,950          | -              |
| GENJER LEAF         | 1,500 | 1,950| 0.23              | 1,500                        | 0                   | 0.3     | 1,950          | -              |
| KENIKIR 150 GR      | 1,500 | 1,950| 0.23              | 1,500                        | 0                   | 0.3     | 1,950          | -              |
| WATER SPINACH 150 GR| 1,400 | 1,950| 0.28              | 1,400                        | 0                   | 0.3     | 1,820          | 130            |
| SPINACH 150 GR      | 2,000 | 2,950| 0.32              | 2,000                        | 0                   | 0.3     | 2,600          | 350            |
| CELERY 150 GR       | 2,000 | 2,950| 0.32              | 2,000                        | 0                   | 0.3     | 2,600          | 350            |
| PAKCOY              | 1,500 | 2,950| 0.49              | 1,500                        | 0                   | 0.3     | 1,950          | 1,000          |
| CHIVES              | 2,850 | 3,950| 0.28              | 2,850                        | 0                   | 0.3     | 3,705          | 245            |
| PARSLEY             | 4,000 | 4,950| 0.19              | 4,000                        | 0                   | 0.3     | 5,200          | (250)          |

Mean 0.3
Table 4. The determination of sale price of the non-leafy vegetable with a + 1 dan t + 1.

| Vegetables                      | Hsupp | Hsm | Δh | %  | Production Cost | holding cost | h      | CMR  |
|--------------------------------|-------|-----|----|----|----------------|--------------|--------|------|
|                                | (1)   | (2) | (3) | (4) | Raw Material   | (%)          | (Rp)   | 10%  |
| BEET WHL                       | 22,000| 23,950| 1,950| 0,08| 22,000         | 0,10         | 2,200  | 2,420|
| KECEPIR WHL                    | 15,000| 16,950| 1,950| 0,12| 15,000         | 0,10         | 1,500  | 1,650|
| LENCAK 200 GR                 | 2,500 | 2,990 | 490 | 0,16| 2,500         | 0,10         | 250    | 300  |
| LONG BEAN SPROUTS 200 GR      | 2,000 | 2,790 | 590 | 0,21| 2,000         | 0,10         | 220    | 264  |
| LONG BEANS 200 GR             | 2,300 | 2,990 | 690 | 0,23| 2,300         | 0,10         | 230    | 276  |
| OKRA 150 GR                   | 3,000 | 3,990 | 990 | 0,25| 3,000         | 0,10         | 300    | 360  |
| STRING BEANS PCK 200 GR       | 2,000 | 2,690 | 690 | 0,26| 2,000         | 0,10         | 200    | 240  |
| PEELED PETAI 150 GR           | 2,500 | 3,390 | 890 | 0,26| 2,500         | 0,10         | 250    | 300  |
| SHORT BEAN SPROUTS 150 GR     | 2,167 | 2,990 | 823 | 0,28| 2,167         | 0,10         | 216,70 | 260,04|
| PEELED PICKLED CORNS 250 GR   | 5,000 | 6,990 | 1,990| 0,28| 5,000         | 0,20         | 1,000  | 600  |
| OYONG WHL                      | 7,000 | 9,950 | 2,950| 0,30| 7,000         | 0,20         | 1,400  | 840  |
| PUMPKIN SIAM WHL              | 4,000 | 5,950 | 1,950| 0,33| 4,000         | 0,20         | 800    | 480  |
| UNPEELED PICKLED CORNS 250GR  | 2,500 | 3,990 | 1,490| 0,37| 2,500         | 0,20         | 500    | 300  |
| WHITE RADISH WHL              | 6,000 | 10,950| 4,950| 0,45| 6,000         | 0,30         | 1,800  | 780  |
| OYSTER MUSHROOM 250 GR        | 3,000 | 5,490 | 2,490| 0,45| 3,000         | 0,30         | 900    | 390  |

| Full Cost (Rp) | Markup (%) | Markup (Rp) | Sale Price (Rp) | Hsm (Rp) | Price Gap (Rp) |
|----------------|------------|-------------|-----------------|---------|----------------|
| (4)+(5)=(7)    | (8)        | (8)*7=(9)   | (10)            | (1)=10 | (11)           |
| 24,200         | 0          | 0           | 24,200          | 23,950  | 250            |
| 16,500         | 0.20       | 550         | 3,300           | 2,990   | 310            |
| 2,750          | 0.20       | 484         | 2,904           | 2,790   | 114            |
| 2,420          | 0.20       | 506         | 3,036           | 2,990   | 46             |
| 2,530          | 0.20       | 660         | 3,960           | 3,990   | (30)           |
| 3,300          | 0.20       | 440         | 2,640           | 2,690   | (50)           |
| 2,200          | 0.20       | 550         | 3,300           | 3,390   | (90)           |
| 2,750          | 0.20       | 477         | 2,860.44        | 2,990   | (129)          |
| 2,383.70       | 0.20       | 1,200       | 7,200           | 6,990   | 210            |
| 6,000          | 0.20       | 1,680       | 10,080          | 9,950   | 130            |
| 8,400          | 0.20       | 960         | 5,760           | 5,950   | (190)          |
| 3,000          | 0.30       | 900         | 3,900           | 3,990   | (90)           |
| 8,400          | 0.40       | 3,120       | 10,920          | 10,950  | (30)           |
| 4,200          | 0.40       | 1,560       | 5,460           | 5,490   | (30)           |
6. Conclusions

Variables considered qualitatively in determining the sale price of vegetables in supermarket are the vegetable age and vegetable segmentation (leaf vegetable and non-leafy vegetable) which lead to a different estimation of category. The quantitative variables using cost plus pricing method and full cost pricing approach are expected profit called Contribution Margin Rate (CMR), holding cost, markup, production cost, and non-production cost. Since all vegetables are supplied by suppliers, so the supplier sale price to supermarket is treated as the raw material cost in calculating the production cost.

Price is a confidential issue, thus there are some costs such as the salary of checker, electricity, and water bills as the overhead cost assumed 0. There is only one overhead cost calculated, the holding cost $h$. Non-production cost including the marketing cost is set 0. Finally, it is found a pattern in adjusting the holding cost and markup using 2 variables: the vegetable segmentation whether it is a low or a high daily consumed vegetable and the raw material cost obtained from the supplier sale price. This pattern occurs while the estimation of sale price is being analyzed. There are some information assumed such as the overhead costs and non-production costs as they are a confidential data. For further research, the data needed could be obtained from more than one supplier and supermarket so it will provide a robust data for analyzing the variables. The sale price of vegetables from modern stalls may also be added in order to gain the gap sale price between supermarkets and the modern stalls. Finally, a sale price calculation can be modelled using the variables influencing the determination of sale price so it will be a better guideline for those modern stalls in formulating their vegetable sale price.

7. References

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