Mapping the Sales Characteristics of Cooking Oil in Indonesia Using Biplot Analysis: A Study on Ten Popular Brands (2021–2022)

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ABSTRACT
Cooking oil is an essential food ingredient in daily life in Indonesia, available in various types such as vegetable oils (like palm oil). Consumption of cooking oil in Indonesia has shown an increasing trend over the years, with 90.27% of households using cooking oil in the years 2019-2021. This research utilizes sales data of cooking oil products from 2021 to 2022 for 10 popular brands in Indonesia: Fortune, Minyakita, Sania, Bimoli, Sunco, Sovia, Tropical, Hemart, Sabrina, and Filma. This study applies biplot analysis to map the sales characteristics of cooking oil products across retail outlets. The biplot analysis results reveal groups of cooking oil brands with similar sales characteristics. For instance, Filma and Sovia exhibit similarities in sales characteristics, as do Sania, Tropical, Sunco, and Bimoli. In contrast, Fortune shows distinctive and unique sales characteristics compared to other brands. This analysis helps understand the relationship between brands and sales variables such as market penetration, expenditure per buyer, and purchase volume.The research provides insights into marketing strategies that cooking oil manufacturers can adopt to enhance market penetration and strengthen their position in a competitive environment. By understanding consumer preferences and sales characteristics, manufacturers can design more effective strategies to increase purchase interest and consumer loyalty towards their brands.

Keywords: *Biplot Analysis, Cooking Oil, Marketing Strategy, Product Sales*

1. INTRODUCTION

Cooking oil is one of the essential food ingredients frequently used in daily life by people in Indonesia, making its availability and price closely monitored by the government as part of staple food necessities to prevent price fluctuations. According to the Central Bureau of Statistics (2022), from 2019 to 2021, approximately 90.27% of households participated in the use of cooking oil. Additionally, the National Socioeconomic Survey (2021) reported that the average household expenditure on cooking oil consumption in Indonesia accounted for 1.35% or IDR 17,277 of the total average monthly household expenditure of IDR 1,281,327.

There are various types of cooking oil commonly used, including vegetable oils such as palm oil and others. Cooking oil plays a crucial role in providing energy and acting as a solvent for vitamins A, D, E, and K. In the market, different types of cooking oil are available, such as packaged cooking oil, used cooking oil, and bulk cooking oil. Packaged cooking oil undergoes two filtration processes, while bulk cooking oil goes through a single filtration process. Used cooking oil, however, refers to cooking oil that has been repeatedly used (Ghifari & Utaminingrum, 2022). Cooking oil is essential for cooking as it not only enhances the flavor of food but also influences texture and aroma (Sari & Wulandari, 2019). These factors contribute to the increasing demand for cooking oil year after year. According to data from the National Food Agency (Bapanas), the average cooking oil consumption per capita in Indonesia in 2023 reached 9.56 kilograms per year, marking a 0.9% increase compared to 2022.

In 2022, it was reported that at least 425 cooking oil brands were available in the market. Branding plays a crucial role in assuring product quality for consumers. Based on the Top Brand Index (TBI) from 2019 to 2024, the top three cooking oil brands were Bimoli, Filma, and Sania. Other brands that have obtained BPOM certification and gained widespread recognition include Fortune, Minyakita, Sunco, Sovia, Tropical, Hemart, and Sabrina (Top Brand Award, 2024) The popularity of these cooking oil brands is closely related to consumer purchase intention.

Purchase intention refers to a consumer's favorable attitude toward a product, which creates a desire to acquire the item through a normal purchasing process. This intention is influenced by several factors, including price, brand image, and product quality (Solomon, 2020). Consumer purchase intention is defined as the desire and willingness of consumers

to purchase a product (Kotler et al., 2016). Price plays a key role in stimulating purchase intention, where pricing strategies are often adjusted based on competitors to enhance consumer interest and ensure affordability across different socioeconomic segments (Kotler et al., 2016). Brand image is another significant factor affecting purchase intention, as it is widely utilized in marketing strategies to promote cooking oil, boost sales volume, and attract consumer interest (Solomon, 2020). Product quality is a top priority for cooking oil brands, with manufacturers competing to increase sales volume and enhance product quality (Ishomuddin et al., 2023). Since quality is a crucial factor influencing consumer purchasing decisions, it directly impacts sales performance across different brands.

According to Nielsen and IRI, product sales can be measured using several key metrics, including penetration, spend per buyer, average weight of purchase (AWoP), number of trips, spend per trip, and weight per trip (Nielsen, 2020). Penetration refers to the percentage of households that have purchased a product within a specific time period. Spend per buyer is the average expenditure per household or consumer within a given time frame. Average weight of purchase (AWoP) represents the average volume of purchases per household over a certain period. Number of trips indicates the average purchase frequency per household within a given period. Spend per trip refers to the average spending per transaction per household during a specific period. Weight per trip is the average volume of purchases per transaction within a given period (IRI, 2019). For this study, the selected timeframe is 2021 and 2022. These metrics provide valuable insights into consumer purchasing behavior, buying patterns, and brand preferences.

One method for analyzing product positioning in the market is through brand mapping. Similar to product representation, an effective marketing strategy is essential for maintaining or increasing total sales driven by purchase intention in the cooking oil industry. These marketing strategies involve market segmentation, target market identification, and positioning (Dolnicar et al., 2018). By conducting a brand mapping analysis for cooking oil in 2021 and 2022, it is possible to determine market segmentation, target audience, and the relative positioning of each cooking oil brand against its competitors. This approach ensures a more precise and well-directed market segmentation.

A suitable analytical tool for brand mapping in this research is biplot analysis. Biplot analysis is a multivariate statistical technique used to visually and simultaneously represent multiple observation objects and variables within a single graphical representation (Greenacre, 2017). This study aims to apply biplot analysis to classify cooking oil brands based on similarities in sales performance metrics, examine the diversity of sales-related variables, explore inter-variable correlations, and assess the impact of these sales metrics on various cooking oil brands.

2. RESEARCH METHOD

2.1. Product Sales Metric

The product sales metrics frequently used by Nielsen and IRI provide deep insights into the sales performance of a product or brand in the market (Nielsen, 2020). The sales metrics include the following (IRI, 2019)

a. Penetration. Penetration refers to the percentage of households or consumers who purchase a particular product at least once within a specific time period. Nielsen describes penetration as one of the key indicators for understanding how wide a product's market reach is. A high penetration rate indicates that the product has successfully attracted a large number of consumers.
b. Spend per Buyer. Spend per Buyer refers to the average purchase value per household or consumer who buys the product within a given time period. IRI uses this metric to evaluate the average spending per buyer, helping to understand how much consumers spend on a particular product.
c. Average Weight of Purchase (AWoP). AWoP represents the average purchase volume per household or consumer within a specific time period. This metric provides insights into the quantity of product typically purchased by consumers in each transaction. It is crucial for understanding consumer preferences regarding the amount of product they buy at one time.
d. Number of Trips. The Number of Trips represents the average purchase frequency of a product by a single household or consumer within a given time period. Nielsen uses this metric to measure how often consumers purchase a product within a specific timeframe, providing insights into consumer shopping patterns for a particular product.
e. Spend per Trip. Spend per Trip refers to the average purchase value per transaction or shopping trip made by a single household or consumer within a given time period. IRI uses this metric to evaluate how much consumers spend on average in each purchase transaction, offering insights into consumer spending behavior and preferences.
f. Weight per Trip. Weight per Trip represents the average purchase volume per transaction or shopping trip by a single household or consumer within a given time period. This metric provides information about the amount of

product consumers buy per purchase or shopping trip, which is crucial for understanding consumption patterns and consumer preferences for product quantities.

2.2. Segmentation, Targeting, and Positioning (STP) Theory

The Segmentation, Targeting, and Positioning (STP) theory is a strategic approach used by companies to better understand their markets and develop effective marketing strategies (Dolnicar et al., 2018). The STP strategy helps companies identify the most potential market segments (segmentation), accurately set targeting strategies for those segments, and position their brand uniquely and advantageously in the eyes of consumers (positioning). In the context of understanding brand competition, knowledge of consumer preferences toward competing brands is crucial for designing strategies that differentiate a company's product from its competitors (Kotler et al., 2016).

2.3. Biplot Analysis

Biplot analysis is a multivariate analysis technique that simultaneously maps n observations and p variables in a two-dimensional space. This simultaneous visualization provides deeper insights into the relationships between variables and observations (Khotimah & Zakaria, 2023). Biplot analysis can offer various types of information, including the proximity between observed objects, variable diversity, inter-variable relationships or correlations, and variable values for each object (Diana, 2018). These four aspects are explained as follows (Leleury & Wokanubun, 2015):

1. Proximity Between Observed Objects. The proximity between objects indicates the similarity of their characteristics. The closer two objects are on the graph, the more similar their characteristics are.
2. Variable Diversity. The length of the vector in the biplot reflects the degree of variability of a variable. Variables with low variability are represented by short vectors, while variables with high variability are represented by long vectors.
3. Correlation Between Variables. Two variables are considered positively correlated if their vectors form an acute angle. Conversely, two variables are considered negatively correlated if their vectors form an obtuse angle. If two variables are represented by vectors forming a right angle, they are said to have no correlation.
4. Variable Values in an Object. Objects that are aligned with the variable vector have above-average values, while objects that are opposite to the vector have below-average values. The variable value for an object is determined by orthogonally projecting the object onto the variable vector.

2.3. Data

The data used in this study is secondary data from purchase reports of cooking oil products through retail outlets from various brands sold in Indonesia during 2021–2022. A total of 10 cooking oil brands were analyzed in this study, namely Fortune, Minyakita, Sania, Bimoli, Sunco, Sovia, Tropical, Hemart, Sabrina, and Filma. Meanwhile, the variables observed in the cooking oil purchase reports are shown in Table 1.

The data analysis was conducted both descriptively and inferentially. Descriptive analysis was used to examine the characteristics of each variable, while inferential analysis was performed using biplot analysis to map the distribution of cooking oil products sold at different retail outlets. This study was supported by R Studio software.

Table 1. Research Variables

Variable	Description
Penetration	Average percentage of households that have purchased cooking oil
Spend per Buyer	Average spending (IDR) per household
Average Weight of Purchase	Average purchase volume (Gr/mL) per household
NoT (Number of Trips)	Average frequency of cooking oil purchases per household
Spend per Trip	Average spending on cooking oil in each transaction
Weight per Trip	Average cooking oil purchase volume per household per transaction

3. RESULT AND DISCUSSIONS

3.1. Descriptive Statistics

Descriptive analysis is used to describe the data utilized in this study. The variables in this study are sales reports of cooking oil products through retail outlets from various brands sold in Indonesia during 2021–2022. The descriptive analysis is presented in Table 2.

Table 2. Descriptive Statistics

Variable	n	Minimum	Maximum	Mean
Penetration	6	13,89	46.15	27,01
Spend per Buyer	6	44945	183094	115828
Average Weight of Purchase	6	3187	12253	7114
Number of Trip	6	2,169	7,279	4.029
Spend per Trip	6	16724	40162	30025
Weight per Trip	6	1077	2379	1813

Based on Table 2, the average percentage of households that purchased cooking oil during 2021–2022 was 27.01%. The average spending per buyer (Spend per Buyer) was IDR 115,828, while the average purchase volume of cooking oil (Average Weight of Purchase) was 7,114 grams/mL. The average frequency of purchases per household (Number of Trips) in 2021–2022 was 4.029 times, and the average spending per transaction (Spend per Trip) was IDR 30,025. The average purchase volume per transaction (Weight per Trip) was 1,813 grams/mL. Further analysis of the maximum values for each variable is presented in Figure 1.

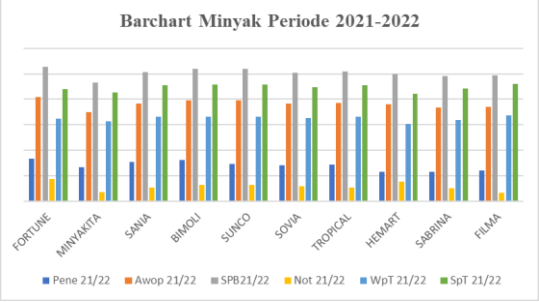

Figure 1. Bar Chart of Each Cooking Oil Brand

Figure 1 represents the bar chart of cooking oil brands sold in retail outlets in Indonesia during 2021–2022. Based on Figure 1, the Fortune brand recorded the highest values in the variables of penetration (percentage of households that purchased cooking oil), spend per buyer, average weight of purchase, and number of trips. Meanwhile, the highest spend per trip was observed in the Tropical brand, and the highest weight per trip was found in the Filma brand.

3.2. Biplot Analysis Results

The biplot analysis results, using cooking oil sales data from retail outlets during 2021–2022, are shown in Figure 2.

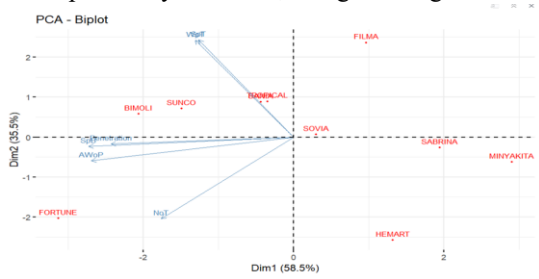

Figure 2. Biplot of Cooking Oil Purchases

Based on Figure 2, the biplot analysis results are derived from Principal Component Analysis (PCA), displaying two main dimensions (Dim1 and Dim2). The data points represent cooking oil brands, while arrow vectors indicate the direction of product sales measurement variables. Dim1 explains 58.5% of the variance, and Dim2 explains 35.5%, totaling 94% of the variance. This indicates that the biplot analysis provides a highly accurate representation of the sales measurement variables for different cooking oil brands. The interpretation of the biplot graph is as follows:

1. Proximity Between Cooking Oil Brands
   This information helps identify which cooking oil brands have similar characteristics. Brands positioned in the same quadrant have closer sales characteristics compared to those in different quadrants. This means that the closer the brands are in the graph, the more similar their sales characteristics. Based on Figure 2, the cooking oil brands grouped by quadrant are:
   - Quadrant I: Brands Filma and Sovia, indicating that these two cooking oil brands share similar sales characteristics in retail outlets across Indonesia during 2021–2022.
   - Quadrant II: Brands Sania, Tropical, Sunco, and Bimoli, which have similar sales characteristics in retail outlets.
   - Quadrant III: Only the Fortune brand is positioned here, indicating that it does not share sales characteristics with any other brands.
   - Quadrant IV: Brands Hemart, Sabrina, and Minyakita, which have similar sales characteristics in retail outlets.
2. Sales Metric Variables in Cooking Oil Brands
   This analysis determines the characteristics of sales metric variables for each cooking oil brand. Brands positioned along the same direction as the sales metric vector indicate high values for that specific metric. In contrast, brands that are positioned opposite to a vector have below-average values for that metric. Brands located near the center of the sales metric vector have values close to the overall average. The key findings include:
   - The Filma brand aligns with the Spend per Trip (SpT) and Weight per Trip (WpT) vectors, indicating that these two sales metrics characterize the Filma brand in retail outlets during 2021–2022.
   - The Fortune brand aligns with the penetration, spend per buyer (SpB), average weight of purchase (AWoP), and number of trips (NoT) vectors, meaning these metrics characterize the Fortune brand.
   - The Hemart brand is opposite to the Spend per Trip (SpT) and Weight per Trip (WpT) vectors, indicating that its values in these metrics are below the average of all cooking oil brands.
   - The Sabrina brand is opposite to the Penetration vector, meaning its penetration rate is below average.
   - The Minyakita brand is opposite to the spend per buyer (SpB) and average weight of purchase (AWoP) vectors, indicating that these metrics are lower than average.
   - The Filma brand is opposite to the Number of Trips (NoT) vector, meaning its number of trips metric is below average.
   - The Bimoli, Sunco, Sania, and Tropical brands are positioned near the center of the Spend per Trip (SpT) and Weight per Trip (WpT) vectors, indicating that their values in these metrics are close to the average.
3. Variability in Sales Metric Variables
   This analysis examines the variability in the characteristics of each cooking oil brand. In biplot analysis, variables with high variability are represented by longer vectors, while those with low variability have shorter vectors. The detailed findings are:
   - The blue vectors (sales metrics) indicate the direction and strength of each metric.
   - Spend per Buyer (SPB) has high variability, meaning this sales metric is not evenly distributed across brands.
   - Number of Trips (NoT) has low variability, meaning this sales metric is evenly distributed across brands.
   - Spend per Trip (SpT) and Weight per Trip (WpT) have vectors that are somewhat distant from the center, indicating that they contribute significantly.
   - Average Weight of Purchase (AWoP) and Number of Trips (NoT) have vector directions that contribute to both dimensions, but more strongly to Dimension 2.
4. Correlation Between Sales Metric Variables
   The relationships between sales metric variables are analyzed based on the biplot graph. Variables are considered positively correlated when their vectors are closely aligned (forming an acute angle). A right-angle relationship indicates low correlation, while an obtuse angle suggests negative correlation. The results show:
   - Spend per Buyer (SPB) and Penetration have the strongest positive correlation, meaning an increase in one leads to an increase in the other.
   - Average Weight of Purchase (AWoP) and Number of Trips (NoT) have the weakest correlation with other sales metrics.

Overall, the biplot analysis provides a comprehensive understanding of how cooking oil brands are positioned based on key sales metrics. Brands closely located on the graph share similar characteristics, while those far apart exhibit different sales behaviors.

5. CONCLUSION

The PCA biplot analysis for cooking oil brands provides valuable insights that can be utilized to optimize marketing strategies and product development. The analysis results indicate that brands like Filma and Sovia share similar sales characteristics, as they are positioned in the same quadrant, allowing them to be grouped and marketed together. In contrast, Fortune exhibits unique sales characteristics, requiring a different marketing approach.

Brands such as Hemart, Sabrina, and Minyakita show lower performance in several sales metrics, highlighting the need for improvements in their sales strategies. The strong correlation between Spend Per Buyer (SpB) and Penetration suggests that an increase in one of these metrics can enhance the other, meaning that a marketing strategy focused on increasing penetration could positively impact spend per buyer.

Understanding the variability and contribution of sales metrics also aids in designing more effective marketing strategies. For example, the Spend Per Buyer (SpB) metric, which exhibits high variability, requires special attention in distribution and promotions.

Overall, this analysis provides valuable insights into the relationships among cooking oil brands based on sales characteristics, helping in the development of more effective and efficient marketing strategies to optimize each brand's sales performance.

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