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CONSUMER BEHAVIOR | RESEARCH ARTICLE

Consumption and Consumer Preferences of Fresh and Frozen Potatoes in Semarang City

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Abstract: Farmers, producers, and other parties involved in the agricultural production chain of vegetable commodities place a high value on knowing consumer preferences when making decisions on developing and manufacturing agricultural food products. This study aims to investigate consumer behavior and identify information on consumer preferences for both fresh and processed (frozen) potatoes. The study was conducted in Semarang City, using a survey method. Purposive sampling method was employed to recruit 100 respondents, aged above 21 years, residents of Semarang City, and had consumed at least fresh and/or frozen potatoes in the last month. A questionnaire using Google Forms was employed to gather data online. It was distributed via social media platforms. The data collected was analyzed by descriptive and conjoint analysis. The results showed that the most frequent consumption was once a week with regular types of fresh potatoes being consumed; the respondents' spending on potato consumption was ≤ IDR 25,000/ month, and they consumed ≤2 kg of potatoes per week. Potato consumer preferences showed that the fresh potato attributes most liked by consumers are large tuber size, smooth skin, and ≤5 lateral buds, with the number of lateral bud attributes being the most prioritized. The most preferred attributes for frozen potatoes are a straight form, priced at IDR 39,000 to 58,000, batter-coated flavor, 801-1000 gr size packaging, and branded, with the shape attribute being the most prioritized. These findings suggest that farm producers can develop innovative potato varieties with fewer lateral buds and shapes for frozen potatoes.

Keywords: conjoint analysis, consumer preference, consumption spending, most important attributes

JEL Classification: D12, E21, E22

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PUBLIC INTEREST STATEMENT

Producers must be ready to meet customer demands as the level of potato consumption rises. Customers play a crucial role in the decision-making process since they have perceptions about the things they consume based on their experiences and five senses. Marketers therefore need to understand what customers require, what attributes determine their choice of product, and which ones they consider the most important.

Previous research on potato commodities has mostly concentrated on behavior, demand, and purchasing choices. Prior research on potato preferences was frequently done with raw potatoes. As a result, we had to overcome the difficulty of identifying the characteristics of frozen potato preferences. Nonetheless, this study discovered that many participants prefer to eat fresh potatoes over frozen ones. The results of earlier studies on fresh potato preferences differ from the attribute that respondents value most when purchasing fresh potatoes, as this study highlighted.

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1. Introduction

Currently, people are aware of their high nutritional needs. These nutrients can be obtained through the consumption of vegetables. Indonesia's most widely produced vegetable commodities are potatoes, shallots, cabbage, cayenne peppers, and large chilies (BPS - Statistics Indonesia, 2023). One of the vegetable commodities that is prospective for development is potato (*Solanum tuberosum L.*), which is not only consumed as a vegetable but is also used as an industrial raw material such as potato chips and french fries. According to BPS - Statistics Indonesia (2023), Indonesia's potato production decreased by 8.3% from 2019 to 2020. The level of potato consumption in Indonesia is 0.049 kg/capita/week, and this figure shows an increase of 8.9% from 2021 (BPS - Statistics Indonesia, 2024). Increasing potato consumption requires producers to meet consumer demand.

Consumption behavior is divided into three parts: before buying, buying, and consuming. Pre-purchasing activities involve consumer behavior in searching for information about the product to be purchased; purchasing activities involve product searching and carrying out transactions; and consumption activities involve using or consuming products purchased in the shop (Adiwinata et al., 2021). Understanding consumption behavior is potentially useful in preparing strategies to increase potato consumption to align with the preferences of potato consumers in Indonesia.

Agricultural businesses must adapt to consumers' desires for quality vegetables that suit their preferences. In addition, consumers play an important role because they form perceptions based on experience and their five senses regarding the products they consume, influencing their decisions. Therefore, knowledge of consumer behavior and preferences for vegetable products is very important. Consumer preferences facilitate the marketing of products that suit consumer tastes so that the products can be well-received (Priyambodo et al., 2019). Consumer preference is the subjective assessment and comparison of customer options according to their requirements and tastes (Solomon et al., 2006). It refers to the extent customers favor one good or service over another. Product characteristics are among the variables that affect customer preference. Customers assess products according to features, functionality, design, pricing, brand reputation, and quality. These qualities can be prioritized differently by various customers.

Semarang City has a weekly per capita potato consumption value of 0.064, which is above the Indonesian average of 0.049 (BPS - Statistics Indonesia, 2024). This indicates that Semarang City is a potential market for potato products. The market potential is quite large, attracting potato farming businesses and french fry companies to enter and compete. This is evidenced by the many brands competing in the French fries business. The variety of consumer traits and product preferences at each location is influenced by the population. Semarang City has a large population, which results in a broader range of customer behaviors and preferences.

Prior studies on potato commodities typically focus on demand, behavior, and purchase decisions (Akter et al., 2022; Gustavsen, 2021; Maksan & Jelić, 2022; Marcomini, 2021; Samoggia et al., 2023). Previous studies on potato preferences were often conducted on fresh potatoes (Adiyoga & Nurmalinda, 2012; Irsyad et al., 2018). Studies on preferences for frozen potatoes are still limited (Marcomini, 2021; Mickiewicz et al., 2022; Samoggia

et al., 2023). This study employs conjoint analysis to identify consumer preferences based on product attributes.

The description above has provided novel insights into consumer preferences for both fresh and frozen potatoes. Thus, this study aims to investigate consumer behavior and identify preferences for fresh and processed (frozen) potatoes. It is expected to contribute to potato preference studies.

2. Literature Review

2.1 Theory of Consumption Behavior

Consumption behavior refers to individuals' activities of consuming a product or service that is useful for meeting their needs (Adiwinata et al., 2021). Consumption is always related to households. It is one of main variables in the macroeconomic concept. When households engage in consumption activities, they contribute to national income. Suyanto et al. (2020) have noted that Indonesians' consumption behavior and decisions appear to be significantly influenced by social class and status.

The current social consumption reflects a consumerist culture. Consumptive behavior is the behavior of individuals who like to spend large amounts of money. Rapidly developing digital payment platforms have made payments easier, thereby increasing household consumption (Li et al., 2020). The total consumption is greatly influenced by consumers' consumption behavior in the long term. This consumers' consumption behavior is used to find the current consumption patterns since consumption decisions are often influenced by several factors, such as life experiences, perspectives, thoughts, and knowledge (Sandi Wachyuni & Wiweka, 2020). One of the core ideas of consumer behavior is consumer preference (Solomon et al., 2006).

2.2 Consumer Preferences

Consumer preference is an individual's choice of liking or disliking the products (goods or services) consumed (Rohmah & Subari, 2021). The increasing need of consumers for products and services is an opportunity and challenge for entrepreneurs to create products that meet the desires and needs of these consumers (Rachmat et al., 2023). One of the aspects which affects consumer preference is product attributes (Solomon et al., 2006). Customers assess products based on their features, functionality, design, pricing, brand reputation, and quality. These attributes can be prioritized differently by customers. Consumer preference analysis aims to determine the importance order of a product's attributes. The attributes are used to measure consumer preferences. This preference is based on consumers' perceptions of a product's attributes (Angriva & Sunyigono, 2020).

2.3. Product Attributes

Product attributes are the characteristics or features of a product that differentiate the product from other brands (Andini et al., 2023). A consumer values a product based on its characteristics, features, or attributes. Marketers must know what consumers need, what attributes are known about a product, and what attributes consumers consider most important. Consumer preferences can be seen through product attributes, which

determine which products to buy, whether in the form of goods or services (Santoso et al., 2023). The level of consumer preference for product attributes can create consumer satisfaction (Fajarani et al., 2021).

The attributes of fresh potatoes include tuber size, skin surface, and the number of lateral buds. The attributes of fresh potatoes studied in this research were adopted from Adiyoga and Nurmalinda (2012). The tuber's weight provides information about its size. Potatoes will be categorized as giant, medium, or tiny based on weight. Potatoes are typically sold in plastic packaging that holds four to six potatoes, totaling between 0.5 and 1 kilogram in weight. The skin of potatoes is defined by small peeling and a smooth texture, features readily assessed by consumers who are naturally inclined towards visually appealing products. Notably, Irsyad et al. (2018) discovered that among potato consumers, light brown skin color and a smooth, clean surface are the most valued attributes.

This study explores frozen potato preferences, analyzing shape, price, taste, packaging, and brand attributes. Price signifies the price level or payment method for consumers (Saefudin et al., 2020), which indicates product quality (Kumrotin & Susanti, 2021) and is imperative in consumer purchasing decisions. Taste attributes aid in identifying food and beverage products (Beacom et al., 2021), influencing consumer acceptance or rejection. Taste is considered highly essential by consumers (Safitri and Harti, 2022). Packaging involves creating containers for products with essential product information, particularly critical in food packaging.

3.   Conceptual Framework

This study observed the characteristics, purchasing behavior, and preferences of consumers that can be measured using the attributes of fresh and frozen potatoes. Figure 1 presents the research framework of the attributes determining consumers' preferences for fresh and frozen potatoes.
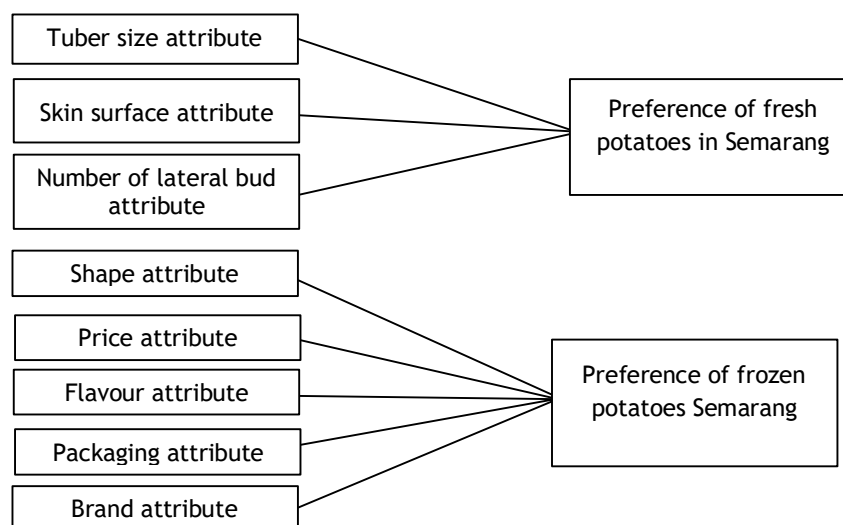

Figure 1. Conceptual framework of fresh and frozen potatoes preference

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4. Methods

4.1 Research Design

Research data were collected through a survey using a questionnaire. The survey involved researching large or small populations to gather opinions, behaviors, and characteristics. The results are typically generalizable. The study focused on potato consumers in Semarang. An online approach was employed, and a questionnaire using Google Forms was distributed via various social media platforms such as WhatsApp, LINE, Facebook, Twitter, and Instagram. Semarang City was purposively selected as the research location due to its high potato consumption rate of 0.064 kg per capita per week, surpassing the Indonesian average of 0.049 kg per capita per week (BPS - Statistics Indonesia, 2024), indicating its potential as a potato market.

4.2 Sampling

The sampling method employed for recruiting potato consumers was non-probability by purposive sampling. Purposive sampling is the selection of samples based on specific characteristics related to the characteristics of the previous population (Lenaini, 2021). The exact population of potato consumers in Semarang City is unknown, so the Lemeshow formula was used to calculate the sample size (Ismail et al., 2022). The study obtained 96 respondents, which were rounded up to 100.

$$n = \frac{z^2 \times p(1-p)}{d^2}$$

$$n = \frac{1,96^2 \times 0,5(1-0,5)}{0,1^2}$$

$$n = 96$$

Explanation:
- n = number of samples
- z = z score on 95% confidence = 1,96
- p = Estimated proportion population, maximum estimate = 0,5
- d = alpha or sampling error = 10% = 0,1

In this study, respondents were required to meet three criteria. Firstly, they had to be adults aged at least 21 years, considered mature enough to make food consumption decisions for themselves or their families. Secondly, they needed to be the individual responsible for food shopping for a family or themselves. Lastly, respondents had to reside in Semarang City and have consumed fresh and/or frozen potatoes within the last month.

4.3 Measurement

Both primary and secondary data were collected. Primary data, focusing on consumers' potato preferences, were gathered using a questionnaire put in Google Forms. The questionnaire aimed to identify consumers' preferred product attributes and key considerations when purchasing fresh or frozen potatoes. It comprised two sections: one for respondent identification and another for preferences regarding fresh or frozen potatoes. This research assessed important product features rather than using generic variables, focusing on lateral bud numbers, tuber size, and skin surface for fresh potatoes, as well as brand, packaging, flavor, price, and shape for frozen ones. The measurement

instrument for product attributes was adapted from Adiyoga and Nurmalinda (2012) and Irsyad et al. (2018).

Nine indicators were used for fresh potatoes, while sixteen were employed for frozen potatoes. Likert scale was used to assess the combination of potato product attributes, assigning scores ranging from negative to favorable. The questionnaire included preference statements for fresh and frozen potatoes, with responses on a Likert scale ranging from "Strongly Dislike" to " Strongly Like." This method, integral to conjoint analysis (Hair et al., 2014), informed the study's measurement. The respondents were reached through social media platforms. The online survey option allowed the respondents to conveniently complete the questionnaire using the Google Form link, ensuring efficiency in terms of both time and cost (Anggraeni et al., 2022).

4.4   Data Collection

Data were collected purposively from the population of potato consumers in Semarang City based on the sampling criteria. Google form questionnaires were distributed through social media platforms, including Facebook, Instagram, Twitter, WhatsApp, and LINE. The responses were used to gather data.

4.5   Data Analysis

The data analysis method used was descriptive analysis, which explained the general characteristics of potato consumers in Semarang City, including age, gender, income, education level, and number of family members. Consumer behavior includes the type of potato consumption, frequency and amount of consumption, place of purchase, reasons for consuming potatoes, knowledge about potatoes, monthly expenditure on potato consumption, and sources of information about potatoes.

The second method was conjoint analysis, used to explore consumer preferences for potato products, consisting of a combination of several attributes. The choice of this method is based on the research objective of obtaining the most important attributes and priority value of consumer preferences for a combination of attributes of fresh and frozen potatoes which influences consumer behavior in decision-making. The selected product attributes of fresh potatoes were tuber size (three levels), skin surface (two levels), and number of lateral buds (three levels). The tuber size stimulus consists of three levels, namely, large, medium, and small. Meanwhile, the two stimuli on the skin surface were smooth skin and small peeled skin. Finally, the number of lateral buds consisted of three stimuli: ≤5, 6-9, and ≥10. The average number of fresh potato stimuli was 18. This number was then reduced using the orthogonal array design procedure of the IBM SPSS Statistics 25 application to 10 stimuli. The results of the stimuli for fresh and frozen potatoes are presented in Table 1.

The selected product attributes of the frozen potatoes were shape (four levels), price (three levels), flavor (two levels), packaging size (three levels), and brand (two levels). The 144 frozen potato stimuli were reduced using an orthogonal array design process with IBM SPSS Statistics 25 because this number was considered to lead the respondents to provide inconsistent judgments. Therefore, the number of stimuli was reduced to 16.

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Table 1. Results of the fresh and frozen potato orthogonal procedure

Stimuli	Description of stimuli	
	Fresh Potato	Frozen Potato
1	Large size, smooth skin, ≤5	straight, 75001-93000, original, 501-800, branded
2	Small size, skin has small peeling, ≥10	straight, 58001-75000, batter coated, <500, unbranded
3	Large size, smooth skin, ≥10	crinkle, 39000-58000, batter coated, <500, branded
4	Small size, smooth skin, 6 – 9	wedges, 39000-58000, batter coated, <500, branded
5	Medium size, smooth skin, ≥10	wedges, 58001-75000, batter coated, 501-800, branded
6	Large size, skin has small peeling, 6 – 9	shoestring, 39000-58000, batter coated, 501-800, unbranded
7	Medium size, skin has small peeling, ≤5	wedges, 75001-93000, original, <500, unbranded
8	Medium size, smooth skin, 6 - 9	shoestring, 58001-75000, original, 801-1000, branded
9	Small size, smooth skin, ≤5	straight, 39000-58000, batter coated, 801-1000, unbranded
10	-	straight, 39000-58000, original, <500, branded
11	-	shoestring, 75001-93000, batter coated, <500, unbranded
12	-	crinkle, 58001-75000, original, <500, unbranded
13	-	crinkle, 75001-93000, batter coated, 801-1000, branded
14	-	shoestring, 39000-58000, original, <500, branded
15	-	wedges, 39000-58000, original, 801-1000, unbranded
16	-	crinkle, 39000-58000, original, 501-800, unbranded

5. Findings

5.1 Characteristics of Potatoes' Respondents

The respondents were adults responsible for family or individual food purchasing, consumed fresh potatoes and/or frozen potatoes in the last month, and lived in Semarang City. The characteristics of the respondents in this study were divided into categories of gender, age, education, number of family members, total monthly income, and total monthly expenditure.

The age of the potato consumers was between 41 and 50 years old with a total of 39 people (Table 3). Consumer characteristics, in terms of respondents' ages, showed that they were in the productive age range. The demographic component of age is significant because age variations affect patterns of consumption.

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Table 2. Distribution of potatoes' respondents' characteristics

Characteristics	Category	Frequency	%
Gender	Male	26	26
	Female	74	74
Age (yo)	21 – 30	6	6
	31 – 40	33	33
	41 – 50	39	39
	51 – 60	15	15
	>60	7	7
Education Level	High School	19	19
	Diploma	10	10
	Undergraduate	59	59
	Postgraduate	12	12
Number of Family members	2 persons	14	14
	3 persons	20	20
	4 persons	35	35
	5 persons	21	21
	6 persons	6	6
	7 persons	3	3
	9 persons	1	1
Income (IDR/ month)	< 2,500,000	33	33
	2,500,000 – 3,500,000	21	21
	> 3,500,000	46	46

As Table 2 indicates, most respondents who bought potatoes were female (74%), while only 26% were male. This shows that fulfilling household needs in terms of food shopping is more determined by women in the household. Most respondents had a bachelor's degree or had graduated from a university (59%), indicating that the more educated a person, the greater the respondents' information and knowledge about foods need to be consumed.

The number of family members can also influence household consumption. As shown in Table 2, 35% of potato consumers have family members of 4 people. The Chi-square test revealed that $p < 0.05$; therefore, H1 is rejected, and it can be concluded that the availability of children under 18 years of age in the family will increase total potato consumption per week. This study revealed that the quantity of potatoes consumed by a household depends on whether there are children under 18 in the family.

Consumer income typically encompasses earnings from all family members within a household. In Table 2, varying income levels are observed among respondents, with a majority earning >IDR 3,500,000 (46%), implying a demographic of middle to upper-middle-income potato consumers in Semarang City. Table 3 highlights that most respondents spend <IDR 1,000,000 on food shopping monthly. Income levels and family size influence consumer expenditure. The Chi-square test revealed a significant relationship (p-sig < 0.05), supporting the conclusion that higher monthly incomes correspond to increased monthly food expenditures.

5.2. Consumption Behavior

Potato consumption behavior among consumers in Semarang City is examined through several aspects, such as the type of potato consumed, frequency and amount of consumption, place of purchase, knowledge about potatoes, and source of information about potatoes. Table 3 shows that 44% of potato consumer respondents consumed potatoes mostly once a week and mostly consumed regular vegetable potato (94%). These potatoes are commonly called yellow potatoes, mostly consumed in Indonesia. Most of of consumers (81%) in Semarang City consumed potatoes in the form of fresh potatoes. This indicates that the respondents choose to consume fresh rather than frozen potatoes.

Table 3. Potato consumption behavior of consumers in Semarang City

Category	%
Consumption frequency:	
Once a week	44
2 times a week	24
3 times a week	10
Once a day	0
2 times a day	0
3 times a day	0
Other	22
Variety types of potato consumed:	
Regular vegetable potatoes	94
Rendang potatoes (baby potatoes)	2
Red potatoes	0
Other	4
Form types of potato consumed:	
Fresh	81
Frozen	11
Other	8
Types of processed potato:	
Fried	43
Boiled	36
Mashed	6
Other	15
Place of purchase:	
Straight from the farm/ garden	1
Delivered home	3
Vegetable stall/ general stall	60
Supermarket/ modern market	49
Traditional Market	59
Other	4
Reasons for consuming potatoes:	
Health	14
Likes/habits	65
Other	21

Table 3. Potato consumption behavior of consumers in Semarang City (Continue)

Category	%
Total Consumption (kg/ week):	
≤ 2	90
3-5	10
6-9	0
≥ 10	0
Nominal expenditure for potatoes (IDR/ month):	
≤ 25.000	61
25.001 – 50.000	31
50.001 – 100.000	7
100.001 – 150.000	1
Source of information about potatoes:	
Television	21
Radio	4
Newspapers, magazines	24
Friends and family	34
Info on shopping center	14
Social media	93
Other	9
Knowledge value of potato (score):	
≤50	38
51 – 60	27
61- 70	20
71-80	13
>80	2

On average, the respondents thought that fresh potatoes are healthier, have more varieties of cooking results, and can be processed according to their needs. The respondents have different reasons for consuming potatoes. Most consumers in Semarang City consumed potatoes because of their preference/habit. Furthermore, as Table 3 indicates, 90% of the respondents consumed ≤ 2 kg of potatoes weekly and the rest 10% consumed 3-5 kg/week. It was found that no potato consumers in Semarang City consumed potatoes more than 6 kg/ week. Table 3 indicates that 43% of the respondents consumed processed potatoes in the form of fried potatoes, and boiled potatoes are in second place (36%). Many consumers buy potatoes from vegetable stalls/ general stalls (34.1%), traditional markets (33.5%), and supermarkets/modern markets (27.8%).

This study found that 61% of potato consumers in Semarang spent ≤IDR 25,000.00 per month (Table 3). According to the survey, the price of potatoes ranged from 19,000 to 22,000/kg, depending on the place of purchase. Information about potatoes can be obtained from various sources, such as television (10.6%), newspapers, and magazines (12.1%), opinions from friends and family (17.1%) who have purchased potatoes, information on shopping centers (7.0%), and other sources of information (school, previous workplace, and readings/journals). Table 3 shows that 46.7% of potato consumers in Semarang City obtain information about potatoes from social media. The respondents preferred looking for information about a product on social media because

it is faster and easier to find. Table 3 also describes that the respondents had different levels of understanding of potatoes. Less than 40% of the respondents assumed that they had knowledge about the nutritional content of potatoes of ≤50, and only 2% of the respondents had a knowledge value more than 80.

5.3 Consumer Preferences

Fresh potatoes are potatoes in their whole form that need to be processed before consumption. Frozen potatoes are processed potato products in the form of french fries that are preserved by freezing. As Table 4 indicates, more than 80% of the respondents preferred fresh potatoes, and less than 20% preferred frozen potatoes. Approximately 60% of fresh potato consumers preferred fresh potatoes because they are healthier without added preservatives. Furthermore, almost 20% said that fresh potatoes have more varieties, and the rest stated that fresh potatoes are cheaper and easier to obtain in the market. Meanwhile, the respondents who chose frozen potatoes mentioned practicality (14%). Fresh potatoes are more accessible to obtain in the market and last longer.

Table 4. Reasons of consumer preference of fresh and frozen potatoes

Types	Frequency	%
Reasons for consuming fresh potatoes:		
Healthier	31	35.3
Without added preservatives	29	32.9
More variety	17	19.2
Better	4	4.6
Prefer	4	4.6
Cheaper	2	2.3
Easier to obtain in the market	1	1.1
Reasons for consuming frozen potatoes:		
Better	2	10
Longer shelf life	2	10
Easier to obtain in the market	2	10
More practical	14	70

The attributes of fresh potatoes examined were tuber size, skin surface, and number of lateral buds. The attributes of frozen potatoes were shape, price, taste, packaging, and brand. Consumer preferences for potatoes in Semarang City were analyzed using a joint analysis with a full-profile approach. The results of the joint analysis of consumer preferences for fresh potatoes in Semarang are presented in Table 5. The utility value indicates the level of preference for various attribute levels. A negative value suggests dislike, while a positive value signifies preference. In Table 5, large tuber size holds the highest utility value (0.201), indicating a preference for larger potatoes. Smooth skin surface (0.155) and a small number of lateral buds (≤5) with a high utility value (0.643) are also preferred. Consumers prioritize large, smooth-skinned potatoes with few lateral buds. The most crucial attribute is the number of lateral buds (49.8%), followed by tuber size (32.1%) and skin surface (18.1%).

Table 5. The fresh potatoes conjoint analysis results

Attributes	Importance values (%)	Description	Utility estimate	Std. error
Tuber size	32.1	Small size: 9-12 items/kg	-0.278	0.075
		Medium size: 6-8 items/kg	0.077	0.075
		Large size: 3-5 items/kg	0.201	0.075
Skin surface	18.1	Smooth skin	0.155	0.056
		The skin has small peels	-0.155	0.056
Number of lateral buds	49.8	≤5	0.643	0.075
		6 - 9	-0.132	0.075
		≥10	-0.511	0.075
		(Constant)	3.039	0.056

As Table 6 indicates, consumers show a preference for straight-shaped frozen potatoes over shoestring, crinkle, and wedge shapes, as indicated by a positive utility value (0.097). Affordability is a key factor, with a utility value of 0.313 for prices ranging from IDR 39,000 to 58,000. Consumers preferred frozen potatoes with pre-seasoned coating, reflected in a positive utility value of 0.021. Larger packages (801-1000 grams) are preferred, as indicated by positive utility. Branded frozen potatoes are preferred over unbranded ones, shown by a utility value of 0.19. In summary, consumers prioritize straight-shaped frozen potatoes, priced between IDR 39,000 and 58,000, with pre-seasoned coating, larger packaging, and branded products. The significant attributes are shape (29.2%), price (26.0%), brand (19.2%), packaging (15.6%), and taste (10.0%).

Table 6. The frozen potatoes Conjoint analysis results

Attributes	Importance values (%)	Description	Utility estimate	Std. error
Shape	29.2	Shoestring	-0.036	0.043
		Crinkle	0.052	0.043
		Straight	0.097	0.043
		Wedges	-0.113	0.043
Price	26.0	39.000-58000	0.313	0.033
		58001-75000	-0.050	0.039
		75001-93000	-0.263	0.039
Flavour	10.0	Original	-0.021	0.025
		Batter coated	0.021	0.025
Packaging	15.6	<500 gr	-0.031	0.033
		501-800 gr	0.004	0.039
		801-1000 gr	0.026	0.039
Brand	19.2	Branded	0.190	0.025
		Not Branded	-0.190	0.025
		(Constant)	3.223	0.028

6. Discussion

6.1 Consumers Behavior

This research aimed to analyze potato consumers' consumption behavior and preferences in Semarang City. Consumption behavior among consumers in Semarang City was reviewed in terms of frequency and weekly total consumption, variety and form types of potatoes consumed, place of purchase, reasons for consuming potatoes, nominal expenditure for potatoes, source of information, and knowledge value about potatoes.

The research found that most potato consumers in Semarang consume potatoes once a week. This can be explained by the fact that households generally do not consume the same food daily, and potatoes are not the primary carbohydrate source for most Indonesians. This finding supports the results of Lacy and Huffman (2016), who found that 93% of households consume potatoes weekly. The dominant age group consists of adult respondents who tend to make rational decisions when purchasing food, particularly vegetables (Mega et al., 2022). This study found that most of the respondents, which aligns with Dewanti et al.'s (2020) assertion that women excel in managing consumption activities, including choosing healthier foods than men.

Most consumers revealed that they consumed regular vegetable potatoes, commonly called yellow potatoes. This is in accordance with Lutfi and Hafriana (2020) who stated that yellow potatoes are most preferred because they have delicious, savory, and tender tastes. Meanwhile, the respondents stated that red potatoes are rarely sold in markets, and may not even be available in supermarkets. The price of red potatoes tends to be higher compared to that of regular potatoes (Fauzie et al., 2016), which is why respondents rarely consumed red potatoes.

Many respondents indicated that they chose to consume fresh potatoes rather than frozen potatoes. There are various varieties of fresh potatoes that suit their family consumption needs. For example, it is a raw ingredient of various Indonesian dishes. According to Farooq et al. (2020), freshly harvested potatoes can be used as fresh vegetables for cooking at home and as raw materials for food products. On average, the respondents claimed that fresh potatoes are healthier, can be processed, and yield a wider variety of cooking outcomes. In their unprocessed form, potatoes make a very nutritious diet (Gray, 2018). The respondents who selected frozen potatoes reported they were more practical, delicious, and had a longer shelf life. This is in accordance with research by Kyntani et al. (2022), which states that many consumers consume frozen food products based on practicality. They tend to eat potatoes for snacks, including French fries. Although French fries are sometimes regarded as junk food (Izhar, 2020), fried potato products are commonly consumed as snacks that are popular among people of all ages, including young people and the elderly (Zaheer & Akhtar, 2016). The expansion of the potato product industry—driven by customer demand—is one of the factors contributing to the rise in potato consumption. These products include dried potato puree, chips, flour, starch, fries, and granules (Mickiewicz et al., 2022). Meanwhile, most Indonesian side-dish menus require frying potatoes during cooking. According to Gray (2018), the Irish food service industry does not seem to have much of a need for processed potato products.

The study revealed that most customers prefer purchasing potatoes from vegetable stalls due to convenience and comparable costs to markets (Afriansyah, 2021). Vegetable stalls

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offer a one-stop shopping destination, saving customers time searching for ingredients, echoing the findings of Khaeruman and Hanafiah (2019) regarding market shopping preferences for variety and direct interactions with farmers. Customers buying ≤ 2 kg of potatoes weekly are categorized as having low protein consumption (Priharwanti, 2016). In Semarang, many consumers spend ≤ IDR 25,000, sourcing potatoes at stalls or markets where prices range from IDR 19,000 to 22,000/kg. Income significantly influences product choices (Haeruddin et al., 2019), with middle-class income in Indonesia ranging between IDR 2,500,000 and 6,000,000 (World Bank, 2020). Higher shopping expenses increase preferences, a sentiment supported by Sumarwan et al. (2013), as noted by Widyastomo (2022), illustrating the average monthly food shopping expenditure in Semarang, mostly falling within IDR 1-3 million, indicative of the purchasing power of upper-middle-class households.

Consumer spending is influenced by income levels and family size, determining purchasing preferences (Rahmah & Satyaninggrat, 2023). The presence of children under 18 increases potato consumption due to its energy benefits, immune system support, and neurological advantages (Sholichah et al., 2023).

Research before purchasing is a common practice (Fajar et al., 2023), with social media emerging as a preferred platform for product information search due to its speed and accessibility, aligning with the online trend of fresh vegetable consumption (Aprilliyanti & Riyanto, 2020). Online comments and reviews serve as crucial information sources for consumer decision-making. A knowledge score ≤50 indicates a limited understanding of potato nutrition among respondents, necessitating improved awareness for better dietary choices (Suryana et al., 2023).

6.2 Consumer Preferences of Fresh Potatoes

This research reveals that the respondents prioritize the number of lateral buds when purchasing fresh potatoes, contrary to the findings of Adiyoga and Nurmalinda (2012) where taste ranked highest followed by flesh color, price, shape, size, eye depth, and lateral buds. Potatoes with fewer lateral buds are preferred for easier peeling, aligning with Sembiring and Adiyoga's (2020) research emphasizing a preference for shallow tuber buds.

Tuber size is another key consideration for consumers when selecting fresh potatoes, with a preference for larger varieties. Quality indicators cited by Sinaga et al. (2014) include large size, yellow flesh, clean unpeeled skin, and good condition. Consumers also favor potatoes with smooth skin as noted in Irsyad et al.'s (2018) study, highlighting preferences for a smooth surface and light brown skin color as taste-related attributes.

6.3 Consumer Preferences of Frozen Potatoes

Frozen potatoes are considered the most important factor in consumer preferences, with straight-cut varieties without skin being the most popular choice within the group. Customers consider pricing between IDR 39,000.00 and IDR 58,000.00 acceptable, emphasizing the need for frozen potato companies to align pricing strategies with product quality (Putra et al., 2023).

Taste ranks least important among consumer considerations, as batter-coated frozen potatoes eliminate the need for added flavors. Consumers favor 801 to 1000 gram packaging for its cost-effectiveness and lasting quantity. Brands like Golden Farm, Fiesta, Frozenland, Just Fry, and McCain are preferred over unbranded options, reflecting trust and reliability in branded products (Laksono & Suryadi, 2020).

6.4   Managerial implications

The study identified the number of lateral buds as the most prioritized attribute for fresh potatoes. This emphasizes the importance of innovative potato varieties with fewer lateral buds. On the other hand, product form ranks highest for frozen potatoes, highlighting the need for production and store managers to cater to consumer preferences. Attention to attributes like potato shape, especially straight cuts, is vital for meeting consumer expectations in frozen potato production. Government and relevant agencies can enhance consumer knowledge of potatoes through educational initiatives, such as household meetings, promoting potato processing benefits for families, and increasing consumer awareness.

6.5   Theoretical implications

This study is based on the theory of consumption behavior and consumer preference. Consumers' preferences are displayed based on their selection of current product attributes. Attributes are tools for quantifying customer preferences, which are shaped by how customers view a product's attributes (Angriva & Sunyigono, 2020). Thus, the results of this research support the existing theories and complement the results of previous research.

6.6   Limitations

This study had limitations because it was conducted only in Semarang City. As the study was limited to a single city, the sample might not be sufficiently reliable to be generalized. Future studies should examine other Indonesian cities.

7.   Conclusions

Potato consumers in Semarang City consumed potatoes once a week, bought regular and fresh potatoes, processed potatoes by frying, purchased potatoes at vegetable stalls/stalls, consumed potatoes for reasons of preference/habit, spent on potato consumption IDR $\leq$ 25,000/month, mostly consumed $\leq$ 2 kg of potatoes per week, obtained potato nutritional information from social media, and had knowledge of potato nutrition at a value of $\leq$50. Furthermore, the consumers prefer fresh potatoes with large tubers, smooth skin, and $\leq$ 5 lateral buds. The attributes most prioritized by fresh potato consumers were the number of lateral buds, tuber size, and skin surface. The frozen potato attributes that the consumers like most are a straight form, priced between IDR 39,000 and 58,000, batter-coated taste, 801-1000 gr packaging, and branded. The attributes that are prioritized the most by frozen potato consumers in Semarang City are shape, price, brand, packaging, and taste.

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8.   Recommendation

Future research should add the attribute of cooking/processing potatoes based on consumer preferences and expand the research location (consumer area coverage) to several other cities in Indonesia.

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