ISSN:2527-273X (Online)
https://ejournal.agribisnis.uho.ac.id/index.php/JIA
doi: http://doi.org/10.37149/JIA.v11i1.2502

JIA (Jurnal Ilmiah Agribisnis) : Jurnal Agribisnis dan Ilmu Sosial Ekonomi Pertanian
2026:11(1):44-50

Sustainable Chicken Eggs from Cage-Free and Free-Range Production Systems (Consumer Satisfaction in Yogyakarta, Indonesia)

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To cite this article:
Aisyah, D. D., Cahyasita, D., & Mussodaq, M. (2026). Sustainable Chicken Eggs from Cage-Free and Free-Range Production Systems (Consumer Satisfaction in Yogyakarta, Indonesia). *JIA (Jurnal Ilmiah Agribisnis) : Jurnal Agribisnis Dan Ilmu Sosial Ekonomi Pertanian*, *11*(1), 44–50. https://doi.org/10.37149/jia.v11i1.2502

Received October 22, 2025; **Received in revised form** October 29, 2025; **Accepted** December 28, 2025
Available online January 01, 2026

Abstract

The distribution of food ingredients with sustainable claims from cage-free and free-range production systems is currently increasing. Eggs, as one of the affordable and easily accessible food ingredients for the community, have been developed into products with sustainable value. The study aims to identify the socio-demographic characteristics of sustainable egg consumers, investigate consumer satisfaction levels, and map the attributes that reflect the urgency and performance inherent in egg products with sustainable claims. Data were collected in July 2024 through structured interviews with up to 100 consumers in the Special Region of Yogyakarta. Customer Satisfaction Index (CSI) and Importance-Performance Analysis (IPA) were applied in this study. The results show that respondents were mostly of productive age, had small households, and belonged to low- to middle-income groups, with generally moderate egg consumption levels. At the same time, the analysis shows that consumer satisfaction with eggs bearing sustainable claims is relatively high. The attributes of freshness, variety of egg types, and the added value of Omega-3 are considered the most important and satisfying attributes. In developing their products, marketers need to improve the performance of egg size, packaging, and the number of eggs per package.

Keywords: chicken egg; satisfaction; staple food; sustainability.

1. Introduction

To achieve responsible and sustainable food consumption and production in the Sustainable Development Goals (SDGs), the development of science related to sustainable food consumption for communities is expanding over time. This is supported by data showing that the standard of living of the population in almost all countries has increased (Gradín, 2024), but at the same time, the increase is followed by worsening environmental degradation (Folwarczny et al., 2023). Building healthy and sustainable food consumption habits from an early age is needed to reduce the rate of obesity and chronic diseases, while at the same time reducing pressure on the ecosystem (Vos et al., 2022)

One of the staple foods that cannot be separated from people's diets worldwide is eggs. The demand for egg products continues to rise alongside population growth. Therefore, the egg industry continues to strive to improve the quality, nutrition, safety, and functionality of its own egg products (Wardy et al., 2014). Today's egg consumers can easily access information about various types of eggs and their different nutritional content. (Amfo et al., 2024) found that most consumers of chicken eggs in Ghana are willing to pay more for value-added egg products than for conventional eggs. However, his research found consumer dissatisfaction with several product attributes, such as price, hygiene, packaging neatness, size, and customer care.

Based on studies on consumer satisfaction with product purchases, it can be understood that consumers evaluate and assess product attributes (Antonides & Hovestadt, 2021). Eggs themselves have a very wide market segmentation because they are included in staple foods. Along with the

times, more and more egg products are targeting niche markets at higher prices, including those with added value. When associated with the SDGs, eggs that prioritize the value of additional nutrients and animal welfare are gaining market share. Egg production with sustainability value is intended for consumers who have a higher awareness of social, environmental, and health concerns (Thompson et al., 2011)

As one of the provinces with a relatively high proportion of low-income population on Java Island, Yogyakarta represents an interesting context for examining food consumption behavior. Although eggs are generally considered an affordable protein source for all income groups, sustainable claims such as cage-free and free-range eggs are typically sold at higher prices than conventional eggs. This price difference raises important questions regarding consumer satisfaction, particularly in regions with limited purchasing power. At the same time, Yogyakarta is characterized by relatively high awareness of ethical and sustainable food consumption, making it a relevant setting to examine how consumers evaluate sustainable egg products. The study aims to identify the socio-demographic characteristics of sustainable egg consumers, investigate consumer satisfaction levels, and map the attributes that reflect the urgency and performance inherent in egg products with sustainable claims in the Special Region of Yogyakarta.

2. Materials and Methods

The Special Region of Yogyakarta, comprising Yogyakarta City, Bantul Regency, Sleman Regency, Kulon Progo Regency, and Gunung Kidul Regency, is where this study was conducted. Primary data is the kind of data that is used. A total of 100 respondents provided data that was collected offline. Customers who fit the following requirements are the study's respondents: 1) they must be above 17 years old; 2) they must reside in Yogyakarta's Special Region; 3) they must have bought eggs with a sustainable claim for at least a month; and 4) they must not have an egg allergy. In July 2024, data gathering will take place. Purposive sampling was used in the sample selection, and specific inclusion criteria were applied. Respondents were given standardized questionnaires to complete in order to gather data for this research.

Consumer satisfaction in this study was analyzed using Importance-Performance Analysis (IPA) and the Customer Satisfaction Index (CSI). IPA is known as a tool applicable to marketing research. It helps indicate the main factors or attributes of a certain product that need improvement. The average rating of importance and performance will be displayed on the Cartesian diagram, which will be divided into four quadrants. The recommendation will depend on where the attributes are placed within those quadrants (Jolanta Wyród-Wróbel & Grzegorz Biesok, 2017). Quadrant 1 is an aspect that maintains the status quo because it is enough with a high level of importance and satisfaction. Quadrant II is a place for aspects that need focused improvement. Quadrant III is an area with a low level of importance and satisfaction, so the attributes located in this quadrant rank low in improvement priority. Meanwhile, quadrant IV is an area where marketers must avoid excessive effort because it includes aspects that are considered to have a low level of importance with a high level of satisfaction (Bae, 2020). The criteria for this satisfaction index are divided into five categories, as shown in Table 1.

Table 1. Satisfaction index criteria

Score (%)	Information
81-100	Very satisfied
66-80,99	Satisfied
51-65,99	Satisfied enough
35-50,99	Less satisfied
0-34,99	Not satisfied

(Bunga et al., 2025)

The assessment is carried out by measuring the average level of importance and performance of attributes. The science matrix has two dimensions: the x and y axes. The x-axis is performance, while the y-axis is the level of importance. This matrix can serve as a guideline for improving attributes with limited resources in more specific areas where performance improvements have major implications for total consumer satisfaction. The CSI model is an analysis of consumer satisfaction with performance and performance attributes in a consumer satisfaction study, expressed as a percentage. Measurement is carried out by assessing the consumer satisfaction level based on respondents' answers to questions related to the product's expectations and actual performance.

$$CSI=\frac{\sum_{i=1}^{p} WSi}{HS} \times 100\% \quad (1)$$

Information: CSI: Customer Satisfaction Index, WSI: Weight Score, HS: The maximum scale value used in this study is five

3. Results and Discussion

3.1. Respondent Characteristics

Consumer demographics can be an important factor in consumer satisfaction with a particular product. (Nurrokhman & Jawad, 2024) stated that demographic conditions are crucial to market segmentation, as they provide insights into consumer behavior. This research focuses on adult female consumers who generally know the family's consumption expenditure. An overview of demographic conditions is shown in Table 2.

Table 2. Demographic conditions of egg consumers with sustainable claims

Characteristics	Categories	%
Age	Productive	92
	Non Productive	8
Children	2 Or Less	63
	More Than 2	37
Education	Elementary	23
	Junior High	14
	Senior High	50
	Higher Education	13
Income per month	<2.000.000	66
	2.000.000-4.000.000	28
	4.000.001-6.000.000	3
	>6.000.000	3
Consumption expenditure	<500.000	10
	500.000-1.000.000	47
	1.000.001-1.500.000	22
	1.500.001-2.000.000	13
	>2.000.000	8
Egg consumption per week	0-5	50
	5-10	27
	10-15	5
	>15	18

Source: primary data analyzed (2024)

In Table 2, several characteristics are used to provide an overview of egg consumers with sustainable claims, including age, number of children, income per month, and consumption expenditure per month. Based on age, most consumers are in the productive age group under 64, where female consumers are at a supportive age to work or create. Productive age is also often associated with greater acceptance of product innovation (Hettich et al., 2025). However, Maherawati et al. (2023) confirmed the benefits of chicken eggs for families with children, aiming to meet animal protein intake. In this study, most consumers had 2 or fewer children. Providing nutritious food will optimize the growth and development of their children.

Another characteristic that generally affects the consumer mindset is education level. The higher the level of education, the easier it will be to access information related to healthy eating. Not only are consumers with higher education more interested in products that offer sustainable values (Yılmaz, 2025), but they are also more likely to purchase them. According to Table 2, most consumers complete their studies at the equivalent of a high school level. This means that they have sufficient ability to understand the development of egg products, especially eggs with sustainable value. Based on monthly income, the majority of consumers earn less than two million per month. This shows that respondents need affordable food for their family's side dishes at home. Eggs are one of the options because they are the cheapest source of protein (Sarma et al., 2017). However, this will be one of the obstacles for consumers, as eggs with sustainable claims generally cost significantly more than domestic chicken eggs without added value. Previous studies suggest that consumers with higher levels of education and income tend to place greater importance on ethical and sustainable

food attributes, leading to higher acceptance and satisfaction despite higher prices. In contrast, consumers with lower incomes are more likely to prioritize affordability, leading to different consumption behaviors toward products with sustainable claims (Kim & Kim, 2024).

Food expenditure reflects a household's ability to meet its members' nutritional needs and is often used as an indicator of household food security (Rachmah & Marzuki, 2016). Based on weekly egg consumption patterns, the results show considerable variation among respondents. Half of the respondents consume 0–5 eggs per week, while others consume between 6 and more than 15 eggs per week. This variation indicates that egg consumption among low-income households is not uniform and depends on household preferences and consumption patterns rather than daily consumption regularity.

3.2. Customer Satisfaction Index (CSI)

Consumer satisfaction is an important object of study in economic activities, beyond simply analyzing the production and consumption of products. This is because satisfaction describes consumer loyalty, which impacts repeat purchases. According to Khadija and Shakir (2022), Customer satisfaction is an organizational strategy towards marketing and profitability targets. The Customer Satisfaction Index (CSI) is a commonly used measure for evaluating how a company's products and services meet or exceed customers' expectations in their consumption activities (Nurmahdi, 2019). The customer's perception of the perceived quality of sustainable eggs in this study is illustrated by CSI.

The quality of sustainable egg products is measured by consumer assessments of how important and satisfied they are with several attributes applied to these products. The attributes that serve as indicators of consumer satisfaction in this sustainable egg study are price, size, packaging shape, omega-3 content, type of egg (native or country), freshness, happy eggs (free-range), and the number of eggs in the package. The results of the study on consumer satisfaction with these various attributes are presented in Table 3.

Table 3. Customer Satisfaction Index (CSI) analysis results

Attributes	MIS	MSS	WF	WS
Price	3.94	3.90	13.796	53.803
Size	3.12	3.95	10.924	43.151
Packaging	2.59	3.93	9.069	35.640
Omega-3	3.98	4.02	13.936	56.021
Type of eggs	3.90	4.06	13.655	55.441
Freshness	4.52	4.10	15.826	64.888
Happy Egg (Free Range)	3.73	3.80	13.060	49.629
The number of eggs in one pack	2.78	3.94	9.734	38.352
Weight Total				396.924
CSI (%)				79.39

Source: Primary data analyzed (2024)
Information: MIS= Mean Importance Score; MSS= Mean Satisfaction Score; WF: Weight Factor; WS= Weight Satisfaction

The study found that the CSI for sustainable egg products was 79.39%. Referring to Table 1, these results indicate that, in general, consumers are satisfied with their consumption of sustainable egg products. In Table X, the WS value for the Freshness attribute (64.88) is the highest. This indicates that consumers are most satisfied with sustainable eggs for the freshness they provide. The results of this study have implications: to achieve consumer satisfaction, marketers can continue to maintain egg freshness, followed by selecting egg types and ensuring omega-3 content.

3.3. Importance Performance Analysis (IPA)

Science analysis is used to calculate the order of attribute priorities based on consumer judgment. This is done to obtain recommendations on which attributes require the most attention to improve, thereby optimizing consumer satisfaction(Nurrokhman & Jawad, 2024). The recommendation for each attribute will depend on its location in the 4 quadrants of the Cartesian diagram in Figure 1.

Based on the science matrix drawn in the diagram, it can be seen that 37.5% of the total attributes are located in quadrant I, which means that the attributes of egg type (free-range or domestic chicken eggs), omega-3 content, and freshness obtain a high level of importance and satisfaction from consumer assessments. In addition, there are as many portions as in quadrant III,

which shows that the attributes of packaging, the number of eggs per package, and egg size receive low priority in the eyes of consumers. The price attributes and types of happy eggs are in quadrant IV, which means that, so far, the performance efforts to improve these two attributes are too high relative to their level of importance from the consumer's point of view.

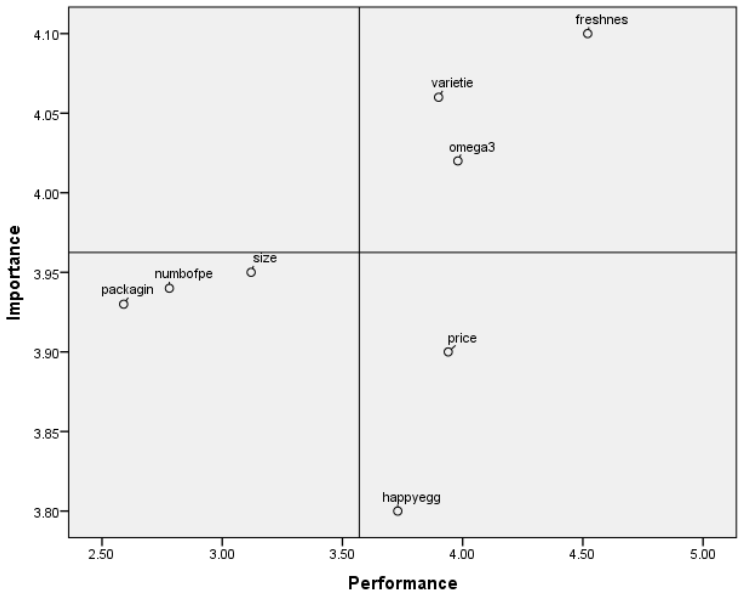

Figure 1. Diagram Cartesius
Source: Primary data analyzed (2024)

The assessment is based on classical science theory. Meanwhile, the 6-field criterion IPA matrix used by Jolanta Wyród-Wróbel & Grzegorz Biesok (2017) is determined. Using six criteria can yield more detailed recommendations by examining the location of each attribute in the Cartesian diagram. The decision of the recommendation can be seen in Table 3.

Table 3. IPA analysis and decisions about attributes

Attributes		I	P	Priority line criterion	6-field criterion
X1	Price	3.90	3.94	Leave	Low Priority
X2	Size	3.95	3.12	Leave	Improve
X3	Packaging	3.93	2.59	Leave	Improve
X4	Omega-3	4.02	3.98	Concentrate	Keep Up
X5	Type of eggs	4.06	3.90	Concentrate	Warning
X6	Freshness	4.10	4.52	Concentrate	Keep Up
X7	free range (happy egg)	3.80	3.73	Leave	Low Priority
X8	Number of eggs per package	3.94	2.78	Leave	Improve

Source: primary data analyzed (2024)

The decision to improve, maintain, or ignore each attribute in the classical IPA approach differs from that in the six-criteria IPA. The difference is evident in Table 3, where the decisions yield different results even though they are based on the same attribute. According to Bi et al. (2019), the method for determining recommendation decisions in IPA is quite diverse to date. There are two quadrant division methods: data-centered and scale-centered. In addition, a method of adding diagonal lines increases the number of quadrants from the original four to six. This category can accommodate attributes that cannot be explained in the classical approach.

Based on the six-criteria approach, the attributes of freshness and omega-3 content must be maintained. On the other hand, the type of free-range chicken eggs or domestic chicken eggs received a warning value, which means that the performance of these attributes needs to be maintained so that they remain in that quadrant. Some attributes can even be optimized again. The size, packaging, and number of eggs per package can increase the performance value of consumer assessments. This opportunity can be used by producers and marketers who are trying to improve their product attributes to ensure they meet consumer expectations.

4. Conclusions and Suggestions

Based on the analysis and discussion, the respondents are predominantly of productive age and have relatively small household sizes. Most have a senior high school education and belong to low- to middle-income groups, with monthly incomes largely below IDR 2,000,000. Household consumption expenditure is mainly between IDR 500,000 and IDR 1,000,000 per month, while egg consumption levels are generally moderate. Furthermore, consumers of eggs with sustainable values in the Special Region of Yogyakarta are satisfied with their purchases. In addition, several attributes, such as size, packaging, and the number of eggs per package, can be improved to increase consumer satisfaction. Therefore, it is recommended that marketers focus on improving the product marketing process through these attributes.

Funding Declaration

This research was supported by the Institute for Research and Community Service (LPPM), UPN "Veteran" Yogyakarta, through the Beginner Lecturer Research Scheme under contract number 120/UN62.21/DT.07.00/2024.

CRediT Authorship Contribution Statement

Dinda Dewi Aisyah contributed to data curation, formal analysis, writing – original draft preparation, and writing – review & editing; Dhika Cahyasita contributed to conceptualization, methodology, writing – original draft preparation, and data curation; and Mochammad Mussoddaq contributed to data collection.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

The data supporting the findings of this study are available upon reasonable request by contacting the corresponding author via email.

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