Factors affecting the demand for native chicken eggs in Surakarta City

A K Setyawati, S Marwanti and M T Sundari
Department of Agribusiness, Agriculture Faculty of Universitas Sebelas Maret, 57126 Surakarta, Central Java, Indonesia.

Abstract. Native chicken egg is one of the animal protein sources to meet the need for protein. This study analyzes what factors affect the demand for native chicken eggs in Surakarta City and examine the elasticity of demand for native chicken eggs in Surakarta City. The primary method of research is descriptive. This research was conducted in Harjodaksino Market, Jongke Market, Legi Market, Gede Market, dan Sangkrah Market. This study carried out the research location selection purposively and used 100 respondent end consumers of native chicken eggs. The data analysis method used is multiple linear regression. The result showed that factors that affect the demand for native chicken eggs in Surakarta City are native chicken eggs prices, laying hen eggs prices, duck egg prices, native chicken meat prices, broiler chicken meat prices, and rice prices. Price elasticity indicates that the demand for native chicken eggs is elastic. Cross elasticity showed that laying hen eggs, duck eggs, and native chicken meat are substitute goods for native chicken eggs. In contrast, broiler chicken meat dan rice is complementary good for native chicken eggs.

1. Introduction
Food is the most basic need for all living things. Every human being needs food to obtain benefits for growth and health derived from carbohydrates, proteins, fats, vitamins, minerals, fiber, water, and other components [1]. Adequacy of calories and protein is a reflection of adequate food and nutrition.

One of the protein needs can be met from animal products, namely eggs. Native chicken eggs are one of the types of eggs that have high nutritional value. The egg needs of the Indonesian are 65% fulfilled by laying hens, and the rest is dominated by native chicken eggs, duck eggs, and even quail eggs [2]. Cargill Indonesia stated that the national egg demand in 2017 was 1.78 million tons. The need for eggs in Indonesia can be met by domestic production, which is native chicken eggs. The production of native chicken eggs in Indonesia from 2015 to 2019 fluctuated but tended to increase. Total production of native chicken eggs in Indonesia from 2015 to 2019 were consecutively 190,739 tons, 196,703 tons, 221,000 tons, 212,342 tons, and 220,244 tons [3].

Eggs produced will be consumed by the community. Most layers of society consume eggs as food because it has a high nutritional content. The level of egg consumption is affected by various factors, including consumption patterns, income levels, education. Consumption of native chicken eggs per capita in Indonesia from 2014 to 2018 fluctuated but tended to increase. Total consumption of native chicken eggs per capita in Indonesia from 2014 to 2018 were consecutively 2,598 kg, 3,754 kg, 3,546 kg, 4,066 kg, and 3,804 kg [3].
Before consuming native chicken eggs, the consumer will demand or purchase native chicken eggs first. Demand is a consumer's desire to buy goods at various possible prices in a certain period by assuming other things remain the same (ceteris paribus) [4]. An increase in egg consumption is also interpreted as an increase in demand where the demand for eggs is a real thing and an important component of the entire structure of activities in the food sector [5]. Normatively, prices, people's incomes, population, and prices of other goods will determine the demand for eggs [6].

Based on the things above, it is necessary to research the factors that affect the demand for native chicken eggs in Surakarta City. This study aims to (1) analyze what factors affect the demand for native chicken eggs in Surakarta City and (2) examine the elasticity of demand for native chicken eggs in Surakarta City.

2. Method
The primary method of research is descriptive. The research location was carried out in 5 traditional markets in 5 districts in Surakarta City, namely Harjodaksino Market, Jongke Market, Legi Market, Gede Market, and Sangkrah Market. The selection of research locations purposively considering that traditional markets with the largest land and building areas and the largest number of traders will be chosen as research locations. The large market has the largest number of traders, so that many people will shop at the market to buy various needs. Harjodaksino Market is the only traditional market in Serengan District, so that became the location of research. Jongke Market, Legi Market, and Gede Market were chosen as research locations because of the largest land and building area and the most traders compared to other traditional markets in each district. Meanwhile, Sangkrah Market is the research location because Kliwon Market and Gading Market have larger buildings and have more traders. It turns out that there are no traders who sell native chicken eggs.

Respondents comprise 100 people who are end consumers of native chicken eggs in Surakarta City. The sample in this research was determined by accidental sampling. Determination of the number of samples in this study used Roscoe’s theory. According to Roscoe’s theory, the minimum number of limits the sample must be taken if the research will perform analysis with multivariate (correlation or multiple regression). The number of sample members is at least 10 times the number of variables investigated [7]. The research was conducted from December 2020 to January 2021.

This study uses a multiple linear regression model with computer tools, namely the SPSS (Statistical Product and Service Solution) version 22 to determine the factors that affect the demand for native chicken eggs in Surakarta City. The demand function model is transformed into a natural logarithm so that it becomes a multiple linear regression model to facilitate the analysis as follows:

\[ \ln Q_d = \ln b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + b_8 \ln X_8 + e \]

Description:
- \( \ln \) : Natural logarithm
- \( Q_d \) : Number of demand for native chicken eggs (kg/month)
- \( b_0 \) : Constant
- \( b_{1,8} \) : Regression coefficient
- \( X_1 \) : Native chicken eggs prices (Rp/kg)
- \( X_2 \) : Laying hen eggs prices (Rp/kg)
- \( X_3 \) : Duck eggs prices (Rp/kg)
- \( X_4 \) : Native chicken meat prices (Rp/kg)
- \( X_5 \) : Broiler chicken meat prices (Rp/kg)
- \( X_6 \) : Rice prices (Rp/kg)
- \( X_7 \) : Household income (Rp/month)
- \( X_8 \) : Number of household members (people)
- \( e \) : Standard error

The elasticity value is the percentage increase or decrease in the demand for native chicken eggs if prices change or income. The elasticity test can be known by looking at the value of the regression
coefficient of each independent variable [8]. The criteria for price elasticity are 1) Elastic ($\varepsilon_d > 1$), which means that the quantity demanded of a good changes by a greater percentage than the change in the price of the goods. 2) Unitary ($\varepsilon_d = 1$) means that the quantity demanded of a good changes by the same percentage as the change in the price of the goods. 3) Inelastic ($\varepsilon_d < 1$) means that the quantity demanded of a good changes by a smaller percentage than the change in the price of the goods. The criteria for income elasticity are 1) Luxury goods ($\varepsilon_i > 1$), which means that if there is an increase in the price of goods, it will increase the demand for other goods vice versa. 2) Normal goods ($0 < \varepsilon_i < 1$), this means that if there is an increase in the price of goods, it will result in an increase in the demand for other goods, and vice versa. 3) Inferior goods ($\varepsilon_i < 0$) means that the demand percentage will decrease if income increases.

The criteria for cross elasticity are 1) Substitution relationship ($\varepsilon_c > 0$ or positive value). If there is an increase in the price of goods, it will decrease the demand for other goods, and vice versa. 2) Unrelated ($\varepsilon_c = 0$) means that if there is an increase in the price of one good, it will not affect the quantity demanded of other goods. 3) Complementary relationship ($\varepsilon_c < 0$ or negative value), this means that if there is an increase in the price of a good, it will result in an increase in the number of demand for other goods, and vice versa [9].

3. Result and discussion

3.1. Characteristic of respondent

Respondents who consume native chicken eggs have characteristics classified into several groups based on gender, age, last education, occupation, monthly household income, and the number of household members. Based on Table 1, most respondents are women because women are more dominant in caring for household needs than men. The decision to buy native chicken eggs as one of the staples households consume is women as wives who often shop at the market. Respondents' consumers of native chicken eggs based on age can be grouped into six age groups. The age group between 51 to 60 years is the respondent who mainly purchases native chicken eggs because this age group requires native chicken eggs to be consumed to increase stamina or endurance. Senior high school/vocational high school graduates dominate the education level of consumers of native chicken eggs. Education is closely related to knowledge about nutrition by consumers in regulating and determining the food menu consumed by households which will affect household consumption patterns of native chicken eggs. Education also describes how much understanding and assessing, and choosing a product that matches their expectations.

Respondents who consume native chicken eggs have various occupations: civil servants, housewives, private sector employees, self-employed, teachers, laborers, HP technicians, suppliers, school guards, students, and retirees. Most of the respondents have jobs as self-employed. The household income of most respondents is more than IDR 3,500,000, with an average of IDR 3,997,000. Household income comes from all household members who come from the main job or side job. Household income is used to meet needs, one of which is the need for native chicken eggs. The number of household members who are dependents on the respondent for native chicken eggs is mostly 3-4 people. The number of household members is all the people who eat and live in one house who are the dependents of the household. Household members consist of the head of the family, wife, children, and other members.

3.2. Analysis of factors affecting the demand for native chicken eggs in Surakarta City

The multiple linear regression analysis results in Table 2 show the adjusted $R^2$ value of 0.609, which means that the independent variable contributes 60.9% to the demand for native chicken eggs. In contrast, other variables outside the research such as age, education level, consumer preferences, prices of other related goods affect the demand for native chicken eggs by 39.1%.
Table 1. Characteristics of respondent end consumer of native chicken eggs in Surakarta City

| No | Characteristics of respondent end consumer of native chicken eggs | Frequency | Percentage (%) |
|----|---------------------------------------------------------------|-----------|----------------|
| 1. | Gender                                                        |           |                |
|    | Female                                                        | 79        | 79             |
|    | Male                                                          | 21        | 21             |
|    | Total                                                         | 100       | 100            |
| 2. | Age                                                           |           |                |
|    | ≤20                                                           | 1         | 1              |
|    | 21-30                                                         | 7         | 7              |
|    | 31-40                                                         | 18        | 18             |
|    | 41-50                                                         | 23        | 23             |
|    | 51-60                                                         | 35        | 35             |
|    | 61-70                                                         | 14        | 14             |
|    | >70                                                           | 2         | 2              |
|    | Total                                                         | 100       | 100            |
| 3. | Last Education                                                |           |                |
|    | Elementary school                                            | 21        | 21             |
|    | Junior high school                                           | 12        | 12             |
|    | Senior high school/vocational high school                     | 40        | 40             |
|    | Diploma                                                       | 5         | 5              |
|    | Bachelor                                                      | 22        | 22             |
|    | Total                                                         | 100       | 100            |
| 4. | Occupation                                                    |           |                |
|    | Civil servants                                               | 3         | 3              |
|    | Housewife                                                     | 31        | 31             |
|    | Private sector employees                                      | 13        | 13             |
|    | Self-employed                                                | 37        | 37             |
|    | Teachers                                                      | 4         | 4              |
|    | Labors                                                        | 5         | 5              |
|    | HP technician                                                 | 1         | 1              |
|    | Supplier                                                      | 1         | 1              |
|    | School guard                                                  | 1         | 1              |
|    | Student                                                       | 1         | 1              |
|    | Retires                                                       | 3         | 3              |
|    | Total                                                         | 100       | 100            |
| 4. | Monthly household income                                      |           |                |
|    | <IDR 1,500,000                                                | 12        | 12             |
|    | IDR 1,500,000-IDR 2,500,000                                   | 31        | 31             |
|    | >IDR 2,500,000-IDR 3,500,000                                  | 14        | 14             |
|    | >IDR 3,500,000                                                | 43        | 43             |
|    | Total                                                         | 100       | 100            |
| 5. | Number of household members                                   |           |                |
|    | 1-2                                                           | 21        | 21             |
|    | 3-4                                                           | 47        | 47             |
|    | 5-6                                                           | 27        | 27             |
|    | ≥7                                                            | 5         | 5              |
|    | Total                                                         | 100       | 100            |

Primary data, 2021.
Table 2. The result of the regression analysis of the factors affecting the demand for native chicken eggs in Surakarta City

| Independent variable                  | Regression coefficient | Std. Error | t_count | sig  |
|--------------------------------------|------------------------|------------|---------|------|
| (Constant)                           | -19.419                | 10.757     | -1.805  | 0.074|
| Native chicken egg prices (X1)       | -3.067**               | 0.470      | -6.529  | 0.000|
| Purebred chicken egg prices (X2)     | 1.401*                 | 0.717      | 1.954   | 0.054|
| Duck prices (X3)                     | 3.046**                | 0.593      | 5.136   | 0.000|
| Native chicken meat prices (X4)      | 2.867**                | 0.598      | 4.797   | 0.000|
| Broiler chicken meat prices (X5)     | -1.310**               | 0.571      | -2.296  | 0.024|
| Rice prices (X6)                     | -1.214**               | 0.441      | -2.754  | 0.007|
| Household income (X7)                | 0.007**                | 0.068      | 0.099   | 0.922|
| Number of household members (X8)     | 0.119**                | 0.104      | 1.139   | 0.258|

Determination coefficient (Adjusted R²) 0.609
F_count and sig 20.292
Fsig 0.000
Number of observations 100

** significant at the 95% confidence level, * significant at the 90% confidence level, ns not significant

Primary data analysis, 2021.

F_count value of 20.292 > F_table of 2.04 at the 95% confidence level or significant value of 0.000 < alpha of 0.05, shows that all independent variables jointly affect the dependent variable. Factors affecting demand, including native chicken eggs prices, laying hen eggs prices, duck eggs prices, native chicken meat prices, broiler chicken meat prices, rice prices, household income, and the number of household members together have a significant effect on the demand for native chicken eggs in Surakarta City.

The mathematical function of the results of multiple linear regression analysis for the factors that affect the demand for native chicken eggs in the Surakarta City with the following equation:

\[ \ln Q_d = -19.419 - 3.067\ln X_1 + 1.401\ln X_2 + 3.046\ln X_3 + 2.867\ln X_4 - 1.310\ln X_5 - 1.214\ln X_6 + 0.007\ln X_7 + 0.119\ln X_8 \]

Based on the test results of the factors that partially affect the demand for native chicken eggs, the native chicken eggs prices variable (X1) has a t_count value of 6.529 > t_table value of 1.98638 and has a significance value of 0.000 < alpha of 0.05. Therefore, it can be concluded that native chicken eggs prices (X1) individually have a significant effect on demand for native chicken eggs (Y) at 95% confidence level. This finding is in accordance with research conducted by Simatupang [10] where the results of the t-test of the native chicken egg variable have a t_count value of 2.312 and a significance value of 0.027. Therefore, it can be concluded that the price of native chicken eggs individually significantly affects the demand for native chicken eggs.

The results of the regression analysis show that the price elasticity is -3.067. The negative sign on the elasticity value means that the native chicken eggs prices are variable, and the demand for native chicken eggs has an inverse relationship. If native chicken eggs prices increase by 1%, the demand for native chicken eggs will decrease by 3.067% and vice versa. The more than one elasticity coefficient value indicates that the price elasticity is elastic, which means that the change in demand for native chicken eggs is greater than the price change. This result is in line with the research conducted by Febrianto and Putritamara [11], which states that the demand function model used shows that the magnitude of the regression coefficient is the price elasticity of chicken eggs itself. The magnitude of the price elasticity is 5.807. Native chicken eggs are elastic goods because the elasticity value is more than one.
Laying hen eggs prices variable ($X_2$) has a $t_{count}$ value of 1.954 > a $t_{table}$ value of 1.66177 and has a significance value of 0.054 < alpha of 0.10. Therefore, it can be concluded that laying hen eggs prices ($X_2$) individually significantly affect demand for native chicken eggs ($Y$) at 90% confidence level. This finding is in line with the research conducted by Sopian et al. [12], that the price of laying hen eggs variable has a $t_{count}$ value of 2.745 and a significance value of 0.052, which is smaller than alpha of 0.10 so that the cost of laying hen eggs variable has a significant effect on demand at 90% confidence level.

Laying hen eggs have a cross-elasticity value of 1.401. A cross elasticity value greater than one indicates that the percentage change in the laying hen eggs prices is very responsive to changes in the demand for native chicken eggs. This result means that if laying hen eggs prices increase by 1%, the demand for laying hen eggs will decrease so that the demand for native chicken eggs will increase by 1.401%. A positive sign on the elasticity value means that the relationship between native chicken eggs and laying hen eggs is a substitute good. This finding is reinforced by Pahlavi and Afiza [13], which shows that the higher the price of laying hen eggs, the higher the purchase of native chicken eggs.

Duck eggs prices variable ($X_3$) has a $t_{count}$ value of 3.046 > a $t_{table}$ value of 1.98638 and has a significance value of 0.000 < alpha of 0.05. Therefore, it can be concluded that duck eggs prices ($X_3$) individually have a significant effect on demand for native chicken eggs ($Y$) at 95% confidence level. Saputra et al. [14] show that the price of duck eggs has a $t_{count}$ value of 2.282 and a significance value of 0.024, which is smaller than alpha of 0.05, so that the price of duck eggs has a significant effect on the demand for native chicken eggs. Duck eggs have a cross-elasticity value of 3.046. A cross elasticity value greater than one indicates that the percentage change in the duck eggs prices is very responsive to changes in the demand for native chicken eggs. If duck eggs prices increase by 1%, the demand for native chicken eggs will increase by 3.046% because the demand for duck eggs will decrease. A positive sign on the elasticity value means that the relationship between native chicken eggs and duck eggs is a substitute good. Saputra et al. [14] state that duck eggs are substitutes for native chicken eggs so that duck eggs have the same function that can replace native chicken eggs.

Native chicken meat prices variable ($X_4$) has a $t_{count}$ value of 4.797 > a $t_{table}$ value of 1.98638 and has a significance value of 0.000 < alpha of 0.05. Therefore, it can be concluded that native chicken meat prices ($X_4$) individually have a significant effect on demand for native chicken eggs ($Y$) at 95% confidence level. This result is supported by research previously conducted by Hasriani et al. [15], which states that the price of native chicken meat has a significant effect on demand, which is indicated by the $t_{count}$ value of 5.527 at an error rate of 1%.

Native chicken meat has a cross-elasticity value of 2.867. A cross elasticity value greater than one indicates that the percentage change in the native chicken meat prices is very responsive to changes in the demand for native chicken eggs. If native chicken meat prices increase by 1%, the demand for native chicken eggs will increase by 2.867% because the demand for native chicken meat will decrease. A positive sign on the elasticity value means that the relationship between native chicken eggs and native chicken meat is a substitute good. Ramadhani et al. [16] state that the cross elasticity relationship between chicken eggs and native chicken meat shows that the demand for chicken eggs will decrease if the price of eggs increases. As a result, consumers will buy substitute goods, namely native chicken meat, to increase the demand for native chicken meat.

The broiler meat price variable ($X_5$) has a $t_{count}$ value of 2.296 > a $t_{table}$ value of 1.98638 and has a significance value of 0.024 < alpha of 0.05. Therefore, it can be concluded that broiler chicken meat prices ($X_5$) individually significantly affect demand for native chicken eggs ($Y$) at 95% confidence level. The results of this study are supported by the research of Hermanus et al. [17], which also shows that the broiler chicken meat variable has a significant effect, which is indicated by a significance value of 0.000, which is smaller than the alpha of 0.01.

Broiler chicken meat has a cross-elasticity value of -1.310, which means that if broiler chicken meat prices increase by 1%, the demand for native chicken eggs will decrease by 1.310%. The negative sign on the elasticity value means that the relationship between native chicken eggs and broiler chicken meat is complementary good. Suryani's research [18] strengthens the results of this
research, which states that eggs are not substitutes goods for chicken meat but are complementary goods for chicken meat.

Rice prices variable ($X_6$) has a $t_{count}$ value of 2.754 > $t_{table}$ of 1.98638 and has a significance value of 0.007 < alpha of 0.05. Therefore, it can be concluded that rice prices ($X_6$) individually have a significant effect on demand for native chicken eggs ($Y$) at 95% confidence level. This finding is in accordance with research conducted by Fridayanti et al. [19], with the results of the analysis showing that the price of rice has a significant effect on the demand for chicken eggs, where at the 95% confidence level with a significance value of 0.013.

Rice has a cross-elasticity value of -1.214, which means that if the price of rice increases by 1%, the demand for native chicken eggs will decrease by -1.214%. The negative sign on the elasticity value means that the relationship between native chicken eggs and rice is a complementary good. Bandrang [20] states that rice is a complementary good for chicken eggs because people's habits in consuming rice as a mandatory food that must be consumed.

The people of Surakarta City have different responses in making demand for substitute goods for native chicken eggs, namely laying hen eggs, duck eggs, and native chicken meat. When the price of native chicken eggs increased by 1%, the demand for native chicken eggs increased by 1.401%, the demand for duck eggs increased by 3.046%, while the demand for native chicken meat increased by 2.867%. When the price of native chicken eggs increases, the people of Surakarta City prefer to decrease the demand for purchases for native chicken eggs and increase the demand for duck eggs more than laying hen eggs and native chicken meat. They have a higher taste for duck eggs because the protein content in native chicken eggs and duck eggs is almost the same.

The household income variable ($X_7$) has a $t_{count}$ value of 0.099 < $t_{table}$ value of 1.98638 and has a significance value of 0.992 > an alpha of 0.05. Therefore, it can be concluded that household income ($X_7$) individually has no significant effect on demand for native chicken eggs ($Y$) at 95% confidence level. Research conducted by Simatupang [10] showed the t test, in which the income variable has a $t_{count}$ value of 0.680 and a significance value of 0.501, which means that income does not significantly affect the demand for native chicken eggs. Saputra et al. [14] show that income does not affect the demand for chicken eggs, so that consumers will continue to buy chicken eggs without considering the income earned. Taslim et al. [21] also support this research where income does not significantly affect the demand for chicken eggs because it has a significant value of 0.132, greater than alpha of 0.1.

Household income does not affect consumers purchasing native chicken eggs because consumers need native chicken eggs because of their nutritional content. Consumers of native chicken eggs in Surakarta City have a very high household income, greater than IDR 3,500,000 per month with an average of IDR 3,997,000 per month. Changes in household income do not cause changes in the number of chicken eggs. With this income, consumers will continue to buy native chicken eggs because they know the importance of meeting protein needs from native chicken eggs. This awareness is indicated by the consumption of native chicken eggs per capita in Surakarta City by 4.30 kg/cap/year, higher than the average consumption of native chicken eggs per capita in Indonesia from 2014 to 2018 3.55 kg/cap/year.

The number of household members variable ($X_8$) has a $t_{count}$ of 1.139 < $t_{table}$ value of 1.98638 and has a significance value of 0.258 > an alpha of 0.05. Therefore, it can be concluded that the number of household members ($X_8$) individually has no significant effect on demand for native chicken eggs ($Y$) at 95% confidence level. The number of household members does not affect the demand for native chicken eggs because everyone has different preferences and tastes in consuming various types of food. Not everyone in one household will eat native chicken eggs because they have their tastes and preferences. This finding is supported by research conducted by Amelia et al. [22], in which the number of household members variable on demand shows insignificant results with a $t_{count}$ value of 1.214 and a significance value of 0.230 at 95% confidence level. This is also in line with the research conducted by Taslim et al. [21]. This research indicates that the number of family has no significant effect on the demand for chicken eggs because it has a significant value of 0.558 is greater than alpha of 0.1.
4. Conclusion
The factors that affect the demand for native chicken eggs are native chicken eggs prices, laying hen eggs prices, duck eggs prices, native chicken meat prices, broiler chicken meat prices, and rice prices. Household income and the number of household members do not affect the demand for native chicken eggs. The demand for native chicken eggs is elastic, meaning that the response to changes in the demand for native chicken eggs is greater than changes in the price of native chicken eggs. The elasticity of demand for native chicken eggs in Surakarta City is categorized as elastic demand because it is worth more than 1, which is -3.067.

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