

Determinants of Animal Food Demand in The Urban Region South Sulawesi

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Abstract. Animal food is a very important source of protein for increasing superior human resources and strengthening food security. Superior human resources and food security are supporting factors for achieving sustainable development goals (SDGs), particularly sustainable agricultural development. The purpose of this research is to examine changes in animal food consumption as well as factors influencing animal food demand in South Sulawesi's metropolitan areas. Secondary time series data - semi-annual (2005 - 2020) - were used in this investigation. Trend analysis and multiple linear regression are the data analysis techniques employed. According to the findings of this study, the trend of animal food intake in urban areas of South Sulawesi Province from 2005 to 2020 increased by 9.78 grams per inhabitant per month. Beef consumption averaged 7.9 grams per capita per month, chicken meat consumption averaged 53 grams per capita per month, chicken egg consumption averaged 92 grams per capita per month, and fish consumption averaged 352 grams per capita per month during that time period. Per capita expenditure, chicken meat prices, and fish prices all have a substantial impact on demand for animal food. If per capita spending rises by one percent, demand for animal feed rises by 1.58 percent. If the price of chicken meat increases by 1%, the demand for animal food reduces by 0.43%, and if the price of fish increases by 1%, the demand for animal food decreases by 2.12%.

Keywords: consumption, animal food, demand

1 Introduction

Food is a basic necessity that is essential for human survival. Nutrients in food are needed by humans to live a healthy life. Food problems can cause various economic, socio-cultural, political, and even defense and security problems of a country. In the economic aspect, nutritional deficiencies in food can cause people to tend to have lower productivity, work output, and income than people who are nutritionally adequate [1]. Animal food is an important source of protein that must be consumed by households. The level of health and

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wellbeing of the household will be determined by the adequacy of protein consumption [2]. Animal protein has the advantage of having an important role in increasing human resources, developing intelligence and carrying hereditary traits from generation to generation. Indonesia still has very important problems in the field of food consumption, especially in animal protein. The low contribution of food from animal protein sources is because the price of food sources of animal protein is relatively more expensive than vegetable protein. Thus, people prefer to depend on food sources from vegetable protein, especially rice [3].

Protein is an essential ingredient in human resource development. Protein adequacy, along with energy, can be used as an indicator to examine the nutritional state of the community as well as the government's effectiveness in integrated food, agricultural, health, and socioeconomic development. Protein can be obtained from vegetable and animal foods, but compared to vegetable protein, animal protein has several advantages. One of the most important is the transmission of inherited features from generation to generation, as well as their function in the development of human intelligence [4]. Animal protein intake determines the quality of food consumption needed to support a healthy, active, and productive life [5].

Demand for food is dynamic, among others can change due to changes in nutritional knowledge, income, food prices (own food prices and other food prices), preferences, socio-culture and food characteristics. The results of the FAO study show that in developing countries with population growth rates and levels of prosperity achieved based on high economic growth have a tendency for the nation to improve the quality of its food menu, among others, by increasing animal protein consumption more than vegetable protein consumption [5].

In 2019, the average percentage of monthly per capita expenditure on food in South Sulawesi Province's urban area was 43.66 percent, with an expenditure value of Rp 536,284.00 per capita per month. The food commodity group that experienced the largest decrease in per capita expenditure in a month was the meat group (down 65.48 percent). Furthermore, the food commodity groups that experienced the largest increase in per capita expenditure in a month were tubers (up 31.26 percent), nuts (up 24.66 percent), and fish/shrimp/squid/shellfish (up 23.38 percent). The monthly per capita expenditure for the meat group is 16,307 rupiah, the tuber group is 5,123 rupiah, the legume group is 7,594 rupiah, and the fish/shrimp/squid/shellfish group is 63,942 rupiah [6].

The demand for animal food (animal protein consumption) at the household level can be influenced by various factors, both internal and external. In this study, per capita population expenditure, beef prices, chicken meat prices, chicken egg prices, and fresh fish costs are hypothesized to influence demand for animal food. The purpose of this study is to examine changes in animal food consumption as well as factors influencing animal food demand in South Sulawesi's metropolitan regions.

2 Research method

This research is a type of quantitative research using secondary data sourced from the Central Statistics Agency, Ministry of Trade, Ministry of Agriculture, and other related agencies as supporting data. The source of data in this study is secondary data of the semi-annual time series (2005 – 2020). The data used to analyze animal food demand is in the form of animal food consumption expenditure data for households taken from Susenas data (National Socioeconomic Survey). The National Socioeconomic Survey (Susenas) is one of the national survey activities of the Central Statistics Agency designed to collect

broad and complete demographic socio-economic data. The data analysis techniques used are trend analysis and multiple linear regression analysis.

Trend analysis utilizing the least squares approach was utilized to solve the formulation of the first problem in this study, with the following formulation:

$$Y = a + bX$$

(1)

Description:

X = time period (semi-annual)

Y = consumption of animal food (kg/capita)

a = constant

b = coefficient

Multiple linear regression analysis was utilized to answer the second objective of this investigation. The multiple linear regression equation is as follows: The multiple linear regression equation is as follows:

$$\ln Y = a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + e \quad (2)$$

Description:

Y = consumption/demand of animal food (kg/capita/month)

X₁ = per capita expenditure (Rp/capita/month)

X₂ = beef price (Rp/kg)

X₃ = chicken meat price (Rp/kg)

X₄ = chicken egg price (Rp/kg)

X₅ = fresh fish price (Rp/kg)

a = intercept

b₁- b₅ = regression coefficient

e = error term

3 Result and discussion

3.1 Trend of Animal Food Consumption

Animal food is an important food after carbohydrates. Animal foods, such as eggs, poultry, cattle, fish, and milk, supply essential amino acids that the body cannot generate; hence, intake is met by food or drink consumption. Protein deficiency leads to dwarfism and stupidity. On the other hand, the price of animal food is still classified as a luxury, expensive and fluctuating item. Even more severe impact, protein deficiency, especially in infants and children, will carry over to adulthood and cannot recover [2].

The consumption of animal foods referred to in this study is the consumption of beef, chicken meat, chicken eggs, and fish, which is measured in kilograms per capita per month. During the period March 2005 to September 2020, animal food consumption in South Sulawesi urban areas averaged 3,029 kilograms per capita every semester, or 0,505 kilograms per capita per month. The overall consumption of animal food can be seen in Figure 1.

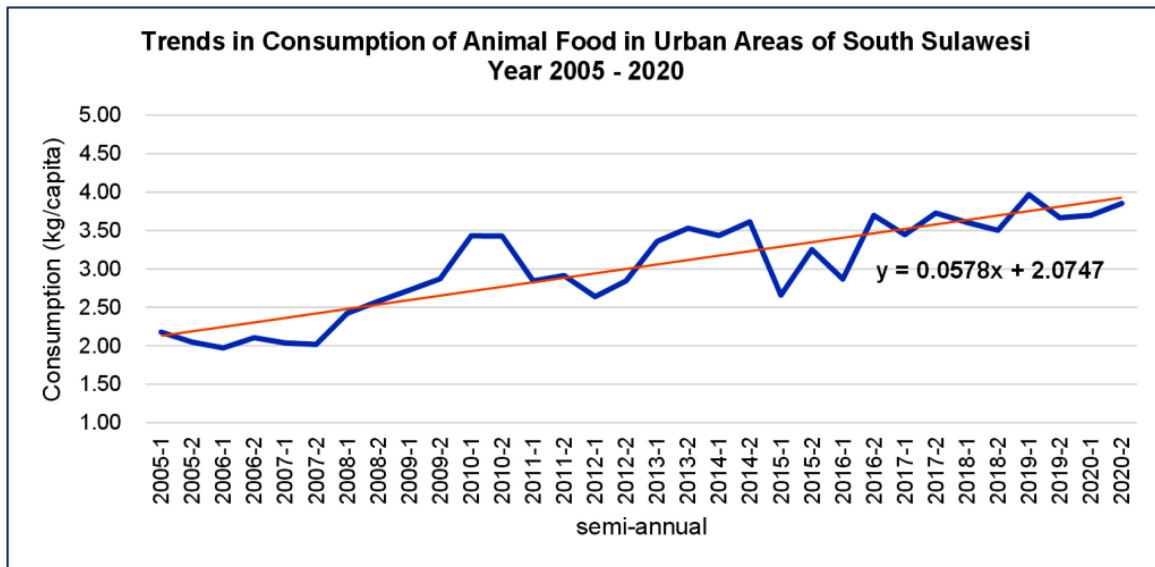


Fig. 1 Trends in Animal Food Consumption in South Sulawesi Urban Areas

Animal food consumption in urban areas of South Sulawesi is showing an upward trend during the period from March 2005 to September 2020. From this trend line, it can be seen that animal food consumption in the region increased by 0.0587 kilograms per capita per semester or per six months. So that it can also be equated to an upward trend in animal food consumption of 0.00978 kilograms per capita per month. This value is relatively small because most animal food commodities have relatively expensive prices (Figure 1).

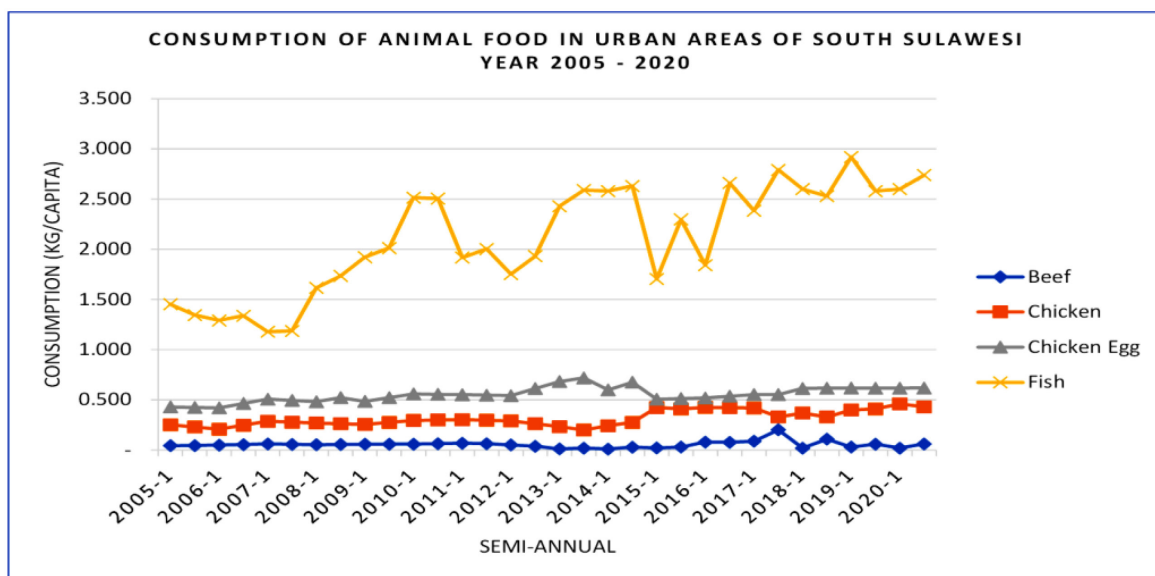


Fig. 2 Animal Food Consumption in South Sulawesi Urban Areas

Beef is one of several sources of animal food, beef contains nutritional elements that are rich in protein and energy. Similar to population changes, the demand for animal food products is increasing every year. In addition to population issues, the shift in people's dietary patterns from vegetable protein sources to animal protein sources is a factor contributing to the increased demand for beef [7]. From March 2005 to September 2020, beef consumption in South Sulawesi Province's urban areas averaged 0.048 kilograms per capita every semester, or 0.0079 kilograms (7.9 grams) per capita per month.

Chicken meat is one type of animal food that is high in protein and energy. The need for animal feed is expected to rise further. Furthermore, variables that contribute to an increase in demand for chicken meat as people's consumption patterns move from vegetable protein sources to cattle protein sources. The growing population can influence the increase in demand for chicken meat in a certain location [8]. From March 2005 to September 2020, the average consumption of chicken meat in the South Sulawesi Province Urban Area was 0.316 kilograms per capita every semester, or 0.053 kilograms (53 grams) per capita per month.

Eggs are livestock products that have an important role in overcoming community nutrition problems. Egg consumption is greater than the consumption of other livestock products. This is due to the fact that eggs are a commodity that is easily available, and the price is relatively low and reasonable for the population [9]. Chicken egg consumption in South Sulawesi Province's Urban Area during the period March 2005 to September 2020 had an average of 0.553 kilograms per capita per semester or 0.092 kilograms (92 grams) per capita per month.

Fish has a great nutritional content, including protein as a source of growth, omega 3 and 6 fatty acids that are useful for maternal health and fetal brain formation, vitamins, and minerals that are beneficial to both the mother and the fetus. Factors that influence food consumption are food availability, socioeconomic status including work and education, and socio-culture which includes maternal education, taboos, food preferences, and eating habits [10]. Fish consumption in South Sulawesi Province's Urban Area during the period March 2005 to September 2020 had an average of 2.112 kilograms per capita per semester or 0.352 kilograms per month per capita. Fresh fish has the highest level of consumption compared to other animal protein food sources, this happens because of the availability of abundant marine resources in the South Sulawesi Province.

3.2 Determinants of Animal Food Demand

The demand for animal food in this study is proxied with animal food consumption data which includes consumption of beef, chicken meat, chicken eggs, and fish. Fish consumption according to data sources is the consumption of fish and shrimp which are generally consumed by locals every month. Per capita expenditure, beef prices, chicken meat prices, chicken egg prices, and fish costs are assumed to influence demand for animal food. In addition, the results of multiple linear regression analyses for these components are shown in Table 1 below.

Table 1. Estimated Factors Affecting Animal Food Demand in South Sulawesi Urban Areas

Independent Variable	Coefficient	t-statistics	P
Per capita expenditure (X1)	1.578655***	-5.917099	0.0000
Beef price (X2)	-0.255087 ^{ns}	-0.733711	0.4697
Chicken meat price (X3)	-0.427910***	-2.989118	0.0060
Chicken egg price (X4)	-0.043090 ^{ns}	-0.344570	0.7332
Fish price (X5)	-2.117849***	-15.32144	0.0000
Constant = 2.283022	*** = significant ($\alpha = 0.01$)		
R ² = 0.969576	** = significant ($\alpha = 0.05$)		
F statistics = 165.7196	* = significant ($\alpha = 0.10$)		
Prob= 0.000000	ns = non significant		

Source: Primary Data Analysis, 2021

With a confidence level of 99 percent, the determinants of per capita expenditure, beef price, chicken meat price, chicken egg price, and fish price together (simultaneously) have a significant effect on animal food demand. The coefficient of determination (R^2) of 0.969576 indicates that these independent variables have a simultaneous effect of 96.96 percent on animal food demand, with the remaining 3.04 percent influenced by other factors not explored in this study.

The pattern of demand for animal food in Indonesia differs in terms of consumption, pricing, total spending, and the fraction of animal food expenditure in Indonesia. In Indonesia, demand for animal food is impacted by the Human Development Index (HDI), preferences, and time trends, as well as changes in animal food prices and income. The growth of animal food costs, income, HDI, preferences, and time trends are expected to increase demand for animal food in Indonesia over the next six years, from 2019 to 2024 [1]. Price, number of household members, income group, type of region (rural or urban), and education level of the head of family are socio-demographic characteristics that influence demand for domestic animal food in West Java Province [11].

According to the results of partial test analysis in multiple linear regression analysis, per capita expenditure, chicken meat prices, and fish prices have a substantial effect on animal food demand. Each of these variables had a substantial influence with a confidence level of 99 percent ($\alpha = 0.01$ or $\alpha = 1\%$). The consumption pattern of beef, poultry meat, and fish in West Sumatra Province households demonstrates that economic variables, specifically prices, affect the amount of consumption of each meat commodity, and the average monthly expenditure also affects the amount of meat consumption in these households. For socio-demographic variables, showing the area where households live shows that households occupying urban areas will have a higher average consumption compared to households occupying rural areas [12].

The per capita expenditure of the population of South Sulawesi has an estimated result shown by a regression coefficient value of 1.578655, meaning that if per capita spending rises by one percent, demand for animal feed rises by 1.58 percent. The higher the level of per capita expenditure, the higher the consumption of animal food. This means that animal food consumption contributes significantly to household expenditure.

The retail price of chicken meat has a considerable impact on the demand for animal food, with a coefficient value of -0.42791, implying that every one percent increase in chicken meat costs causes a 0.43 percent decline in demand for animal food. Thus, these price parameters have a considerable influence on both high and low consumption of chicken meat. When the price of chicken flesh falls, the demand for it rises. According to the findings of a study conducted in West Java, people in urban areas are more sensitive to prices for animal foods such as meat, eggs, and milk than people in rural regions [11].

Fish prices have a considerable negative effect on animal food demand, with a coefficient value of -2.117849, which means that if fish prices rise by 1%, animal food demand falls by 2.12%. Fish costs are the most important determinant impacting people's intake and desire for animal food in South Sulawesi's metropolitan regions. The higher the price of fish, it will cause a decrease in demand for fish. This situation is very in accordance with the diet of the people of South Sulawesi, who always provide fish in the daily mandatory menu.

There are differences in household preferences in urban and rural areas towards animal food as indicated by differences in participation rates and consumption levels. The consumption rate of livestock products is higher in cities than in rural areas. Among the types of livestock products, purebred chicken eggs and purebred chicken meat are most consumed by households in cities and villages, while for the fishery group the most

consumed is marine fish in the form of tuna / skipjack fish. Not a large proportion of households consume beef, the participation rate at the national level is only 3.8 percent. The level of participation and consumption of animal food tends to be positively related to household income [13].

4 Conclusions

During the period 2005–2020, animal food consumption in South Sulawesi Province's urban areas increased by 9.78 grams per inhabitant per month. Beef consumption averaged 7.9 grams per capita per month, chicken meat consumption averaged 53 grams per capita per month, chicken egg consumption averaged 92 grams per capita per month, and fish consumption averaged 352 grams per capita per month during this time period. When compared to other animal protein intakes, fresh fish consumption is relatively high. Per capita expenditure, chicken meat prices, and fish prices all have a substantial impact on demand for animal food. If per capita spending rises by one percent, demand for animal feed rises by 1.58 percent. If the price of chicken meat increases by 1%, the demand for animal food reduces by 0.43%, and if the price of fish increases by 1%, the demand for animal food decreases by 2.12%.

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