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The Elasticity of Demand for Catfish Products (*Clarias* sp.) in Bandung City of Indonesia

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ABSTRACT

This research aims to analyze the demand elasticity of catfish (*Clarias* sp.) on Bandung City and to analyze the factors (the price of catfish, the price of tilapia fish, the price of broiler chicken meat, the price of rice and percapita income) that are affect the demand for catfish (*Clarias* sp.) on Bandung City. This research was conducted on January 22th until February 16th at Bandung City. The method used is descriptive analytical method by using periodical data (time series). This data retrieval technique by using purposive sampling where a researcher must really know that the respondents who choose can provide the desired information in accordance with research problems. The results showed that the demand for catfish (*Clarias* sp.) on Bandung City is elastic, and the factors that affect the demand for catfish (*Clarias* sp.) on Bandung City are the price of catfish, the price of red tilapia fish, the price of broiler chicken meat, the price of rice and percapita income.

Keywords: Demand elasticity, Catfish, Bandung City, price, percapita income, *Clarias* sp

1. INTRODUCTION

West Java is one of the provinces in Indonesia which produces a quite high number of fishery, especially catfish. The increasing number of fisheries production in West Java is a special advantage to this province that contributes to national fishery production.

Every year, the Office of Fisheries and Marine of West Java Province continues to increase the catfish production target due to the demand for catfish in West Java and regions surrounding it is significantly high (Ministry of Marine and Fisheries Affairs 2014). Bandung has become the city with the highest fish marketer unit. Along with the fact that the marketing opportunities of fishery products are so great, they should be able to increase the fishery production in Bandung, especially catfish which has become the leading fish products of West Java Province. Fishery production of catfish cultivation in Bandung reached 1,891,24 tons per year in 2016 (Tran U, et.al., 2017)

Catfish (*Clarias sp.*) is the most popular freshwater cultivated fish. In 2016, the consumption of catfish in Bandung reached 915 000 kg / year (Food and Agriculture Office of Bandung 2018). The demand for catfish is affected by several factors such as catfish prices, the price of substitute goods, the prices of complementary goods and income.

In order to find out how much the volume of catfish's demand changes in Bandung as a result of the changes of the factors that affect, we are using the concept of elasticity. According to Ünal, V. (2003), elasticity is a tool to measure buyers' or sellers' reactions to price changes, how far buyers or sellers react to price changes. Knowing the elasticity of catfish's demand in Bandung, we could anticipate buyers' reaction when the price of catfish is rising or declining, and we can conclude the factors that affect the demand for catfish in Bandung.

2. RESEARCH METHOD

Data retrieval and processing is conducted from January to February 2018. The sampling technique used in this research is purposive sampling, which is an intentional sampling that is compatible to the requirement or criteria of the required sample and appropriate as the data source (Yazıcı, A. 2011). The basic method used in this research is descriptive analytical using periodical data (time series) for 11 years starting from 2006-2016. The method of data processing conducted in this study is using Correlation Test, F Test and t Test. Analysis of data is obtained using multiple linear regression.

3. RESULT AND DISCUSSION

3. 1. General State of Fishery

It can be observed that the largest fishery in Bandung in 2016 is catfish, which reached 945.62 tons. This is possible since catfish is easily bred in a pond. Production of catfish in the city of Bandung is located in Cirangrang and Cibaduyut Kidul, but the production is more focused on the hatchery due to expensive food supply. The supply of catfish for Pasar Kosambi, Pasar Kiaracondong, Pasar Baru, Pasar Sederhana and Pasar Ciroyom are obtained from Subang, Cianjur, Sukabumi, Cibaduyut and Ciparay. The products of fishery have an important role as a provider of animal protein sources. The number of production of various species of fish in Bandung in 2016 (Table 1).

Table 1. Production by Species of Fish in Bandung, 2016

Species	Production (Ton)
Catfish	945,62
Tilapia	407,91

Source: The Office of Food and Agriculture of Bandung, 2017

According to Food and Agriculture Office of Bandung City in 2018, the largest supply of catfish is in Pasar Ciroyom with 1.5 tons/day. The catfish supply from Subang to Kosambi Market is 40-60 kg/day, Kiaracandong Market is 2-3 quintals/day, Pasar Baru is 30-40 kg/day, and Pasar Sederhanais 60-80 kg/day.

3. 2. The Demand for Catfish in Bandung

The demand for catfish studied in Pasar Ciroyom, Pasar Kiara condong, Pasar Baru, Pasar Kosambi and Pasar Sederhana (Table 2).

Table 2. The Growth of Catfish Demand in Pasar Ciroyom, Pasar Kiaracandong, Pasar Baru, Pasar Kosambi dan Pasar Sederhana in 2017

Market	Demand for Catfish (kg/day)
Pasar Ciroyom	1000
Pasar Kiaracandong	200
Pasar Baru	25
Pasar Kosambi	26
Pasar Sederhana	55
Average	261,2

It can be concluded that the average demand for catfish is 261.2 kg/day (Table 2). Catfish demand in Ciroyom Market is higher than Pasar Kiaracandong, Pasar Baru, Pasar Kosambi and Pasar Sederhana. This happened because the supply of catfish in Pasar Ciroyom Market is higher than the other market, which was up to 1.5 tons/day. The lowest demand for catfish is in Pasar Baru, since catfish grocers in this market has fewer numbers than other markets and the place is dominated by chicken butcher and vegetable grocers. The demand for catfish in Pasar Ciroyom, Pasar Kiaracandong, Pasar Baru, Pasar Kosambi and Pasar Sederhana are still relatively low due to the number chicken butchers are larger than catfish grocers.

Based on the results of research, consumers of Bandung substitute catfish with broiler chicken. The demand for catfish studied in Bandung from 2006 to 2016 is in Table 3 as follows.

Table 3. The growth of Catfish Demand in Bandung from 2006-2016.

Year	Demand (Kg)
2006	388.400
2007	395.600
2008	411.300
2009	415.000
2010	435.000
2011	475.000
2012	557.000
2013	592.000
2014	684.000
2015	732.000
2016	915.000
Average	545.481

Source: Food and Agriculture of Bandung 2017

Based on Table 3, it can be concluded that the average demand for catfish in Bandung from 2006-2016 is 545.481 kilograms per year. However, the consumption of catfish by the people of Bandung is still relatively low. This is indicated by a quite large number of differences between production and demand for catfish.

3. 3. The Price of Catfish

The price of catfish in this study is the amount of money paid by the residents of Bandung for a kilogram of catfish. Based on Table 4, it can be concluded that the price of catfish in Pasar Ciroyom, Pasar Kiaracundong, Pasar Baru, Pasar Sederhana, Pasar Kosambi of Bandung and the price of catfish according to the Trade and Industry Office of Bandung from 2006 to 2016 has increased per year. The average price of catfish in 2006-2016 is Rp. 18,827,- per kilogram. the price of catfish in 2006-2016 did not experience fluctuation. The data on the price of catfish growth in Bandung from 2006 to 2016 (Table 4).

Table 4. The Growth of the Price of Catfish in Bandung from 2006-2016.

Year	Price on the market (Rp/Kg)	Price according to the Trade and Industry Office (Rp/Kg)
2006	13.300	13.300
2007	14.500	14.500
2008	16.000	16.000
2009	17.000	17.000
2010	18.000	18.000
2011	18.500	18.500
2012	18.800	18.800
2013	20.000	20.000
2014	21.000	21.000
2015	25.000	25.000
2016	25.000	25.000
Rata-Rata	18.827	18.827

Source: Markets in Bandung dan Trade and Industry Office of Bandung 2017

Nutritional content of catfish is comparable with other fish. Some types of fish, including catfish, contain higher and better protein than chicken meat. The average type of Catfish sold in Bandung markets is dumbo catfish. Dumbo catfish is one of the most easily accepted fish by community because of its various advantages. These advantages are its rapid growth, the high ability to adapt to an environment, the taste is good and the nutritional content is quite high and the price is cheap. Nutritional composition of catfish are protein (17.7%), fat (4.8%), minerals (1.2%), and water (76%) (Tran U, et.al., 2017).

3. 4. The Price of Red Tilapia Fish

The price of red tilapia in this study is the amount of money paid by residents of Bandung City for a kilogram of red tilapia fish. The data on the growth of red tilapia prices in Bandung from 2006 to 2016 is in Table 5.

Based on Table 5, it can be concluded that the price of red tilapia in Pasar Ciroyom, Pasar Kiaradondong, Pasar Baru, Pasar Sederhana, Pasar Kosambi in Bandung from 2006 to 2016 has increased per year with the average price of Rp. 21,200,- per kilogram.

Table 5. The Growth of the Price of Red Tilapia Fish in Bandung from 2006-2016

Year	Price on the market (Rp/Kg)	Price according to the Trade and Industry Office (Rp/Kg)
2006	13.200	13.200
2007	14.500	14.500
2008	16.000	16.000
2009	18.000	18.000
2010	18.700	18.700
2011	19.000	19.000
2012	19.800	19.800
2013	20.500	20.500
2014	21.000	21.000
2015	26.500	26.500
2016	28.000	28.000
Average	21.200	21.200

Sources: Markets in Bandung dan Trade and Industry Office of Bandung in 2017

Tilapia fish acts as substitute for catfish because the price of tilapia is not too different from catfish, while the nutrient content of tilapia fish and catfish are almost the same which contains protein more than 15%. However, consumers in Bandung demand catfish more since it is easily found compared to tilapia fish. The majority of the consumer chose catfish, since it taste delicious and nutritious. It proves that the product of catfish, in addition to offering flavor delights, also offers nutritional intake because it contains high protein that is good for health.

3. 5. The Price of Broiler Chicken Meat

The price of broiler chicken meat in Pasar Ciroyom, Pasar Kiaracondong, Pasar Baru, Pasar Sederhana, Pasar Kosambi in Bandung from 2006 to 2016 based on Table 6 is fluctuated but it tend to increase with an average of Rp. 25.461,-. The abundance of broiler chicken meat makes grocers lower the selling price. Fluctuations in broiler prices is due to changes in demand, production and the supply of broiler chicken to the market as well as price changes at the farmers and distributors level. The data on the growth of broiler chicken meat prices in Bandung from 2006 to 2016 (Table 6).

Table 6. The Growth of Broiler Chicken Meat Prices in Bandung from 2006-2016

Year	Price on the market (Rp/Kg)	Price according to the Trade and Industry Office (Rp/Kg)
2006	18.200	18.200
2007	19.800	19.800
2008	21.200	21.200
2009	22.500	22.500
2010	24.000	24.000
2011	24.367	24.367
2012	25.283	25.283
2013	29.550	29.550
2014	28.400	28.400
2015	31.717	31.717
2016	35.067	35.067
Average	25.461	25.461

Source: Trade and Industry Office of Bandung in 2017

Broiler chicken meat became the substitution of catfish because beef is much more expensive than chicken meat. One of the consumers proves through his statement about the reason why chicken meat is chosen as a substitution of catfish. The respondent stated that in his family that if they served catfish as menu, they have to present other option on the menu such as chicken meat, as the replacement because not all family members likes catfish. Some people in Bandung choose to consume broiler chicken meat because it is easier to get than catfish.

3. 6. The Price of Rice

Based on Table 7 it can be observed that the price of rice in Pasar Ciroyom, Pasar Kiaracandong, Pasar Baru, Pasar Sederhana, Pasar Kosambi in Bandung has increased with an average of Rp. 7,642. According to Trade and Industry Office of Bandung, the stock of rice decreased which makes the price of rice jumped quite high. The rice in this research is the IR 64 type, because this type is the most rice consumed by residents of Bandung. The growth price of rice in Bandung from 2006 to 2016 (Table 7).

Table 7. The growth price of rice in Bandung from 2006 to 2016

Year	Price on the market (Rp/Kg)	Price according to the Trade and Industry Office (Rp/Kg)
2006	5.400	5.400
2007	5.600	5.600
2008	6.300	6.300
2009	7.000	7.000
2010	7.500	7.500
2011	7.067	7.067
2012	8.100	8.100
2013	8.430	8.430
2014	8.683	8.683
2015	9.875	9.875
2016	10.100	10.100
Average	7.642	7.642

Source: Trade and Industry Office of Bandung in 2017

3. 7. Income per capita

The growth of income per capita in Bandung from 2006-2016 in in Table 8.

Table 8. The Growth of Income per Capita in Bandung 2006-2016

Year	Income per capita (Million Rupiah)
2006	43,49
2007	50,55
2008	60,44
2009	70,28
2010	82,00
2011	95,61

2012	131,98
2013	151,77
2014	172,69
2015	195,84
2016	217,04
Average	115,61

Source: Central Bureau of Statistic Bandung 2017

Based on Table 8, it can be concluded that the income per capita of Bandung continued to increase quite high during 2006-2016. In 2006, the income per capita in the city of Bandung reached 43.49 million rupiah and increased to 131.98 million rupiah in 2012. It continued to increase to 172.69 million dollars in 2014, to 195.84 million dollars in 2015, and to 217.04 million rupiah in 2016.

3. 8. The Supply of Catfish in Bandung

The supply of catfish in Bandung is approached by the number of products. The number of products is a very important factor in the supply since the amount of production is the amount to be supplied to consumers. A high amount of product will make the supply for the item high and vice versa. The growth of catfish supply in Bandung during 2012-2016 is in Table 9.

Table 9. The Growth of Catfish Supply in Bandung 2012-2016.

Year	The Supply of Catfish (Ton)
2012	1.385,03
2013	1.446,69
2014	1.561,57
2015	1.756,63
2016	1.891,24
Average	1.6078

Source: Food and Agriculture Office of Bandung 2017

Table 9 shows that the average supply of catfish in Bandung is 1.6078 tons/year. In one year, the production of catfish is extremely high that it was enough to fulfill the large demand for catfish.

4. DATA ANALYSIS

The results of primary and secondary data analysis compelled using Ms. Excel. In order to obtain the best regression results, the data have to meet the following statistical criteria.

4. 1. Correlation Test

The result of correlation test of r value = 0.931, which means that r value is close to 1, then the correlation between all independent variables (catfish price, tilapia price, broiler chicken price, rice price and income per capita) is positive and very strong. The relationship between all of the independent variables (catfish price, tilapia price, broiler chicken price, rice price and income per capita) is directly proportional to the dependent variable (Catfish demand).

4. 1. 1. F Test

The result of F Test analysis is in Table 10.

Table 10. The Result of Catfish Demand Variants in Bandung 2006-2016.

Variants Source	Df	Mean Square	F	Significance
Regressi	5	0,029	61,63	0,000
Residual	5	0,002		
Total	10			

Based on Table 10, it can be observed that the significance value is 0.000 and smaller than $\alpha = 0.05$. Thus, H_a is accepted and H_o is rejected, which means that the independent variables studied significantly affects the demand for catfish in the city of Bandung at 95% level of trust. It also means that the variable price of catfish, the price of red tilapia fish, broiler chicken prices, rice prices and income per capita altogether significantly affects the demand for catfish in the city of Bandung.

4. 1. 2. T Test

The result of t Test analysis show in Table 11.

Based on Table 11, we can conclude that the price variable of red tilapia fish and income per capita significantly affect the demand for catfish in Bandung with the level of trust of 95%. It is indicated by the significance value of the price of red tilapia and income per capita which are smaller than $\alpha = 0.05$, the value obtained when using t-table is 2.364, t-count variable of red tilapia price and income per capita has a smaller value than 2.364 which make the variable of red tilapia is significant. Variable of catfish price, broiler chicken price and price of rice have an effect to the demand for catfish in Bandung but not significant.

This is indicated by the significance value of the three variables that is greater than the value of $\alpha = 0.05$.

Table 11. The result of t Test analysis with Independent Variables.

Variable	Regression Coefficient	t-count	Significance
Catfish Price	-0,943	-1,903	0,115 ^{ns}
Red Tilapia Price	1,283	2,945	0,032*
Broiler Chicken Meat Price	0,599	0,063	0,951 ^{ns}
Rice Price	-1,372	-2,283	0,071 ^{ns}
Income per Capita	0,609	4,668	0,005*

Notes:

* : significance has reached 95% level of trust

^{ns} : not significant

4. 2. The Elasticity of Demand for Catfish

The analysis result of the elasticity of demand for catfish in Bandung is in Table 12.

Table 12. The Elasticity Value of Demand for Catfish in Bandung.

Variable	Nilai Elastisitas		
	Price	Cross	Income
Catfish Price	-(1,932)		
Red Tilapia Price		0,873	
Broiler Chicken Meat Price		2,936	
Rice Price		0,614	
Income Per Capita			3,924

Those elasticity value of demand can be classified by:

Price Elasticity

Based on the result of the analysis, the price elasticity value of catfish is -1,932. The value of elasticity with negative mark indicates that the catfish price variable has an inverse relationship with the demand for catfish. If the price of catfish rose by 1% then the demand for catfish will decrease by 1.932%, and conversely, if the price of catfish decreased by 1%

then the demand for catfish will rise by 1.932%. The negative mark only explains the inverse relation between the price of the item and the number of demand. The elasticity value of the price that is more than one indicates that demand for catfish is elastic, which means the percentage change in quantity demanded is greater than the price change.

Cross Elasticity

Based on the analysis, the cross elasticity value of red tilapia is 0,873. It means that if the price of red tilapia rose 1% then the demand for catfish will rise by 0.873%, and vice versa. A positive mark on the value of elasticity indicates that red tilapia is a substitute of catfish. The cross elasticity value of broiler chicken price is equal to 2,936. This means if the price of broiler chicken meat rose by 1%, then the demand for catfish will rise by 2.936%, and vice versa. A positive mark on the value of elasticity indicates that broiler chicken meat is a substitute of catfish. The cross elasticity value of rice price is 0.614. This means that if the price of rice rose by 1% then the demand for catfish will rise by 0.614%, and vice versa. A positive mark on the elasticity value indicates that rice is not a complementary item of catfish.

Income Elasticity

Based on the results of the analysis, the income elasticity value is 3.924, which means that if there is an increase in income by 1%, there will be an increasing demand for catfish by 3.924%, and vice versa. The income elasticity value with the positive mark indicates that the catfish belongs to normal goods, meaning that if the population's income increases then the demand for catfish will increase. The value with more than one coefficient explains that the change in the number of demand has a greater proportion than the increase of income.

The result of this study shows that catfish in Bandung is considered a normal goods, as a generic food among other foodstuffs. The demand and price of catfish is not too related to the price of red tilapia fish, broiler chicken and rice. It is indicated by the elasticity value of each commodity is smaller than catfish elasticity value, but the elasticity value of income is bigger than elasticity value of catfish. Thus, catfish as a food in the city of Bandung is less responsive to the changes in economic determinants.

5. CONCLUSIONS

The demand for catfish in Pasar Ciroyom, Pasar Kiarcondong, Pasar Baru, Pasar Sederhana dan Pasar Kosambi have an average of 261.2 kg/day. The demand for catfish in Bandung is elastic since catfish has many substitutions. The cross elasticity value between the price of red tilapia fish and the price of broiler chicken meat signified positively, which means both variables are substitution of catfish. The positive elasticity value in rice prices explains that rice is not a complementary food of catfish. The elasticity value of income is positive which indicates that catfish is normal goods (basic necessity).

The price of catfish, red tilapia, broiler chicken meat, rice and income per capita are the factors that altogether significantly affect the demand for catfish in Bandung. The price of red tilapia and income per capita is significant to the demand for catfish in Bandung. In other hand, the price of catfish, broiler chicken meat and rice do not have a real connection, but it still affects the demand for catfish in Bandung.

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