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FACTORS AND ELASTICITY ANALYSIS OF DEMAND FOR FRESH YELLOW FIN TUNA (*Thunnus albacares*) AT KEDONGANAN FISH MARKET BADUNG BALI

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ABSTRACT

This study aims to reveal the factors that influence the amount of demand and elasticity value of fresh yellowfin tuna (*Thunnus albacares)* in the Kedonganan fish market. Interview sampling method with *purposive sampling technique* and data analysis using linear equations with the help of SPSS software and Microsoft Excel. Respondents in this study were 50 buyers and 25 yellowfin tuna traders. The results of the F test state that the demand for fresh yellowfin tuna is simultaneously influenced by all X variables with a correlation value of 58%. T-test analysis with a 95% confidence level, stated that the demand for tuna is significantly influenced by the price of yellowfin tuna, the price of kawakawa fish and the amount of family income and other X variables such as skipjack tuna prices, chicken meat prices and the number of family members have a significant effect. Partial. Calculating the elasticity of demand for fresh yellowfin tuna, it is found that the price elasticity of yellowfin tuna is inelastic. The cross-elasticity value states that the price of skipjack, kawakawa fish and chicken meat is elastic and is a substitute item. Income elasticity value found that yellowfin tuna is a normal type of goods.

KeyWords
Yellowfin Tuna, Demand, Elasticity, Kedonganan Fish Market

INTRODUCTION

Indian Ocean waters have great potential for marine wealth, one of which is tuna fisheries. Judging from its size, there are two types of tuna that are commonly found in Indonesia, namely the large tuna group (Yellowfin Tuna, Bigeye Tuna, Albakora and Southern Bluefin Tuna) and the small tuna group (skipjack, bullet tuna, frigate tuna, etc.) (Ekayana, *et al*., 2017). Tuna is a fishery commodity that has bright prospects for improving the nation's economy, especially in terms of exports. Currently, Indonesia is the largest tuna exporting country in Southeast Asia with export volume in 2021 reaching 124,861,449 kg and export value reaching 517,871,158 US dollars (KKP Statistics Data, 2021). Based on KKP data, Bali Province in 2020, tuna exported in frozen and fresh form was around 16,580.84 tons, all of which came from Bali with export destination countries being Japan, the United States and England (KKP Statistics Data, 2020). Thus, it can be said that the demand for frozen and fresh tuna in the global market is quite high from year to year. This high export figure is in line with the number of tuna production in Indonesia. Even the number of tuna fish production from year to year continues to increase (KKP Statistics Data, 2021).

The high global demand for tuna is not in line with the demand and consumption figures in Indonesia. Indonesia has a low level of fish consumption compared to other countries such as: Japan (110 kg/capita), South Korea (85 kg/capita), United States (80 kg/capita), Singapore (80 kg/capita), Malaysia (45 kg /capita) and Thailand

(35 kg/capita). The low level of fish consumption in Indonesia is caused by two things, namely the weak supply and the low level of demand (Sokib, et al., 2012).

Demand is the amount of goods or services that someone wants and is able to buy at a certain price level and time (Windiyarti, *et al*., 2019). Factors that are thought to cause the low demand for fish in the community include: (1). Low availability of fresh fish in the market (2). Behavior and culture of eating fish taboo in certain communities (3). Knowledge of nutrition among mothers is still low (4). The price of fish and its products are relatively more expensive than other types of products, so that people's purchasing power is low (5). Low variety of processed fish (6). The problem of prestige and preference among certain people who consider food to be inferior (7). Fear of being contaminated with heavy metals from polluted waters (Djunaidah, 2017).

The elasticity of demand is a quantitative term that shows the size of the change in demand for a commodity that is influenced by changes in prices or other factors. In general, the elasticity of demand can be divided into three, namely: the elasticity of demand to price (*right elasticity of demand*), elasticity of demand to income (*income elasticity of demand*) and elasticity of cross demand (*cross price elasticity of demand*) (Murandawi, *et al*., 2018) .

Until now there is no definite data that reveals the factors that affect the demand and elasticity value of fresh yellowfin tuna (*Thunnus albacares)* in the Kedonganan fish market, therefore it is necessary to do a study on the analysis of the elasticity of demand for fresh yellowfin tuna (*Thunnus albacares).* and the factors that influence the demand for fresh yellowfin tuna (*Thunnus albacares)* such as: the price of yellowfin tuna itself, the price of substitute food (skipper fish, kawakawa fish and chicken meat), the amount of income, and the number of family members.

METHODS

This research was conducted at the Kedonganan Fish Market, Badung Regency, Bali Province, which is geographically located at 08°45''23.69" latitude and 115°10'5.57' east longitudeThe time of the study (field data collection) was carried out from March to April 2022.

The method used in this study was a survey method, using a questionnaire as a primary data collection tool. The population in this study is the people of Badung Regency and its surroundings who every day carry out the activity of requesting fresh yellowfin tuna (*Thunnus albacares)* at the Kedonganan Fish Market.

The sampling method used in this research is *purposive sampling technique*. The respondents' criteria taken are mature consumers, with the assumption that they have the authority to decide on purchases and the authority to determine the amount of spending for shopping. Another criterion is that the buyer has made a request for fresh yellowfin tuna (*Thunnus albacares)* and other substitutes, can communicate and is willing to be interviewed.

The data analysis method used in this study is multiple linear regression analysis, correlation test, F test (simultaneous), T test (partial) and elasticity test using questionnaire data that has been filled out by respondents. Data analysis was performed using *SPSS* Version 22.0 software and Microsoft Excel.

Multiple Linear Regression

According to Anggara (2015), multiple regression analysis is used to predict the ups and downs *of the dependent variable* (criteria) if two or more independent variables as *predictor* manipulated (increase in value), then form an equation to analyze the demand factors for tuna are as follows:

$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6$

Y : Demand for yellowfin tuna
a : Constant
b : Coefficient
X_1 : Price of yellowfin tuna (IDR)
X_2 : Price of skipjack tuna (IDR)
X_3 : Price of kawakawa fish (IDR)
X_4 : Price of chicken meat (IDR)
X_5 : Total income per capita (IDR)
X_6 : Number of family members (people)

Correlation Test Correlation

analysis can be calculated using the *Pearson Product Moment* (Riduwan, 2011) as follows:

$$R_{xy} = \frac{n\,(\sum XY) - (\sum X)(\sum X)}{\sqrt{[n\sum X^2\,(\sum X)^2][n\,\sum Y^2 - (\sum Y)^2]}}$$

Description:
R_{xy} : correlation coefficient value
n : Number of sample members
X : Independent variable
Y : Dependent variable

F test (simultaneous)

The f test is used to test all parameters or independent variables influence each other or not with the dependent variable (number of tuna fish demand). The F test was carried out using a 95% confidence level. The F arithmetic formula is

F arithmetic $= \frac{R^2 / (k-1)}{(1- R^2) / (NK)}$

Information:
R^2 : Coefficient of determination
N : Number of observations
k : Number of variables
Decision making criteria:
a). If F count > F table, then H_0 rejected and H_1 accepted
b). If F count < F table, then H_0 accepted and H_1 rejected

T Test (Partial)

The T test is used to determine the effect of each independent variable on the dependent variable (not independent), namely the number of requests for tuna at a significant level (α), namely 5%, with the t arithmetic formula as follows:

t arithmetic $= \frac{\beta i}{Se(\beta i)}$

Description:
t arithmetic : t statistic value i, i-th independent variable regression coefficient
Se (βi) : Standard error of i-th independent variable regression coefficient
Decision making criteria:
a). If t count > t table, then H_0 rejected and H_1 accepted
b). If t count < t table, then H_0 accepted and H_1 rejected

Elasticity test The elasticity

coefficient of demand is a pointer figure that describes to what extent the changes in the quantity of goods demanded are compared to changes in prices, the coefficient of elasticity of demand can be calculated as follows:

$$Ed = \frac{(Q / Q)}{(P / P)} = \frac{(Q / P)}{(P / Q)} = \frac{bi\ p}{q}$$

Q : Changes in quantity demanded
P : Changes in price of yellowfin tuna
P : Initial price
Q : Quantity of initial demand – mula
bi : Regression coefficient
p : average value p
q : average value q
E_d : Coefficient of elasticity of demand
Criteria:
a). Elasticity > 1, Demand is said to be elastic
b). Elasticity < 1, demand is said to be inelastic
c). Elasticity = 1, Demand is said to be unitary.

RESULTS AND DISCUSSION

Overview of Research Locations

Kedonganan Fish Market is a fish market that is directly adjacent to the Kedonganan Fish Landing Base, Kuta District, Badung Regency, Bali. PPI Kedonganan generally has several facilities, including: basic facilities (*breakwater*, *revetment*, dock, harbor pond, shipping lanes, open drainage, etc.) functional facilities (fish market, *water treatment*, water reservoir, factory/ice warehouse, generator house, *docks*, fishery product quality testing laboratories, offices, parking lots, ship maintenance areas, fuel services, etc.) and supporting facilities (kiosks, port managers, fisherman coaching, etc.).

Based on the results of interviews with tuna traders who have filled out the questionnaire on average in one day traders sell 36.88 kg/day of tuna or in the range of 2 to 125 kg/day. So that if accumulated in one month, an average trader can sell 1 ton of yellowfin tuna.

According to interviews with traders, the demand for yellowfin tuna comes from seafood restaurants, hotels, mobile fresh fish traders, seafood traders, housewives, etc. On average, each buyer buys 1 to 20 kg of tuna in one transaction. Every day, on average, traders procure 56.04 kg of yellowfin tuna stock per day. With this much procurement, it can be ascertained that it can meet the number of consumer demands on a daily basis. The price of tuna at the Kedonganan Fish Market is relatively fluctuating between Rp. 25,000 – Rp. 40,000/kg.

Characteristics of Respondents

Respondents in this study were consumers of fresh tuna at the Kedonganan Fish Market, Badung, Bali with a predetermined number of 50 people. From the results of filling out questionnaires to respondents, the following results are obtained. Table 1. From these results it can be concluded that the average buyer is a woman aged 30-40 years, college education, housewife work and income in the range of Rp. 3,000,000 – 5,000,000.

Table 1. Characteristics of Research Respondents

No	Criteria	Category	Total	Percentage
1	**Gender**	Male	16	68%
2		Female	34	32%
3	**Age**	<30 years	5	10%
4		30-40 years	26	52%
5		>40 years	19	38%
6	**Education**	Junior High School	3	6%
7		Senior High School	22	44%
8		College	25	50%
9	**Job**	Housewife	13	26%
10		Civil Servant	4	8%
11		Private	12	24%
12		Trader	10	20%
13		Others	11	22%
14	**Income**	<3,000,000	2	4%
15		3,000,000 - 5,000,000	33	66%
16		5,000,000 - 10,000,000	9	18%
17		>10,000,000	6	12%

Multiple Linear Regression Analysis

The results obtained for multiple linear regression of the factors that influence the demand for tuna Yellowfin can be seen in the following equation:

Y = 17,003 – 7,332 X1 + 1,872 X2 + 4,080 X3 – 1,471 X4 + 0,946 X5 + 0,083 X6

From the regression equation, it is obtained that the constant value (the regression coefficient value of the Y variable) is 17,003. This figure means that the demand for yellowfin tuna will be worth 17,003 if other factors are equal to zero. In other words, the quality of demand for yellowfin tuna will be at the level of 17,003 if there is no consumption activity for other types of fish and side dishes.

In the regression equation there are also coefficients of each variable. This coefficient will determine the value of the variable if there is a change. For the price of yellowfin tuna (X_1) the resulting negative coefficient of 7.332. This negative sign indicates the opposite relationship between the price of yellowfin tuna and the amount of demand for yellowfin tuna. It can be said that if there is an increase in the price of yellowfin tuna, there will be a decrease in the demand for yellowfin tuna by 7.332 kg. This is in accordance with Maulana, et al., 2021 that based on the analysis of linear statistical calculations, the factor that affects the demand for an item (chicken) is the price of the item itself. Price has a role in influencing consumer decisions in buying products. Based on the analysis conducted also shows that if the price of goods offered increases, it will decrease the number of goods demanded by consumers and vice versa.

The regression coefficient for the price of skipjack tuna (X_2) is positive at 1.872. This positive sign indicates the unidirectional effect of skipjack tuna prices on the demand for yellowfin tuna. This means that if the price of skipjack tuna increases Rp. 1,000, then there will be an increase in demand for yellowfin tuna by 1.87 kg. This shows that skipjack tuna is a substitute for yellowfin tuna.

The multiple linear regression coefficient for the price of kawakawa fish (X_3) is positive at 4.080. This positive sign indicates a unidirectional effect between the price of kawakawa fish on the demand for yellowfin tuna. This means that if the price of kawakawa fish increases by Rp. 1000, there will be an increase in demand for yellowfin tuna by 4.08 kg. This also shows that kawakawa fish is a substitute for yellowfin tuna.

This is in accordance with Maulana, et al., 2021 that substitute or substitute goods will affect the amount of demand for a particular good. This is evidenced from the analysis conducted on the demand for beef chicken, namely when the price increases and the price of substitute goods such as eggs and fish decreases, it will cause the number of requests for chicken to decrease. The decrease in purchasing power (amount of demand) occurs because some consumers will switch to other goods with lower prices, and vice versa.

The calculation of multiple linear regression for the chicken meat price coefficient (X_4) has a negative value of 1.471, meaning that if the price of chicken meat increases by Rp. 1,000, there will be a decrease in demand for yellowfin tuna by 1,471 kg. A negative variable coefficient indicates that there is an opposite effect between the price of the item and the demand for yellowfin tuna. This also shows that chicken meat is a complementary item to yellowfin tuna, which is a complementary side dish to fulfill the family's menu.

The types of food in the animal food sub-group are divided into 7 groups, namely: fresh marine fish (yellow tail fish, tuna, tuna, skipjack, mackerel, mackerel, anchovies, snapper, baronang and others), shrimp (shrimp, squid, stong, crabs, crabs, clams and others), freshwater fish (milkfish, cork, mujair, catfish, goldfish and others), processed salted fish, meat (beef, goat, buffalo, free-range chicken, processed meat, liver, offal, tetlan, bones and others), eggs (breed chicken, free-range chicken, quail, duck and others) and milk (factory liquid, sweetened condensed, powder, cheese and others). The division of this group is based on the type, shape, nutritional value and others (Ariani, et al., 2018). So from this study and the results of comparison with references indicate that fresh marine fish (yellowfin tuna) is a type of animal food group that is different from chicken meat. This also indicates that these two types of side dishes may be complementary and not substitute goods.

The results of the multiple linear regression calculation for the family income coefficient (X_5) have a positive value of 0.946. This figure shows a unidirectional effect of family income on the demand for yellowfin tuna. This means that if there is an increase in family income of Rp. 1,000,000, there will be an increase in the demand for yellowfin tuna by 0.946 kg. This also shows that yellowfin tuna is a superior good (goods whose demand will increase / increase if consumer income increases). So that the higher a person's income, the demand for yellowfin tuna will increase.

The results of multiple linear regression calculations for the coefficient of the number of families (X_6) are positive at 0.083. This positive sign indicates that the effect of the number of family members on the demand for yellowfin tuna is unidirectional. This means that if there is an addition of one family member, there will be an increase in the demand for yellowfin tuna by 0.083 kg. An increase in the number of family members can cause an increase in the demand for yellowfin tuna. This causes an increase in the consumption of side dishes in the family. So that the greater the number of family members, the greater the demand for yellowfin tuna.

F test (simultaneous)

significance test of the presumed parameters (F test) was used to show that all independent variables

included in the equation model had a joint effect on the dependent variable (yellowfin tuna demand). This test will compare the calculated F value with the table F value, with the provisions that have been written in the research methods section. The results of the F test calculation obtained in table 15 obtained the calculated F value of 8.7911 which is greater than the F table (> 2.17) with a 95% confidence level. Based on the results of these calculations, it can be concluded that H0 is rejected and the regression coefficient is statistically significant. This states that the regression model made is appropriate and feasible because there is a linear relationship of all independent variables to the dependent variable. It can also be concluded that the price of yellow fin tuna, the price of skipjack tuna, the price of kawakawa fish, the price of chicken meat, income and the number of family members simultaneously (together) have an influence on the demand for yellow fin tuna.

T test (Partial)

This test is proven by comparing the value of t count with t table. With a 95% confidence level, the results are shown in table 2.

variable ($X1_{first}$) is the price of yellowfin tuna at a 95% confidence level, the t-table value is 2.018. The variable price for yellowfin tuna ($X1_a$t-count value of 3.60. It can be said that H0 is rejected, the yellowfin tuna price coefficient is statistically significant. So it can be concluded that there is a significant effect between the price of yellow fin tuna and the number of requests for yellow fin tuna at the Kedonganan Fish Market.

The second variable is the price of skipjack tuna (X_2), the value of t count is 0.58 which means it is smaller than t table (2.018). It can be said that H0 is accepted and the skipjack tuna price coefficient has no significant effect. So it can be concluded that the price of skipjack tuna to the amount of demand for yellowfin tuna at the Kedonganan Fish Market is partially influential.

variable ($X3_{third}$) is the price of kawakawa fish at the 95% confidence level, the t-table value is 2.018. For the variable price of kawakawa fish (X_3) has a t value of 2.21. It can be said that H0 is rejected, the kawakawa fish price coefficient is statistically significant. So it can be concluded that there is a significant effect between the price of kawakawa fish and the demand for yellowfin tuna at the Kedonganan Fish Market.

variable ($X4_{fourth}$) is the price of chicken meat, the value of t count is 0.700 which means it is smaller than t table (2.018). It can be said that H0 is accepted and the chicken meat price coefficient has no significant effect. So it can be concluded that the price of chicken meat on the number of requests for yellowfin tuna at the Kedonganan Fish Market is partially influential.

The fifth variable is income at the 95% confidence level, the t table value is 2.018.income variable (X_5) has a t-count value of 4.016. It can be said that H0 is rejected statistically significant income coefficient. So it can be concluded that there is a significant effect between the amount of income and the amount of demand for yellowfin tuna at the Kedonganan Fish Market.

The sixth variable is the number of family members (X_6), the value of t count is 0.295 which means it is smaller than t table (2.018). It can be said that H0 is accepted and the coefficient of the number of family members has no significant effect. So it can be concluded that between the number of family members on the number of requests for yellowfin tuna at the Kedonganan Fish Market is a partial effect.

In general, it can be explained that based on the T test the factors that significantly affect the demand for yellowfin tuna are the price of yellowfin tuna, the price of kawakawa fish and the amount of income and other factors that partially affect the demand for yellowfin tuna are the price of skipjack, the price of chicken meat and the number of family members.

Table 2. Results of T Test Analysis (Partial)

No.	Variable	T_{count}	T_{table}
1	Y	0.3728606	2.018
2	X_1	-3.604098	2.018
3	X_2	0.5801618	2.018
4	X_3	2.2135745	2.018
5	X_4	-0.700377	2.018

No.	Variable	T_{count}	T_{table}
6	X_5	4.0163736	2.018
7	X_6	0.2945346	2.018

R Test

The coefficient of determination test is used to see how much the price of yellow fin tuna, the price of skipjack tuna, the price of kawakawa fish, the price of chicken meat, income and the number of family members can explain the demand for yellow fin tuna.

The magnitude of the correlation value (R) is 0.7624 and it is explained that the percentage of the influence of the independent variable on the dependent variable which is referred to as the coefficient of determination ($R2^{58}$%), which implies that the independent variable (the price of tuna) , the price of skipjack tuna, the price of kawakawa fish, the price of chicken meat, income and number of family members) to the dependent variable (the amount of tuna demand) is 58%, while the remaining 42% is influenced by other factors outside the analyzed variable X such as taste. consumers, etc.

In table 3 there is also a Durbin-Watson value of 1.29. Autocorrelation is a correlation on the variable itself, on observations at different times or individuals. According to Santoso, 2017 that to detect symptoms of autocorrelation can be seen from the Durbin-Watson (DW) value test, with the provisions: positive autocorrelation if the DW value is below -2, there is no autocorrelation if the DW value is between -2 to +2 and negative autocorrelation if the value is negative. DW is more than +2. So the results of this test indicate that there is no autocorrelation symptom in all independent variables in this study.

Table 3. Results of Correlation Test Analysis

No	Information	Value
1	R	0.76239969
2	R^2	0.581253287
3	R^2 adjusted	0.515135385
4	Durbin - Watson	1.296062386

Elasticity Test

Value elasticity of demand for yellowfin tuna at the Kedonganan Fish Market shows the calculation results as follows in Table 4.

From the table above, it can be seen that the price elasticity of yellow fin tuna on the demand for yellow fin tuna is -198. This means that an increase in the price of yellowfin tuna by 1% will reduce the demand for tuna by 19.8%. The elasticity value is inelastic because the value of e < 1 means that the percentage change in quantity (amount) of tuna demand is smaller than the percentage change in price or is not sensitive to price changes. This is presumably because yellowfin tuna is a necessity product, so that a significant price change does not have a major impact on changes in the quantity of tuna purchased by consumers. Most food commodities will have an elasticity value of less than 1 which is called inelastic. Inelastic commodity commodities are commodities which in case of large price changes will not have a major effect on the amount of demand for these commodities, because these commodities are always needed by consumers. Some food commodities that are inelastic include rice, fish, chicken meat, eggs, vegetables, fruit, tofu (Miranti, et al., 2016 and Wahyuni, et al., 2016)

Cross elasticity of skipjack tuna prices on demand for fin tuna yellow obtained elasticity value of 12.94. This means that with an increase in the price of skipjack tuna by 1% it will increase the demand for yellowfin tuna by 12.94%. The elasticity value is elastic because the value of e > 1. The cross elasticity of the price of kawakawa fish on the demand for yellowfin tuna obtained an elasticity value of 27.05. This means that with an increase in the price of kawakawa fish by 1% it will increase the demand for yellowfin tuna by 27.95%. The elasticity value is elastic because the value of e > 1. The elasticity value of the two variables is positive, which means that these two goods are substitutes for yellowfin tuna. The results of this analysis are also in accordance with the research conducted by

Ferdian, et al., 2012 that the positive value of cross elasticity indicates that the type of goods is substitute goods. Types of substitute goods usually have a role to replace each other or have the same function. Types of substitute goods for fish are usually fish but other types. The elasticity value of the price of chicken meat on the demand for yellowfin tuna is 10.69 which is inelastic. This means that an increase in the price of chicken meat by 1% will reduce the demand for yellowfin tuna by 10.69%. Chicken meat is a substitutes item.

Based on the results of the income elasticity calculation, the income elasticity value is 10.15. The value of income elasticity is elastic because the value of e > 1. The elasticity value is also positive which indicates that yellowfin tuna, namely an increase in family income will result in an increase in the number of requests for tuna (normal goods). This is also in accordance with what was stated by Arthatiani, et al., 2018 that based on the calculation of the income elasticity of seawater fish commodities such as tuna, skipjack and tuna have an elasticity value of > 1 which means that fresh marine fish commodities are a normal type of goods, where an increase in income will increase the income. affect the quantity demanded of goods.

Table 4. Results of Calculation of the Elasticity of Demand for Yellowfin Tuna at the Kedonganan Fish Market

No.	Variable	Elasticity	Interpretation
1	Price Elasticity of Fresh Tuna	-19.7957702	Inelastic
2	Cross Elasticity (Cakalang Fish Price)	12.94230272	Elastic
	Cross Elasticity (Kawakawa Fish Price)	27.0506662	Elastic
	Cross Elasticity (Chicken Meat Price)	10.68529485	Elastic
3	Income Elasticity	10.15390273	Elastis

CONCLUSION

The conclusions in this study include:

1. The factors that influence the demand for fresh yellowfin tuna at the Kedonganan Fish Market simultaneously and partially are the price of yellowfin tuna, the price of skipjack tuna, the price of kawakawa fish, the price of chicken meat, the amount of income and number of family members.
2. The price elasticity of demand for fresh yellowfin tuna at the Kedonganan Fish Market is inelastic (not sensitive to price changes) which indicates that tuna is a daily food product. Cross elasticity indicates that the type of substitute goods / substitutes for tuna include skipjack tuna and kawa - kawa fish and chicken meat. Income elasticity shows that tuna is a normal type of goods, which will increase its demand along with an increase in buyer income or vice versa.

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