



## **The Exchange Rate Analysis of Fish Cultivators in Bandung District, Indonesia**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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### **ABSTRACT**

Bandung Regency is one of the fisheries centers in West Java Province, some residents make freshwater fish farming their main and side livelihood, to see the welfare of fish cultivators in Bandung Regency, namely using the Fish Cultivator Exchange Rate (NTPI). This study aims to analyze the NTPI of Bandung Regency and analyze the factors that can affect the NTPI. The research method used is descriptive observation and interviews. The results showed that most of the fish cultivators in Bandung Regency were in a prosperous condition because they obtained NTPI > 100. The results of multiple linear regression show that age, education, work experience, number of dependents, income and expenses affect the NTPI of Bandung Regency. Partially the factors that have a significant effect are income and expenses. Variables that do not significantly affect are age, education, work experience, number of dependents and land area. Based on the results of the NTPI, as many as 79% of respondents are prosperous and 11% are in the less prosperous level.

*Keywords: Bandung regency; welfare; NTPI; freshwater fish cultivator.*

## 1. INTRODUCTION

Bandung Regency is one of the fishery centers in West Java Province. The annual production of freshwater fish in Bandung Regency increased from 2017 the production of fish on a scale starting at 14,124.48 tons and seed production of 1.2 billion heads. 2020 production of 15429.63 tons of rearing-scale fish and 1.9 billion fish seed production [1].

Statistical data shows that Bandung Regency has great potential in fishery resources. Bandung Regency is geographically and climatologically suitable for fishery business development, starting from hatchery activities, nursery, rearing up to fish processing [2]. Therefore, Bandung Regency is known as the center of West Java's freshwater fish culture with superior fish commodities including carp, tilapia, and catfish.

The way to find out the welfare of fish cultivators in the Bandung Regency is to calculate the Fish Cultivator Exchange Rate (NTPI). Indicators of the welfare of fish farmers can be analyzed with NTPI because it can describe the development of farmers' income and expenditure simultaneously [3]. NTPI is related to the ability and purchasing power of cultivators in financing their household life [4].

Fish farming activities in Bandung Regency should be able to improve the welfare of fish cultivators but on the ground show that the income of fish cultivators is still relatively low because the Fishery Exchange Rate is lower than the exchange rate of the agricultural sector [5]. Therefore, the purpose of this study is to analyze the NTPI in the Bandung district and what factors can affect the NTPI.

## 2. METHODS

The location of the research in the Bandung Regency from October 2020 to June 2021. The data collection method used is the observation and interviews method. The type of data used is primary data obtained by using observations and interviews conducted in Bandung Regency with a total of 45 respondents (15 respondents for carp cultivators, 15 respondents for tilapia cultivators, 15 respondents for catfish cultivators). Types of secondary data obtained from various sources such as books, journals, scientific paper reports, the Department of Marine Affairs and Fisheries of West Java Province, the Food and Fisheries

Service of Bandung Regency, and the Central Bureau of Statistics of West Java.

### 2.1 Data Analysis

Data analysis in this research is a qualitative descriptive analysis. Qualitative descriptions were obtained from samples of the research population which were analyzed based on statistical methods. The analysis used is descriptive qualitative to obtain an overview and factors that affect the NTPI in Bandung Regency.

### 2.2 Fish Cultivator Exchange Rate Analysis

NTPI analysis uses the following formula [6]:

$$NTPi = \frac{IHTPi}{IHBPi} \times 100$$

With :

NTPI = fish cultivator exchange rate

IHTP = price received fish cultivator

IHBP = price paid fish cultivator

With the criteria [7]:

- 1) NTPI > 100 means that fish farmers experience a surplus or a certain period the price of production increases more than the increase in prices of consumer goods and production costs.
- 2) NTPI = 100 means that fish farmers break even in a certain period the increase and decrease in producer prices is equal to the percentage increase and decrease in prices of consumer goods and production costs
- 3) NTPI < 100 means that fish cultivators experience a deficit in a certain period the increase in the price of production goods is relatively smaller than the increase in the price of consumer goods and production costs.

business criteria categories:

- 1) micro:
  - a. have a net worth of at most 50,000,000 IDR
  - b. annual sales of at most 300,000,000 IDR
- 2) small :
  - a. have a net worth of more than 50,000,000 IDR - 500,000,000 IDR
  - b. annual sales revenue is more than 300,000,000 IDR - 2,500,000,000 IDR

- 3) medium :
  - a. have a net worth of more than 500,000,000 IDR
  - b. annual sales revenue is more than 2,500,000,000 IDR

The table data shows that most of the freshwater fish cultivators in Bandung Regency have a productive age. if the age of the workforce is productive, work productivity will increase [11].

### 2.3 Analysis of Factors That Affect the Welfare of Fish Cultivator

#### 3.1.2. Education

#### 2.3.1 Multiple linear regression test

Higher education results in increased work productivity so that income increases [12]. The following is a table of education for fish cultivators in Bandung Regency.

$$Y = a + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + e$$

With:

The results of the data indicate that the education level of fish cultivators in Bandung Regency is quite good, so the work productivity of freshwater fish cultivators in Bandung Regency is quite high. There is an effect of education on work productivity [13].

Y = Welfare of fish farmers  
 a = Constant  
 X<sub>1</sub> = age  
 X<sub>2</sub> = education  
 X<sub>3</sub> = Work experience  
 X<sub>4</sub> = Number of dependents of family members  
 X<sub>5</sub> = Income  
 X<sub>6</sub> = Expenditure  
 X<sub>7</sub> = land area  
 B<sub>1</sub>- B<sub>7</sub> = Coefficient Value of Each Variable  
 e = error

#### 3.1.3. Work experience

The longer a person has working experience the more trained and skilled in executing their work [14]. The following is a table of years of work experience from freshwater fish cultivators in Bandung Regency:

#### 2.3.2 Statistic test

Based on the results of the work experience data of fish cultivators in Bandung Regency, it shows that the majority of respondents have work experience between 5 - 10 years, there is an influence between the length of work experience and the level of one's productivity. The longer a person does the work, the more skilled he will be on work performance as the time it takes to complete the job will be faster.

- 1) The R<sup>2</sup> test aims to show how big the percentage of variation that occurs in the dependent variable can be explained by the independent variables in the model [8].
- 2) The F test aims to test to see how the influence of all the independent variables together on the dependent variable [9].
- 3) The t-test aims to test how the influence of each independent variable individually on the dependent variable [9].

#### 3.1.4. Number of dependents family members

Family dependents are people whose living needs are still borne by the head of the family [16]. The following is a table of the number of dependents of the Bandung Regency fish cultivator family:

## 3. RESULTS AND DISCUSSION

### 3.1 General Characteristics of Respondents

Based on the data table, the number of dependents of the family of fish cultivators in Bandung Regency, the majority have small-scale family dependents with several 1-3 people. The more the number of dependents in the household fish of the greater expenses that will be incurred by fish farmers [17].

#### 3.1.1 Age

Productive age ranges from 15 years to 64 years and non-productive <15 years and >64 years [10]. The following table shows the age of fish cultivators in Bandung Regency.

### 3.2 Based on Business Category

#### 3.2.1 Carp cultivator

The following is a table of NTPI of carp cultivator in Bandung Regency:

Based on the table above, most of the carp cultivators belong to the category of micro and small businesses that have NTPI > 100

indicating that the carp cultivators are prosperous. however, there is 1 carp cultivator with NTPI 83 meaningless prosperous because of NTPI <100. NTPI > 100 indicates that the income fish cultivator can meet the basic needs of the family, while NTPI < 100 means that the income has not been able to cover the basic needs of the family [18].

**Table. 1 Fish Cultivator Age**

No	Description	Total	Percentage (%)
1	Age <15	0	0
2	Age 15-64	36	80
3	Age >64	9	20

**Table 2. Fish Cultivator Education**

No	Description	Total	Percentage (%)
1	primary school	0	0
2	Junior high school	13	29
3	senior High School	25	56
4	Collage	7	15

**Table 3. Fish Cultivator Work Experience**

No	Description	Total	Percentage (%)
1	5 – 10	31	69

**Table 4. Number Of Dependents Cultivator Family**

No	Description	Total	Percentage (%)
1	Small Number of Dependents	38	84
2	Medium Number of Dependents	7	16
3	Big Number of Dependents	0	0

**Table 5. NTPI of Carp Cultivator**

Business Category	Income		Total Income (IDR)	Total expenditure (IDR)	NTPI (%)
	Fishery (IDR)	Non Fishery (IDR)			
Micro	2,573,000	2,000,000	4,573,000	4,000,000	114
	1,929,000	2,500,000	4,429,000	3,000,000	148
	2,065,000	2,500,000	4,565,000	3,000,000	152
	1,633,000	2,000,000	3,633,000	3,000,000	121
	313,000	2,500,000	2,813,000	3,400,000	83
	NTPI Average				103
Small	3,400,000	2,000,000	5,400,000	3,500,000	154
	NTPI Average				154
Medium	0				
	NTPI Average				0

### 3.2.2 Tilapia Cultivator

The following is a table of NTPI Tilapia cultivator in Bandung Regency:

Based on the table above, the NTPI of tilapia cultivators in the micro-enterprise category has NTPI > 100 with an average NTPI of 119, meaning that tilapia cultivators in Bandung Regency are said to be prosperous, but there is 1 tilapia hatchery business actor who is less prosperous because the NTPI obtained is 94 which means that income has not been able to meet the basic needs of the household.

### 3.3 Catfish Cultivator

The following is a table of the NTPI for catfish cultivator in Bandung Regency:

Based on the NTPI table for catfish cultivators in Bandung Regency, there are categories of micro and small businesses, most of the NTPI>100 with an average NTPI of micro-enterprises 106 and small businesses with an average value of NTPI 143. Catfish cultivators in micro-enterprises have NTPI <100 with NTPI values of 77 and 93, which means that the business actor is less prosperous or the income has not been able to meet the basic needs of his household. Results Based on the NTPI study in Karawang Regency which has an NTPI of 155, the Kawarang Regency fish cultivators are prosperous. then the

NTPI of the Karawang Regency is higher than that of the Bandung Regency [19].

### 3.3 Analysis of Factors Affecting NTPI in Bandung Regency

#### 3.3.1 Multiple linear regression test

Multiple linear analysis aims to determine the factors that can affect of NTPI Bandung regency. This research uses multiple linear regression using SPSS 24 software with a 95% confidence level. The results of the analysis can be seen in the following table:

Then the regression model in this research are as follows:

$$Y = 1.149 - 0.001 X_1 + 0.001 X_2 + 0.001 X_3 - 0.003 X_4 + 0.264 X_5 - 0,298 X_6 + 0.00 X_7 + e$$

Based on the results of the multiple linear regression test, a significant value <0.05 is found in the income (X5) and expenditure (X6) variables, meaning that these two variables have a significant effect on NTPI (Y) while other variables have a significant value >0.05, meaning that other variables do not affect NTPI significantly. The results of the NTPI study in the Pangandaran Regency stated that income and expenditure factors significantly affected NTPI [20].

Table 6. NTPI of Tilapia Cultivator

Business Category	Income		Total Income (IDR)	Total expenditure (IDR)	NTPI (%)
	Fishery (IDR)	Non Fishery (IDR)			
Micro	889,000	4,200,000	5,089,000	4,000,000	127
	7,850,000	0	7,850,000	4,500,000	143
	1,780,000	2,000,000	3,780,000	3,000,000	126
	1,980,000	1,500,000	3,480,000	3,200,000	109
	1,713,000	2,000,000	3,713,000	3,000,000	124
	2,570,000	2,000,000	4,570,000	4,200,000	109
	1,600,000	1,500,000	3,100,000	3,300,000	94
	NTPI average				119
Small	0				
	NTPI average				0
Medium	0				
	NTPI average				0

Table 7. NTPI of Catfish Cultivator

Business Category	Income		Total Income (IDR)	Total Pexpenditure (IDR)	NTPI (%)
	Fishery (IDR)	Non Fishery (IDR)			
Micro	6,083,000	0	6,083,000	4,867,000	125
	854,000	2,600,000	3,454,000	3,000,000	115
	1,805,000	2,100,000	3,905,000	3,500,000	112
	750,000	300,000	1,050,000	1,500,000	77
	1,229,000	2,000,000	3,229,000	2,800,000	115
	900,000	500,000	1,400,000	1,500,000	93
	NTPI average				106
Small	11,308,000	0	11,308,000	8,180,000	138
	8,645,000	0	8,645,000	5,900,000	147
	NTPI average				143
medium	0				
	NTPI average				0

Table 8. Multiple Linear Regression Analysis Results

Model	Unstandardized coefficients		Standardized coefficients beta	t	sig
	B	Std error			
1 Constant	1.149	0.18		62.119	0.000
Age (x <sub>1</sub> )	-.001	.000	-.034	-1.568	.125
Education (X <sub>2</sub> )	.001	.004	.003	.144	.886
Work Experience (X <sub>3</sub> )	.001	.001	.035	1.562	.127
Number of Dependents	-.003	.004	-.020	-.882	.383
Family Member (X <sub>4</sub> )					
Income (X <sub>5</sub> )	.264	.005	1.741	49.611	.000
Expenditure (X <sub>6</sub> )	-.298	.008	-1.396	-39.527	.000
Land area(X <sub>7</sub> )	.000	.001	.008	.391	.698

Tabel 9. Coefficient of Determination (R<sup>2</sup>)

Model	R	R square	Adjusted R square	Std. erroe of the estimate
1	.993 <sup>a</sup>	.986	.984	.01287

Tabel 10. F Test

Model	Sum of squares	df	Mean square	f	Sig.
Regression	.590	7	.084	381.594	.000 <sup>b</sup>
Residual	.008	37	.000		
Total	.599	44			

### 3.3.2 Statistic Test

#### 1) Determinant Test (R<sup>2</sup>)

The following table of the coefficient of determination (R<sup>2</sup>):

Based on the table of the coefficient of determination (R<sup>2</sup>) the adjusted R square value

obtained is 0.984. this indicates that 98.4% of NTPI is affected by the independent variable (X), consisting of age (X<sub>1</sub>), education (X<sub>2</sub>), work experience (X<sub>3</sub>), number of dependents (X<sub>4</sub>), income (X<sub>5</sub>), expenditure (X<sub>6</sub>) and land areas (X<sub>7</sub>). whereas 1.6% NTPI was affected by other factors that are not inspected. Other factors that can affect NTPI include fishery production yields and commodity prices,

## 2) F test

The following is the result of the calculation of the F test table in this research

Based on the table, the calculated F value is 381,594, F table is 2.26. then  $F_{count} > F_{table}$  Key that the NTPI independent variables consist of age ( $X_1$ ), education ( $X_2$ ), work experience ( $X_3$ ), number of dependents ( $X_4$ ), total income ( $X_5$ ), total expenditure ( $X_6$ ), and land area ( $X_7$ ) has a significant effect on NTPI.

## 4. CONCLUSION

Based on the research results, the following conclusions are obtained:

- 1) The overall NTPI results for fish cultivators in Bandung Regency have  $NTPI > 100$ , which means the fish cultivators are prosperous. However, there are fish farmers who have  $NTPI < 100$ , indicating that the farmers are less prosperous. Based on the results of the NTPI, 79% of respondents are in the prosperous level and 11% are in the less prosperous level.
- 2) Based on the results of the R2 test, the factors that can affect the NTPI include age, education, work experience, number of family dependents, total income, and total expenditure. Based on a partial test of factors that can significantly affect NTPI, income and expenditure.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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