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# Analysis of Aquaculture Land Conversion In Cileunyi Subdistrict of Bandung District

***Achmad Rizal[1*], Rayana Akbar Maulana[1], Zuzy Anna [1], Lantun Paradhita Dewanti [1]***

*[1]Fishery Studies Program, Faculty of Fisheries and Marine Sciences Padjadjaran University, Jl. Raya Bandung-Sumedang km. 21, Jatinangor 40600, Sumedang, Indonesia*

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ABSTRACT

The increase in activity and population who are part of the development lead to competition and land use conflicts in terms of residential development, infrastructure and economic means. Sub-district of Cileunyi is a suburb area that becomes the target of conversion because it has a lot of unbuilt land such as ponds of aquaculture farms. The purpose of this research is to analyze the performance of fishery cultivation business and analyze the rate of conversion of aquaculture field in sub-district of Cileunyi along with the factors that influence it. The research using survey method, and logistic regression model analysis. The result of the research shows that the conversion of aquaculture land in Cileunyi sub-district progressively occurred in the period of 2009 to 2014 with an average conversion rate of 26,49% per year and the factors that are predicted to influence the decision of the farmer in converting the aquaculture land such as size land area, productivity, profit, and selling price of land, based on the results of research using logistic regression analysis model simultaneously



## 1. Introduction

The continued conversion and development of aquaculture land pose a serious threat to the fishery services derived from aquacultured landscapes. We argue that developing an understanding of the full range of consequences from aquaculture conversion requires understanding the effects of such conversion on both components of ecosystem services: products and processes. However, there are unavoidable challenges involved in quantifying the threats from aquaculture conversion and their related costs to human well-being.

First, most attempts to quantify the costs of aquaculture conversion on ecosystem services will necessarily rely on specific ecological science that is often emerging, changing, or simply nonexistent. For example, the role that many species play in ecosystem processes is poorly understood.

Second, given the interconnected nature of ecosystem products and processes, any attempt to quantify the effects of aquaculture conversion must grapple with jointness in production. For example, the cost of losing a species from aquaculture conversion must account for that species' role as both (1) a product that directly contributes to human well-being, and (2) as a component in an ecosystem process. Finally, the ecology and the human dimensions of ecosystems are highly specific to spatial-temporal circumstances. Consequently, the effects of aquaculture conversion in one spatial-temporal context are likely to be quite different than effects elsewhere.

Land conversion is a permanent change, it includes part or all of functional change from a land which is converted. Population growth is a factor influences functional shift of land. Bappeda Bandung District in 2008-2015 records that population growth in Bandung District increases to 527.650 people or in average it increases 2,7% each year, this increasing is an influence from several regions with high population and density such as in Cileunyi (Bandung Central Statistics Agency, 2016).

Cileunyi SubDistrict is a region with high growth rate with the average of increasing is 5,05-5,95% each year. The number of people in Cileunyi SubDistrict in 2014 was 192.312 people and in 2015 up to 195.384 people. This high number and increasing of the development program occurred in Cileunyi indicates that there is conversion trend, including conversion trend which involves a functional shift of fishing ground (Bandung Central Statistics Agency, 2016).

## 2. Materials and Methods

The method used in this research was survey method that primary and secondary data collection were conducted by primary survey (observation in field, interview, and questionnaire), and secondary survey (initial data collection from government institution such as Central Bureau of Statistics (BPS), Technical Implementation Unit (UPT), District Office, Village Office, books, reports, journals).

Sampling collection technique used saturated sampling

* *Corresponding author*. Tel.: +62 858 7237 5399
E-mail address: achmad.rizal@unpad.ac.id

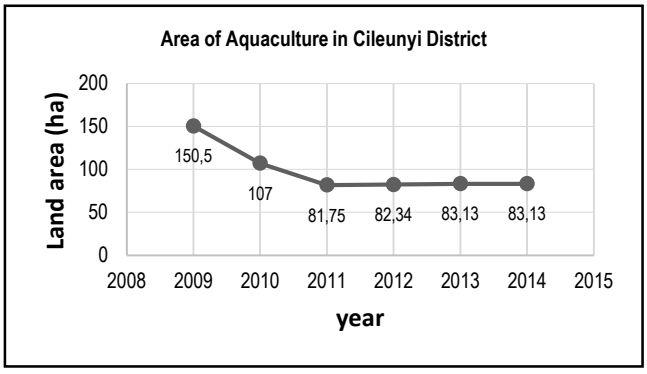
(census) due to the number of population was relatively small, less than 30 people, so the entire members of population became the sample, toward respondents who were the owners/workers of aquaculture in Cileunyi SubDistrict who were still active or non-active in doing aquaculture activity. The research and data collection both primary and secondary data were conducted since November 2016 to February 2017.

Tool analysis are used by analysis profit, conversion rate and logistic regression analysis toward prediction factors which had probability on decision to convert aquaculture land.

## 3. Results and Discussion

The depletion of aquaculture land significantly occurred in range of period in 2009-2011 and the mean of conversion rate was 26,94% per year and it calculated from 2011 to 2014 that the existence of aquaculture land was increasing, it occurred due to the appearance of hatchery units by utilizing unconverted small lands (Pic 1).

The most reduction of aquaculture land was occurred due to land conversion of aquaculture land into housing. Cileunyi SubDistrict was suburb which became the main purpose for developers in choosing location and land acquisition for housing developments. Suburb generally had cheap low characteristic, with the consequence that it was far from the center of the city so it became an attraction for people who wanted to have a house which distance from the city.




**Picture 1**. Fishery Farm Conversion Trends in Cileunyi SubDistrict

Source: Department of Animal Husbandry and Fishery Bandung District, 2015

According to reports from the Department of Animal Husbandry and Fishery Bandung District (2015) there are a number of constraints affecting the aquaculture land conversion in Cileunyi. These include lack of adequate supply of seed, lack of quality fish seed and suitable feeds . Low investment from the private sector is also listed as one of the major problems as well as lack of information concerning economic profitability of aquaculture. Aquaculture in Cileunyi is mostly done on a subsistence basis with very few commercial operators. According to survey most People in Cileunyi see aquaculture as a part-time, limited investment hobby due to the poor regard they have for aquaculture as an economic activity.

Analysis of a business activity is a way to find out the level of feasibility of a aquaculture business involving continuity, stability and profitability of a business. Business cost in detail includes fixed assets, depreciated cost and business operational cost. Based on the efficiency of production cost including cost of fish feed and selling price of commodity indicates the profit of aquaculture business from the respondents in Cileunyi SubDistrict is presented on Table 4.

**Table 1**. Average Profit of Aquaculture Business in Cileunyi Sub-district

| Description | (IDR/Rp) |
|---|---|
| Total cost of production | 5,433,500 |
| Total revenue | 6,640,000 |
| Profit | 1,206,500 |

Logistic regression feasibility model test aimed to test the feasibility of data with the model used. Here is Hosmer and Lemeshow's Goodness of Fit Test Goodness table from the result of data collection with binary logistic analysis by using IBM SPSS Statistics 21.

**Table 2**.Hosmer and Lemeshow Test

| Step | Chi-square | df | Sig. |
|---|---|---|---|
| 1 | 5,568 | 8 | ,696 |

The value of statistics probability (Sig) of Hosmer and Lemeshow's Goodness of Fit Test Goodness was 0,696 which means that it > 0,05, the null hypothesis (H0) was accepted and the model was able to predict the value of observation or the model was accepted because it was fit with the observation data. Overall model test used in this research was a test to see whether overall model was able to be used as prediction tool or not, in overall model test it used two tests.

**Table 3**. -2 log likelihood and Initial -2 Log Likelihood

| Iteration | -2 Log likelihood | Coefficients | | | | |
|---|---|---|---|---|---|---|
| | | Constant | Land area | Productivity | Income | Land Selling Price |
| Step 1 | 15,489 | ,187 | ,000 | -,396 | ,000 | ,000 |
| | 13,748 | -,985 | ,000 | -,550 | ,000 | ,000 |
| | 13,309 | -2,478 | ,000 | -,612 | ,000 | ,000 |
| | 13,271 | -3,159 | ,000 | -,625 | ,000 | ,000 |
| | 13,271 | -3,230 | ,000 | -,626 | ,000 | ,000 |
| | 13,271 | -3,231 | ,000 | -,626 | ,000 | ,000 |

a. Method: Enter
b. Constant is included in the model.
c. Initial -2 Log Likelihood: 27,726
d. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Based on Table 3 above, the initial value -2LL function (block number = 0) was bigger than the mean of -2 log likelihood in block 1, it shows that there was a reduction of value from initial -2LL function to the next -2LL (-2LL block number = 1), and if it compared to the mean of Chi-square, then the value of -2LL was till bigger, then H0 was rejected which means that the model was rejected, so parameter of significance test was able to be continued by resting individually to find out significance of X variables and Y variables.

From the result of Determination analysis, it can be

obtained that Cox & Snell R Square value was 0,515 and Nagelkerke R Square was 0,686. Nagelkerke R Square value was bigger than Cox & Snell R Square and together they showed skills of five free variables which were land area, land productivity, profit, and selling price of land. Determination coefficient test on logistic regression is explained on table 7.

**Table 4**. -2LLRatio, Cox & Snell R Square dan Nagelkerke R Square

| Step | -2 Log likelihood | Cox & Snell R Square | Nagelkerke R Square |
|---|---|---|---|
| 1 | 13,271 | ,515 | ,686 |

The five independent variables which were used in the research had been able to explain dependent variable which was aquaculture land conversion 68,6% (Nagelkerke R Square) and the rest 31,4% was factors in deciding aquaculture land conversion explained by other variables out of research model, such as availability of water, quality of water, availability of fish fry quality of fish fry, fish feed price, weather (farming factor), whereas out of aquaculture factors were growth rate, Gross Domestic Product (PDRB), the number or industries, business experiment and the number of dependents (Yudhistira, 2013). Table 5 show that Test Significance of Coefficient of logit analysis model (logistic binary regression)

**Table 5.** Variable Equations

| | | B | Sig. | Exp(B) | 95% C.I.for EXP(B) | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| Step 1 | Land area | -0,000285 | ,207 | 0,999715 | ,999 | 1,000 |
| | Productivity | -0,626377 | ,259 | 0,534525 | ,180 | 1,585 |
| | Income | -0,000002 | ,180 | 0,999998 | 1,000 | 1,000 |
| | Land Selling Price | 0,000011 | ,337 | 1,000011 | 1,000 | 1,000 |
| | Constant | -3,231133 | ,614 | 0,039513 | | |

Correlation of independent variables which were factors of conversion use in the research had nature to improve and reduce probability of conversion, and it can be seen from mark of correlation in each factor showed by coefficient value in column B (Table 8). Negative correlation used by variables means that there was inversely proportional correlation to the success of land conversion.

The significance of a factor can be seen from comparison of Sig values (Table 5) with real level (5%), a factor was stated as significant had tendency to influence decision in converting land if it had smaller significance than real level (0,05). according to Table 8 the result of processing data above, it can be obtained that coefficient value (B), significance value and Exp (B) or Odds Ratio from each independent variable used in the research, so it can be made the formulation as follows:

Z = -3,231133- 0,000285 (Land area) - 0,626377 (Productivity) – 0,000002(Income) + 0,000011(Land Selling Price) (1)

Variable (land area) which had significance value to decision of functional shift of land was 0,207 with coefficient value (-0,000285) in real level 5% and it means that when there was adding for 1 percent unit of land area (m2) then it tends to reduce probability of functional shift of land for 0,999715 times (Exp (β) or odds ratio). The value describes that land area had influence but it did not significant to the tendency of functional shift of aquaculture land in real value 5% (0,259 > 0,05).

In this research land productivity variable had significance to decision of functional shift of land for 0,259, The value means that land productivity had influence but it was unsignificant to the tendency of functional shift of aquaculture land in real value 5% (0,259 > 0,05). Coefficient of the result of productivity variable was negatively correlated (-0,626377) to Exp (β) or odds ratio was 0,534525, which is when in productivity there was one percent adding, then the tendency of fish farmers to sell land was smaller 0,534525 times compared to not sell the land.

The level of income is a benchmark in a business. The result of the research about income factor to functional shift of land shows that there was insignificance influence to decision of functional shift of land with significance value for 0,180 in real value 5% (0,180 > 0,05), but it negatively correlated which was by significance value -0,000002. Coefficient of result obtained to income variable means that if there was one percent adding for each production then it would reduce probability of land conversion for 0,999998 times (Exp (β)).

Based on the partially result from four independent variables used in this research there was one variable which positively correlated even if it still influenced but insignificantly that was selling price of land with significance 0,337 in real value 5% (0,337 > 0,05). Selling price of land variable had coefficient value was 0,000011 and Exp (β) or odds ratio was 1,000011, which means that for each one percent adding the selling price of land increased the tendency of functional shift/land conversion for 1,000011 times.

Based on the model it can be seen that from four factors used in this research had tendency to influence decision of aquaculture in doing functional shift of aquaculture land in research region insignificantly according to real value (α) which was 5%. The existence of four prediction factors in this research had insignificantly influence due to small number of sample so the smaller number of sample the smaller critic value which was used as reference.

## 4. Conclusion

The main conclusions of the study show that analysis of aquaculture business performance in Cileunyi SubDistrict had mean of total income was Rp 1.206.500 for each production (three months) with mean of total cost was Rp 683.750 and mean of variable cost was Rp 4.749.750. The value of the costs was categorized as small business in Bandung District.

The highest trend of land conversion of aquaculture in Cileunyi SubDistrict occurred between 2009 to 2011 with mean of conversion rate was 26,49% per year from 150,5 ha land in 2009 to 81,75 ha in 2011 and calculated from 2011 to 2014 there was increasing of aquaculture land area to 83,13 ha along with trend of catfish hatchery commodity in plastic pond.

Based on the result of the research, factors of free variables in this research simultaneously influenced the decision of functional shift of aquaculture land, but from correlation model formed was able to predict tendencies based on condition in field.

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