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LAND POTENTIALS AND FISHERY HOUSEHOLD (FH) FOR CATFISH AND TILAPIA CULTURE IN INDRAMAYU REGENCY USING A REMOTE SENSING ANALYSIS

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KeyWords

Land Potential, Fihsery, Aquaculture, Tilapia, Catfish, Remote Sensing, Indramayu

ABSTRACT

Indramayu regency is one minapolitan areas with a developing aquaculture including catfish and Tilapia commodities. However, a wide range of aquaculture fisheries requires appropriate development strategies. The purpose of this research is to obtain the extended land areas and RTP for catfish and indigo commodities through digitization using a remote sensing analysis, which may become the bases for the development of fishery businesses on catfish and Tilapia cultivations in Indramayu Regency. The remote sensing method is conducted by utilizing interpretation of satellite imagery and combined with the field data. The supporting data are collected through direct survey and interviews including the Fishery Household, catfish and Tilapia cultivations, as well as the Environmental data. Interpretation and field survey are conducted in June-November 2015. The data collected and analyzed for the catfish are by 1934 RTP and Tilapia by 138 RTP. Based on the comparison table of catfish cultivation areas, it is shown that the potential of the total extended area for ponds is 9,854.1 ha and the digitation result is 10,879.72 ha. Meanwhile, the potential of the total extended pond area for tilapia cultivations is 12,065.08 ha.

INTRODUCTION

Fishery potentials in Indramayu Regency provide a great contribution to the fishery production of both West Java and Indonesia. There are two main sectors which may become the major potentials in the coastal areas of Indramayu covering the oil and natural gas sector (24.6%) as well as the fishery subsector (24.4%) (Syarif, *et al.*, 2014). In addition to the capture fishery, cultivation fishery also provides a great contribution to the fish production in Indramayu Regency. Several potential commodities of cultivation fishery in Indramayu Regency include milkfish, prawn, vaname shrimp, catfish, and tilapia (DKP, 2015). The Ministry of Maritime Affairs and Fisheries (2011) states that West Java is considered as the catfish production centers in Indonesia with a total production of 110,527 tons in 2011. High cultivation production leads Indramayu to become one fishery supplier for several regions of Indonesia. For example: Indramayu and Bogor are considered as the catfish production centers in West Java (Sari, *et al.*, 2014).

One effort made to improve the cultivation production is through land optimization development. The utilization of remote sensing and Geographical Information System (GIS) in examining the cultivation areas is considered more affective. In addition, the resulted data may be spatially presented in the forms of map that evaluation and monitoring regarding to the distribution patterns and changes may be performed (Paena, *et al.*, 2007). The geographical information system (GIS) has become one integrated component of natural resource management activities in the world, including aquaculture activities (Shree, *et al.*, 2000) which are similar to the research conducted by Radiarta, *et al.*, 2008, Suzanne, *et al.*, 2016, Raushan & Nikunj, 2014, and Nayak, *et al.*, 2014. The purpose of this research is to figure out the extended land areas and Fishery Household (FH) for catfish and tilapia commodities through digitations using a remote sensing analysis as the development bases of fishery businesses on catfish and tilapia seed cultivation in Indramayu Regency.

METHOD

This research is conducted in June-November of 2016 di Indramayu Regency, West Java. The data are collected using survey and interview approaches (Radiarta, *et al.*, 2008) with various informants related to Fishery Household (FH) of catfish and tilapia cultivation in Indramayu Regency. The collected data are in the forms of spatial and attributive data (NAYAK, *et al.*, 2014) consisting of data obtained from the satellite images, digital maps of the related areas, and administrative maps. The image data used consist of *Landsat on* August 8, 2015 and *Quickbird* (Wirastuti, *et al.*, 2016) (Nyerges, 2014) for Indramayu and its surrounding areas. This research also uses attributive data which consist of closing and land utilization data (Prasetyo, *et al.*, 2011). Those data include the demographic and socio-economic data of communities in the related areas obtained from the Central Bureau of Statistics (*BPS*) and the Regional Spatial Panning (*Bappeda*) of the related regency.

Data Analysis

The analysis on image data consists of quantitative analysis, that is, visual analysis (image interpretation) which is conducted to detect and identify the objects on the earth surface appearing at the satellite image. The identification is conducted based on the spatial and spectral characteristics. Furthermore, a quantitative analysis is conducted, in which the obtained information from each pixel of Digital Number (DN) is assisted by the computer utilizing a supervised classification method of MLC. The classification is intended to figure out type, distribution, the utilized land area (land use cover) in the related region by using the maximum probability (*Maximum Likelihood* Classification). The classification is automatically conducted based on the specified *training area* selected based on field sample collection map conducted based on the recognized locations.

The brackish pond digitations processes aim at generating new layers in the forms of brackish pond sections which may subsequently be utilized to analyze the data. This research uses digitations on screen as the method and Google Map images as the data with the following image specifications: Dimension: 1349 x 1332; *Width:* 1349 *pixels; Height:* 1332 *pixels; Horizontal resolution:* 96 dpi; *Vertical resolution:* 96 dpi; and *Bit depth:* 24. The *recorded data* of those brackish pond section areas are then calculated that the result shows the total area of the existing brackish pond area is equal to 215.77 ha.

Field Survey

Field survey is also conducted by measuring the object positions utilizing the *Global Positioning System (GPS*) to determine the position of sample locations that the coordinate recording results are then overlaid with the interpretation result map to figure out the conformity between the results of field checking and those of satellite image interpretation.

After the data bases representing each area are completely obtained, the ground check point validation is conducted. The data processing is then conducted through the following stages:

- 1. Image and Map Geo-referencing
- 2. Brackish and Freshwater Pond Section Digitations

RESULT AND DISCUSSION

Fishery Household (FH) on Catfish and Tilapia Cultivation

The recently prominent freshwater commodities cultivated by the cultivators of Fishery Household (FH) in Indramayu Regency are catfish, tilapia, and carp. The significant difference between freshwater and brackish water cultivation is due to the selection of location. For brackish water commodities, the location adjacent to the salt water source is one important factor. Meanwhile for fresh water culture, location may not become a problem that freshwater cultivation activities may be conducted in each subdistrict of Indramayu.

Easy selection of location facilitates freshwater fishery cultivation to extensively Sdevelop in Indramayu Regency. Small areas, such as small containers as well as small tarpaulin, ground, and wall ponds may be utilized. Tilapia, catfish, and carp have a relatively high tolerance to the quality of waters that limited water supply may still support the cultivation of these commodities. Moreover, those commodities are supported with the administration of fertilizers and organic material-decomposing bacteria in the water.

In addition to the land appropriateness, freshwater cultivation potential development should also be considered based on the existing river flows and water reservoirs. Indramayu Regency has 14 rivers, flowing to the north reaching the Javanese North Sea, and larger rivers, such as Cimanuk, Cipanas, Cipunegara, Cilalanang, Kumpulkuista, Pamengkang and Cimanis river. There are 23 water reservoirs may be utilized as the irrigation sources for freshwater fishery cultivation areas spread in several sub-districts, including Bongas, Losarang, Sindang, Lelea, Kroya, Sukra, Bangodua, Juntinyuat, Cikedung, Krangkeng and Gabus Wetan. These freshwater fishery cultivation activities actually have a great potential and are easily performed and developed by the communities, yet most cultivators of Fishery Household (FH) predominantly prefer the brackish pond cultivation since the benefits obtained are more than those from the freshwater commodities although many conditions should be well met in selecting the location. Table 1. Aquaculture Production in Indramavu 2014

No.	Commodity	Production Value (Rp x 1000)	Production Volume (Tons)	
1	Catfish	858.259.852	59.190,48	
2	Gourame	134.150.421	6.008,68	
3	Tilapia	27.231.785	2.691,98	
4	Another Commodity	27.835.885	2.569,35	
	TOTAL	1.047.477.943	70.641,45	
Source: Fisheries and Marine Office of Indramayu Regency, 2012				

Table 2. Fishery	/ Household	(FH) i	in Various S	ub-Districts	of Indramav	u Regency.	. 2014
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No.	Commodity	Fishery Household
1.	Lele	1.934
2.	Nila	138
3.	Pembenihan Lele	238
4.	Lele-Nila	1

Sumber: Fisheries and Marine Office of Indramayu Regency, 2015

Fishery Cultivation Areas

The areas used for freshwater ponds in Indramayu Regency are increasing year by year. The area increase is due to the opening of new ponds in mangrove areas or the function conversion of those used to be the rice fields or considered dead.

Tu	Table 5. Tishery California Areas Areas based on Commonities			
Years	Pound (Ha)			
2002	120,32			
2003	155,44			
2004	178,74			
2005	265,73			
2006	332,16			
2007	350.78			

Table 3. Fishery Cultivation Areas Areas based on Commodities

Years	Pound (Ha)	
2008	380,85	
2009	404,99	
2010	419,99	
2011	533,87	
2012	533,87	
2013	533,87	
2014	533,87	

Source: Fisheries and Marine Office of Indramayu Regency, 2015

The table above shows that the brackish and freshwater pond areas increase. In facts, the increase of brackish pond areas is more than that of fresh water pond areas. The increasing areas include those in Cantigi, Pasekan, and Kandanghaur sub-district. Cat-fish is one superior cultivation commodity in Indramayu District. Catfish is quite evenly distributed among cultivators in Indramayu Regency. The catfish cultivation areas in Indramayu Regency have reached 386.15 ha. Losarang sub-district is considered having the largest catfish cultivation areas, while the other 28 districts relatively have the smaller ones.

Tilapia cultivation area in Indramayu Regency has reached 136.55 ha. Tilapia is spread in the twenty sub-districts of Indramayu Regency. Tilapia cultivation is conducted in both brackish and freshwater ponds with a simple cultivation scale. Fattening segmentation is the most preferable one conducted by the tilapia cultivators because it is relatively easier to cultivate and appropriate with the characteristics of the territorial waters in Indramayu Regency. Catfish is cultivated with the monoculture cultivation with a simple cultivation scale.

Table 4. Catfish and Tilapia Cultivation Areas based on Each Sub-District of Indramayu Regency, 2014

No	District	Area (Ha)	Area(Ha)
1	Krangkeng	23,00	
2	Karangampel	9,00	
3	Kedokan Bunder	7,50	
4	Kertasemaya	3,10	
5	Juntinyuat	5,15	
6	Balongan	0,09	0,15
7	Pasekan	2,00	11,00
8	Sindang	28,00	102,00
9	Sukra	2,00	0,10
10	Patrol	2,00	
12	Arahan	1,95	
13	Tukdana	156	0,57
14	Sukagumiwang	1,20	0,03
15	Lohbener	13,50	
16	Jatibarang	0,83	
17	Indramayu	0,61	2,08
18	Lelea	1,20	
19	Kandanghaur	125,00	1,00
20	Gabus Wetan	4,00	0,60
21	Sliyeg	3,00	6,00
22	Terisi	0,85	0,17
23	Cikedung	0,74	0,38
24	Widasari	3,53	1,02

No	District	Area (Ha)	Area(Ha)
25	Bangodua	1,92	0,51
26	Haurgeulis	4,20	1,30
27	Losarang	121,00	1,00
28	Bongas	10,50	0,70
29	Anjatan	1,92	1,89
30	Кгоуа	5,00	
31	Gantar	1,80	1,05
	Total	386,15	136,55

Source: Fisheries and Marine Office of Indramayu Regency, 2015

Land Potentials and Digitations results of Catfish and Tilapia Cultivation

Catfish pond cultivation areas are spread in 30 sub-districts of Indramayu Regency. There are 2 commodity segmentations covering hatchery and fattening segmentation. The pond areas available in each sub-district may be shown in the following table.

The table presenting the comparison of catfish cultivation pond areas above shows that the total potential pond area is equal to 329.15 ha with the mitigations result of 324.92 ha. The area difference between the potential and the mitigations result is 4.23 ha, indicating that there is a reduction of catfish cultivation pond areas spread in 30 sub-districts of Indramayu Regency. It is assumed that this significant difference is due to the function conversion of pond areas to the other commodities, such as tilapia and carp.

Of those 30 sub-districts, most commodities of freshwater cultivation are dominated by catfish. Several sub-districts show that the Fishery Household (FH) is dominated by the catfish cultivation than the others, such as in Kandanghaur (462 FH), Sindang (72 FH), Cikedung (81 FH), and Haurgeulis (81 FH). The hatchery commodity segmentation may be found in Haurgeulis, Kandanghaur, Kedokanbunder and Kertasemaya sub-district.

The tilapia brackish ponds are spread in 20 districts of Indramayu Regency. This commodity is divided into 2 segmentations: nursery and fattening segmentation. The area of each sub-district is presented in the following table.



Fig 1. Distribution of Catfish and Tilapia Culture in Indramayu

Source: Fisheries and Marine Office of Indramayu Regency and the Analytical Results, 2015

Based on the table on comparison of tilapia cultivation pond areas above, it shows that the total potential land area has reached 136.5 ha, while the digitations result is equal to 84.66 ha. The land area difference between the potential land and the digitations result is 51.84 ha. It shows that there is a reduction in cultivation land for tilapia ponds which are spread within 20 sub-districts of Indramayu Regency. Almost all sub-districts experience land decrease due to the digitations result conducted. The most significant difference is shown in Sindang sub-district due to the several empty or unused pools indicating that land reduction is in facts taking place. Nursery segmentation is located in Haurgeulis sub-district (1.1 ha).

Conclusion

The total extended potential area for ponds is 329.15 ha with the digitalization result of 324.95 ha. Meanwhile, the total extended potential pond area for tilapia cultivation is 136.5 ha with the digitations result of 84.66 ha.

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