# Analysis of Suitabilityof Cultivation Location and Estimation of Chanos Chanos Productionin Brangsong Dictrict Using Geographic Information System

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# Analysis of Suitabilityof Cultivation Location and Estimation of *Chanos Chanos* Productionin Brangsong Dictrict Using Geographic Information System

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Abstract

**Agnes Purismawati, Slamet Budi Prayitno, Seto Windarto, and Vivi Endar Herawati. 2021 Analysis of Suitabilityof Cultivation Location and Estimation of *Chanos Chanos* Productionin Brangsong Dictrict Using Geographic Information System. *Aquacultura Indonesiana,* 22 (1): 1-9.** *Purwokerto and Turunrejo villages, Brangsong sub-district, Kendal are traditional aquaculture areas that cultivate milkfish. Milkfish production in Brangsong District in the last 3 years has experienced a low increase compared to other districts. The purpose of this study was to evaluate the feasibility of aquaculture ponds and to estimate the potential production of each sampling location based on the DO value and the availability of clamps. The method in this research is a survey with a spatial approach and measurement of water quality. The sampling location was determined by purposive sampling using 5 sampling points with 3 sampling points located in Turunrejo Village, 2 other points in Purwokerto Village, then carried out measurements of the physics and chemistry of the waters in situ and ex situ. Data processing was performed using ArcGis 10.3 by making a base map, spatial distribution map, scoring, overlay and layout. The results of the evaluation of the suitability of the sampling location, obtained an area of land for milkfish cultivation in the Very suitable category of 17,147 Ha. The area of land according to the category according to obtained an area of 650.5314 Ha. Evaluation of the suitability of cultivation locations at the sampling point using GIS aims to represent the locationsof aquaculture in these 2 villages. The results of the estimation of potential production at 5 stations are based on DO values, ranging from 1,290-3,408kg / Ha / cycle, the potential production based on clamps is 27.18-308kg / Ha / cycle. The production potential based on DO is higher than clapper, but this potential cannot be achieved without increasing clapper as natural food.*

Keyword: GIS; Location Suitability;Clapper; Potencial poduction

## Introduction

Milkfish is one type of fish that is popular and cultivated in Indonesia because of its high protein content and affordable prices. The advantages of milkfish compared to other fish are that they can be cultivated with high density, fast growth and resistance to extreme salinity ranges (Reksono *et al*., 2012). One of the areas in Kendal Regency that produces milkfish with traditional cultivation is Brangsong District. Milkfish production in this district has increased which is relatively low in the last 3 years compared to other districts. According to data from the Kendal Regency Marine and Fisheries Service, in 2017 Kec. Brangsong produced 1,383,700 kg, in 2018 as much as 1,474,760 kg, and in 2019 as many as 1,545,100 kg with a cultivation pond area of 300.15 hectares.

The evaluation of the feasibility of the cultivation location is needed to evaluate the quality and condition of the aquaculture pond waters as a material for consideration whether the location is still suitable for use in cultivation or not. The evaluation results are used as the basis for determining production estimates. The sampling points used consisted of 5 points, 3 points in Turunrejo Village and 2 points in Purwokerto Village. The sampling points were determined to represent the water conditions in 2 villages. The method used in the analysis of the feasibility and suitability of the milkfish cultivation location using remote sensing or GIS methods. The determination of the location for cultivation using GIS is carried out by mapping the appropriate water quality in milkfish cultivation such as temperature, salinity, current and location of ponds (Wulandari *et al*. 2016).

Geographic Information Systems in aquaculture activities are carried out to analyze and map natural resources in determining and evaluating the locationsused in cultivation based on measurement data of water physical and chemical parameters. GIS also plays a role in determining the feasibility of a location based on a wide distribution of water quality samples, where measurements are taken as samples at certain points to represent an area (Tarigan *et al*., 2017).

## Methodology

This research was conducted in traditional scale milkfish ponds l°Cated in Purwokerto Village and Turunrejo Village, Brangsong District, Kendal Regency. The sampling location was determined using a purposive sampling method representing the salt, brackish and freshwater ponds in the area.The criteria for pond location used in research include productive ponds, ease of access to pond locationsand representative of the types of waters in the village (fresh, brackish and salty). The tools used in this research are field tools (DO meter, refractometer, digital thermometer, pH meter, modified secchi disk, sample bottle, coolbox, stationery and camera) and data pr°Cessing tools (laptop, Ms. Excel, ArcGis 10.3 Software and Google Earth). The materials used in this research are the chemical reagent Ammonia Salicylate and Ammonia Cyanurate as ammonia test material, Phosphorus reagent for phosphate test, Nitraver for nitrate test, Google Earth recording results in 2019, Kendal Regency earth map and Kendal Regency administrative map.

This research was conducted using a case study method, namely direct observation and data recording. The procedure used in this study is to formulate a matrix first as a basis for weighting the parameters to be tested, then determine the sampling location using the purposive sampling method and take physical and chemical measurements of water in situ and ex situ. Measurement of water quality parameters was carried out 4 times. The sample of the test clamp was taken using a can lid with a diameter of 176.623 $cm^2$ and then weighed. Clapper used in this study is the bottom clapper dried. The data from the measurement results of each test parameter are then processed using *ArcGis* 10.3 software to produce a basic model of thematic maps used in the analysis of the suitability of cultivation location.

The analysis of the suitability of the milkfish farming location was carried out by assessing each test parameter based on a modified matrix according to the level of influence of these parameters on the cultivation location. The water quality test parameters used in the suitability matrix are 9 parameters. The matrix of suitability for milkfish farming locationscan be seen in Table 1.

Table 1. Matrix of the suitability of milkfish farming locations

| Parameter | Range | Point (A) | Weight (B) | Score(AXB) | Reference |
|---|---|---|---|---|---|
| Temperature ($^oC$) | 28 - 30 | 5 | 10 | 50 | Daimalindu (2019) |
| | 31 - 33 | 4 | | 40 | |
| | 33 - 34 | 3 | | 30 | |
| | 34 - 35 | 2 | | 20 | |
| | <5 or> 35 | 1 | | 10 | |
| pH | 7,4 - 9 | 5 | 15 | 75 | Sustianti *et al*. (2014) |
| | 7 - 7,4 | 4 | | 60 | |
| | 6,9 - 7 | 3 | | 45 | |
| | 5 - 6,9 | 2 | | 30 | |
| | <5 or> 9 | 1 | | 15 | |
| Salinity (ppt) | 25 - 34 | 5 | 15 | 75 | Reksono *et al*. (2012) |
| | 20-25 | 4 | | 60 | |
| | 10 - 20 | 3 | | 15 | |
| | 5 - 10 | 2 | | 30 | |
| | <5 or> 34 | 1 | | 15 | |
| DO (mg / l) | 5 - 7 | 5 | 15 | 75 | Athirah *et al*. (2013) |
| | 7 - 8 | 4 | | 60 | |
| | 8 - 9 | 3 | | 15 | |
| | 9 - 10 | 2 | | 30 | |
| | <3 or> 10 | 1 | | 15 | |
| Water transparency (cm) | 30 - 40 | 5 | 10 | 50 | Ghufron and Kordi (2007) |
| | 25 - 30 | 4 | | 40 | |
| | 20-25 | 3 | | 10 | |
| | 15-20 | 2 | | 20 | |
| | <15 | 1 | | 10 | |
| Depth (cm) | 80 - 120 | 5 | 5 | 25 | Ghufron and Kordi (2007) |
| | 70 - 80 | 4 | | 20 | |
| | 30 - 70 | 3 | | 5 | |
| | 15 - 30 | 2 | | 10 | |
| | <15 | 1 | | 25 | |

| | | | | | |
|---|---|---|---|---|---|
| Nitrate(mg / L) | 1.0 - 3.5 | 5 | 10 | 50 | Athirah *et al*. (2013) |
| | 0.5 - 0.9 | 4 | | 40 | |
| | 0.3 - 0.5 | 3 | | 10 | |
| | 0.01 - 0.3 | 2 | | 20 | |
| | <0.01 or> 3.5 | 1 | | 10 | |
| Phosphate (mg / L) | > 0.20 | 5 | 10 | 50 | Athirah*et al*. (2013) |
| | 0.11 - 0.20 | 4 | | 40 | |
| | 0.05 - 0.10 | 3 | | 30 | |
| | 0.02 - 0.05 | 2 | | 20 | |
| | <0.02 | 1 | | 10 | |
| Ammonia (mg / L) | <0.2 | 5 | 10 | 50 | Mustafa and Athiran (2014) |
| | 0.2 - 0.3 | 4 | | 40 | |
| | 0.3 - 0.4 | 3 | | 30 | |
| | 0.4 - 0.5 | 2 | | 20 | |
| | > 0.5 | 1 | | 10 | |

Based on the value of the matrix, the value of the suitability class interval is obtained. The calculation of this interval value will result in the weighted suitability range value. According to Prahasta (2002), the determination of class intervals is obtained from the following calculation results:

$$I = \frac{\sum (Bi \times Ni)\ max - \sum (Bi \times Ni)\ min}{x}$$

Information :

I = class interval
Bi = weight of each variable
Ni = value of each variable
X = maximum class value

Based on the calculation of the suitability class interval, the results of the suitability class scoring are obtained. The results of the scoring of the suitability of the milkfish cultivation location can be seen in table 2.

Table 2. Scoring Results of Milkfish Cultivation Location Suitability

| No. | Value range (Score) | Level of conformity | Evaluation |
|---|---|---|---|
| 1 | 420-500 | S1 | Perfectly fit |
| 2 | 340-419 | S2 | Corresponding |
| 3 | 260-339 | S3 | Quite Suitable |
| 4 | 180-259 | S4 | Not quite right |
| 5 | 100-179 | S5 | It is not in accordance with |

The calculation of the production analysis is carried out based on the value of dissolved oxygen content and the availability of clamps. The calculation of milkfish production analysis can be calculated based on the value of dissolved oxygen. According to Prayitno (1998), there are several stages in calculating the estimated fish production based on dissolved oxygen content, namely:

1. Determine O2 for Milkfish Production

$$O_2 = (DO \times 75\%) - 4\ mg / L) : 4\ mg / L / kg$$

Information :
DO : Dissolved oxygen observed
2.5 mg / L: minimum dissolved oxygen for live milkfish
4mg / L : The maximum dissolved oxygen that another organism consumes
4 mg / L : Dissolved oxygen which is recom mended for milkfish cultivation

Potential Production = $O_2$ production (kg) x Pond volume

2. Determining Production Potential

Number of fish **(fish)**= 4 x Production (kg)

3. Counting the Number of Live Fish For example, every 1 kg contains 4 milkfish
4. Calculating the Need for Seeds

Need for seeds **(fish)**= Number of live fish x (1: SR)

5. Calculating Seed Density

Density (fish / $m^2$) = Total fish production **(fish)**: 10,000 $m^2$

Estimated calculation of production in milkfish ponds can also be calculated based on the availability of clapper as natural food. Clapper samples were taken using a can lid as a transect with an area of 176.623 $cm^2$. According to Widiana et al. (2017), this calculation can be calculated using the following equation:

1. Total clamps in one test pond

Total Clamps = (Area of Test Pond ÷ Area of the Container) × Weight of Test Clamps

2. Determine clapper production per hectare (kg / Ha)

Production of Clapper = 25% x Total Clapper of Test Pond ÷ Total Area of Test Pond

3. Estimated availability of clamps

| Estimated Availability of Clamps = Total Clamps ÷ Total Milkfish Production / Cycles / Ha |
|---|

4. Potential for milkfish production

| Potential milkfish production = (total clapper in 1 Ha ÷ 12.5) x pond area |
|---|

12.5kg: the number of clamps needed for 1 kg of fish
The density of the clapper for the entire area of the pond is not the same so it is assumed to be equal to 25%

5. Comparison of the potential for milkfish production with milkfish production in ponds based on the availability of clapper.
a. If A <B, then the pond area is less potential, however
b. If A> B, on the other hand, the area has the potential to be developed.
With (A) Estimating the availability of clamps and (B) the optimum number of clamps.

## Result

The results of this study obtained the coordinates of the sampling location as the research location, the results of water quality measurements, the suitability of the cultivation location used in milkfish cultivation and the estimated production estimates at the sampling location.

### Determination of Sampling Location

The sampling locationsof this research were conducted in Turunrejo Village and Purwokerto Village with 5 sampling location, with 3 sampling locationsin Turunrejo Village and 2 sampling locationsin Purwokerto Village

Table 3. Description of Location Research Location Coordinates

| Station | Village | Coordinate | | Pond area |
|---|---|---|---|---|
| | | Latitude | Longitude | |
| 1 | Turunrejo | 6°54'02"LS | 110°14'43"E. | 2.4 Ha |
| 2 | Turunrejo | 6°54'34"LS | 110°14'32"E. | 1.4 Ha |
| 3 | Turunrejo | 6°54'53"LS | 110°14'14"E. | 1 Ha |
| 4 | Purwokerto | 6°54'37"LS | 110°14'45"E. | 2,3 Ha |
| 5 | Purwokerto | 6°54'32"LS | 110°14'43"E. | 2 Ha |

The sampling location used to represent the quality of the waters in the Turunrejo and Purwokerto villages

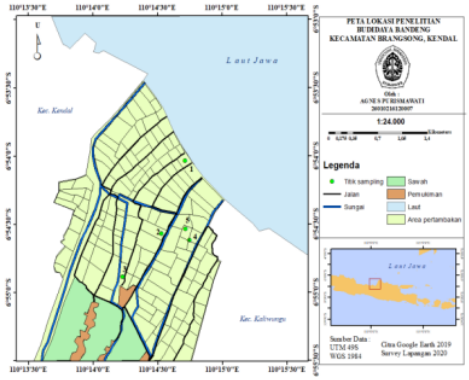


Figure 1. Map of research pond location

Based on the map above, it is known that the pond area 1 has mangroves with medium density around the embankment of the pond and in the middle of the pond area, this pond only has mangroves in some parts of the embankment of the pond. Tambak 2 is located between the residential area and close to the road making it easier for transportation, the location of this pond is next to a river which is separated by a road. Tambak 3 is located near the residential area of Turunrejo Village, this pond is not overgrown with mangroves around the pond area. Ponds 4 and 5 are located in Purwokerto Village and adjacent. The locationsof ponds 4 and 5 are near the river and surrounded by mangroves around the ponds and in the middle of the pond area.

### Water Quality

The results of the measurement of water quality parameters can be seen in Table 3.

Table 3. Results of Measurement of Water Quality Parameters in the Test Pond

| Station | Temperature (° C) | DO (mg/L) | pH | Salinity (ppt) | Nitrate (mg/L) | Phosphate (mg/L) | Ammonia (mg/L) | Depth (cm) | Brightness (cm) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 30.4 | 6.48 | 7.4 | 33 | 2.08688 | 0.09433 | 0.03408 | 60 | 24.25 |
| 2 | 31.3 | 6.80 | 7.4 | 12 | 1.08303 | 0.07423 | 0.06933 | 90 | 24.75 |
| 3 | 33.3 | 6.65 | 7.2 | 6 | 1.25135 | 0.04328 | 0.00885 | 70 | 24.75 |
| 4 | 30.9 | 6.77 | 7.9 | 24 | 1.48338 | 0.05275 | 0.39983 | 110 | 24.5 |
| 5 | 30.3 | 6.85 | 7.7 | 26 | 0.72075 | 0.12378 | 0.45903 | 120 | 23.75 |

Based on the results of the water quality parameters at the sampling location, the water quality is in the appropriate category for milkfish cultivation

**Cultivation Location Suitability Analysis**

The results of scoring and weighting of the parameters of the suitability of the quality of water for milkfish cultivation to determine the suitability of the cultivation location can be seen in Table 4.

Table 4. Scoring Results and Weighting Parameters for the Quality of Milkfish Cultivation Suitability

| Parameter | Station 1 | Score | Station 2 | Score | Station 3 | Score | Station 4 | Score | Station 5 | Score |
|---|---|---|---|---|---|---|---|---|---|---|
| Physics | | | | | | | | | | |
| a. Brightness(cm) | 24.25 | 30 | 24.75 | 30 | 24.75 | 30 | 24.5 | 30 | 23.75 | 30 |
| b. Depth(cm) | 60 | 20 | 90 | 25 | 70 | 20 | 110 | 25 | 120 | 25 |
| c. Temperature (°C) | 30.4 | 50 | 31.3 | 40 | 33.3 | 40 | 30.9 | 40 | 30.3 | 50 |
| Chemistry | | | | | | | | | | |
| a. DO(mg/L) | 6.48 | 75 | 6.80 | 75 | 6.65 | 75 | 6.77 | 75 | 6.85 | 75 |
| b. Salinity(ppt) | 33 | 30 | 12 | 75 | 6 | 15 | 24 | 60 | 26 | 45 |
| c. pH | 7.4 | 60 | 7.4 | 60 | 7,2 | 60 | 7.9 | 75 | 7,7 | 75 |
| d. Ammonia(mg/L) | 0.03408 | 50 | 0.06933 | 50 | 0.00885 | 50 | 0.39983 | 30 | 0.45903 | 20 |
| e. Nitrate(mg/L) | 2.08688 | 50 | 1.08303 | 50 | 1.25135 | 50 | 1.48338 | 50 | 0.72075 | 40 |
| f. Phosphate(mg/L) | 0.09433 | 30 | 0.07423 | 30 | 0.04328 | 20 | 0.05275 | 30 | 0.12378 | 40 |
| Total Conformity Value | | 395 (S2) | | 435 (S1) | | 360 (S2) | | 415 (S2) | | 400 (S2) |

Based on the scoring results, it is known that station 2 is very suitable (SS) and station 1, 3, 4 and 5 are suitable (S) are used in milkfish cultivation.

The map of the suitability of the cultivation location in the test pond of Brangsong District, Kendal is presented in Figure 2

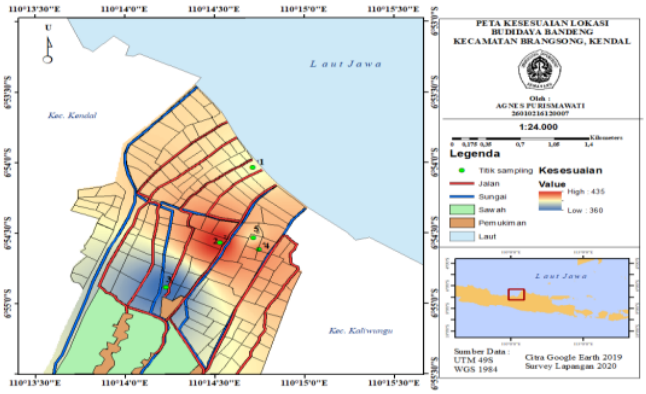


Figure 2. Map of suitability of cultivation location in the test pond Brangsong District, Kendal

**Production Estimation Analysis**

Production estimates are calculated based on the results of measurements of dissolved oxygen and availability of clamps or natural feed. Clapper sampling was carried out using a can lid as a transect with an area of 176.623 $cm^2$. The results of the production estimate calculation can be seen in Table 5.

Table 5. Results of calculation of production estimates

| Station | Large | Stocking Dense (fish) | Production (Kg / Ha) | Dissolved oxygen | | Clapper | |
|---|---|---|---|---|---|---|---|
| | | | | DO (mg/L) | Potency (Kg / Ha) | Clapper (g) | Potency (Kg / Ha) |
| 1 | 2.4 Ha | 12,000 | 625 | 6.48 | 1,290 | 6.1 | 165.78 |
| 2 | 1.4 Ha | 5,000 | 714 | 6.80 | 2,475 | 5.3 | 84.02 |
| 3 | 1 Ha | 4,000 | 500 | 6.65 | 1,729 | 1.4 | 27.18 |
| 4 | 2,3 Ha | 10,000 | 870 | 6.77 | 2,959 | 8.2 | 213.56 |
| 5 | 2 Ha | 10,000 | 900 | 6.85 | 3,408 | 13.6 | 308 |

The results of the calculation of productionestimates show that the production at the research location can be optimized and increased production can be made.

## Discussion

**Water Quality**

The sampling location used in this study used 5 sampling points, where the sampling point was determined using the method *purposive sampling* by representing all types of waters in the area. The sampling points represent each type of water in Turunrejo and Purwokerto villages, namely ponds that are l°Cated closest to the sea or salty waters, ponds that are close to estuary flows and river flows or brackish waters and ponds l°Cated close to settlements or farthest from the sea with fresh water. The results of this study aim to determine the suitability of the water quality in the two villages and the estimated production estimates based on the results of dissolved oxygen parameters and the availability of clamps in the aquaculture pond.

The results of the measurement of 9 test parameters (temperature, salinity, dissolved oxygen, pH, ammonia, nitrate, phosphate, brightness and depth), obtained the results of the suitability of the water quality in the aquaculture pond area. at 5 sampling points tested. The results of measuring the temperature parameters showed that in ponds 2, 3 and 4 had a range of 31-33°C, ponds 1 and 5 were in the range of 28-30 °C. The highest temperature is found in pond 3 with a temperature value of 33.3°C, this value is categorized into the appropriate category. The lowest temperature value is found in pond 5 with a temperature value of 30.3 °C, in milkfish cultivation, this temperature is in the very suitable category. According to (Daimalindu, 2019; Setianingrum*et al*., 2014), the optimum temperature for milkfish growth ranges from 27 - 30°C. However, according to (Mas'ud, 2011; Mangampa and Burhanuddin, 2014), a good temperature for milkfish growth ranges from 27 - 32°C. Based on the measurement, the optimal temperature for milkfish, then the temperature of the 5 ponds is in the suitable category for cultivation.

The results of measuring dissolved oxygen in 5 ponds showed the highest DO measurement results in pond 5 in Purwokerto Village with a dissolved oxygen value of 6.85 mg / L. The lowest DO value was found in pond 1, namely 6.48 mg / L. Pond 2 had a DO value of 6.80 mg / L, while in pond 3 the DO value was 6.65 mg / L and pond 4 had a DO value of 6.77 mg / L. The five tested ponds were very suitable in the range of 5-7 mg / L. Based on (Daimalindu, 2019; Sustianti*et al*., 2014), that the value of dissolved oxygen is good for milkfish cultivation in ponds is> 5 mg / L, and can still survive if the DO value is> 3 mg / L. This is different from the statement (Reksono*et al*., 2012; Athirah*et al*., 2013), that the optimum DO value for milkfish ranges from 3-8mg / L. Based on this statement, the DO values in the 5 test ponds were very suitable.

The pH value or the degree of acidity in 5 ponds showed that the highest pH was found in pond 4 in Purwokerto Village with a value of 7.9. This value is included in the very suitable category for milkfish cultivation. While the lowest pH value is found in pond 3 in Turunrejo Village with a value of. 7.2 and is included in the appropriate category.The pH value in 5 ponds is included in the optimal category in milkfish cultivation according to the suitability matrix.

According to Reksono*et al*. (2012) stated that the optimal pH value in milkfish cultivation is 7-8. Meanwhile, according to (WWF-Indonesia, 2014: Widowati, 2004), the optimal pH value ranges from 7.5-8.5. This shows that the pH value in 5 ponds has an optimal value in the range of 7.2-7.9.

The salinity in the test ponds ranged from 6 to 33 ppt, with the lowest value in pond 3 and included in the unsuitable class. The highest score lies in pond 1 and is in the less suitable category. In general, the salinity value in the test pond can be used in milkfish cultivation, but at station 3 it has a value that is not suitable for milkfish from the salinity value. Ponds 2, 4 and 5 have salinity values of 12, 24 and 26 ppt. The salinity conditions fall into the very suitable, appropriate and quite appropriate categories. According to (Athirah*et al*., 2013; Mas'ud, 2011) that the optimal salinity range for milkfish growth is 12-20ppt, and is still good at 20-30ppt.

The value of nitrate parameters in 5 ponds was in the range of 2.087 mg / L - 0.721 mg / L, with the highest value in pond 1 and the lowest in pond 5. Whereas in pond 2 it had a nitrate value of 1.083 mg / L, pond 3 was 1.251 mg / L and pond 4 worth 1.483 mg / L. The nitrate value in 5 ponds is in the very suitable range and suitable for milkfish cultivation and is in a good range. According to Athirah*et al*. (2013), that the value of nitrate (NO3) which is more than 0.2 mg / L causes eutrophication and stimulates the rapid growth of algae and aquatic plants. In contrast to the statement (Nasrul*et al*., 2018; Makmur*et al*., 2018), that the nitrate value required for algae growth in waters ranges from 0.2 - 0.9 mg / L and optimal in the range 1 - 4.5 mg / L. Phosphate parameters in 5 test ponds, The lowest value was obtained in pond 3 with a value of 0.043 mg / L and the highest was in pond 5 with a value of 0.124 mg / L. Ponds 1, 2, and 4 each had values of 0.094 mg / L, 0.074 mg / L and 0.053 mg / L, respectively. Based on the suitability matrix, the phosphate value in 5 ponds is still classified as good for natural food growth and can be used in milkfish cultivation. According to (Rumanti *et al*. 2014; Nasrul*et al*. 2018; Andayani 2017; Daimalindu 2019) good phosphate value for ponds and natural feed growth ranges from 0.21 mg / L - 5.51mg / L, where the phosphate value is < 0.2 will be a limiting factor. This is different according to the opinion of Liaw (1969) in Athirah *et al*. (2013), that phosphate fertility is categorized into three levels with low fertility in the range 0 - 0.02mg / L, moderate fertility with a value of 0.021 - 0.05 mg / L.

Ammonia value in 5 ponds ranged from 0.00885 mg / L - 0.45903 mg / L, the lowest value was found in pond 3 and the highest was in pond 5. Pond 4 had a value of 0.4 mg / L, ponds 1 and 2 had a value 0.34 mg / L and 0.07 mg / L. Based on measurements of ammonia value, ponds 1 - 3 can still be categorized as good locationsfor cultivation, while ponds 4 and 5 are not suitable for cultivation locationsbased on the ammonia aspect. This is in accordance with Mustafa and Athiran's (2014) statement, that the ammonia value of 0.05-0.20 mg / L has inhibited growth in several types of fish. Fish cannot tolerate high ammonia values because it causes the binding of oxygen to the blood to decrease.

The results of the measurement of brightness obtained the lowest brightness results in pond 5 with a value of 23.75 cm and the highest brightness was found in ponds 2 and 3, namely 24.75 cm. Good brightness will have a good influence on the penetration of sunlight which can be useful for the photosynthesis pr°Cess. The brightness value measured in 5 ponds is still in the appropriate and good category for milkfish cultivation. According to Kordi (2007), a good brightness value for fish farming ranges from 30-40 cm. The depth values for 5 ponds were different. The depth value ranges from 60 - 120 cm. The lowest depth value was l°Cated in pond 1 and the highest depth value was l°Cated in pond 5. The depth in pond 2 was 90 cm, pond 3 was 70 cm and pond 4 was 110 cm. Depth parameters in ponds 4 and 5 are classified as good and can be used in milkfish cultivation, however ponds 1, 2 and 3 are not suitable for the depth of milkfish cultivation. This is consistent with the statement of Ghufron and Kordi (2007), the depth of the milkfish pond has a depth of 1.2 m.

**Cultivation Location Suitability Analysis**

Based on the analysis of the suitability of the quality of the ponds, pond 2 is in the very suitable category seen from the calculation of the matrix with a suitability value of 435. This can be seen based on the depth parameters with a value of 90cm, 12ppt salinity, pH 7.4, DO parameter very much in accordance with the value of 6.8. mg / L and the ammonia parameter strongly corresponds to a value of 0.069 mg / L. The brightness value is not suitable, with a value of 24.75 cm and a sufficiently phosphate value corresponding to a value of 0.07423mg / L. The sustainability of pond 2 and the surrounding ponds in this area can be continued based on the quality of the waters, but it is

necessary to increase the clapper as a natural food for milkfish to support the sustainability of cultivation. The increase can be done through regular fertilization to increase the phosphate content as a stimulant for growth of clapper, because when viewed from the availability of the pond clamps, it is not suitable, with a value of 5.3 g. The location of pond 2 and its surroundings has easy access to transportation because it is close to roads and rivers. Based on this, this pond is still classified as suitable for use in milkfish cultivation. According to WWF-Indonesia (2014), several eligibility criteria for milkfish cultivation locationsare ponds close to water sources, not in flood-prone locationsand having easy access to locations.

Based on the analysis of water quality in ponds 1, 3, 4 and 5 of milkfish cultivation locationsbased on the suitability matrix, pond 1 l°Cated in Turunrejo Village has a suitability value of 395 and is included in the appropriate category (S). Ponds 4 and 5 are l°Cated in Purwokerto Village and each has a suitability value of 415 and 400, these values fall into the appropriate category (S). Tambak 3 is l°Cated in Turunrejo Village with a suitability value of 360 and is included in the appropriate category (S), however pond 3 is the pond with the lowest suitability value. This can be seen from the salinity parameter with a value of 6ppt and low phosphate with a value of 0.04 mg / L, low phosphate value also affects the availability of clamps. The weight of the fishponds in this pond is only 2.4gand the lowest compared to other ponds. In accordance with the opinion of Widiana et al. (2017) that the value of phosphate in waters is related to the availability of natural food in the pond, is related to water fertility and has a role in increasing aquatic productivity.

**Production estimation analysis**

Based on the calculation of the potential production of milkfish calculated from the availability of dissolved and clamped oxygen, it can be concluded that the production potential of the two parameters is very different. The calculation results of the estimated production based on the availability of dissolved oxygen (DO) ranged from 1,290-3,408kg / Ha / cycle while based on the availability of clamps ranged from 27.18- 308kg/ Ha / cycle. The estimated value of the production differed greatly due to the very small content of the clapper in the test pond, namely pond 1 of 86.3 g / $m^2$, pond 2 of 75 g / $m^2$, pond 3 of 44 g / $m^2$, pond 4 of 116.1 g / $m^2$and pond 5 amounting to 192.5 g / $m^2$. To achieve production estimates based on DO, efforts should be made to increase the content of natural feed (clapper) as milkfish feed. Increasing production of clapper can be done by routine fertilization at the bottom of the ponds used in cultivation, as well as controlling the water level in the ponds so that the bottom of the pond can be exposed to sunlight and the clapper can grow. According to (Ichdayati *et al*. 2013; Utojo *et al*. 2010), stated fertilizing with a water level of 15cm so that the bottom of the pond is exposed to sunlight. Additional fertilizers are also needed to support the availability of clapper in the pond. The content of nitrate in the ponds is needed to stimulate the growth of clapper, plankton and moss as the main natural food for milkfish. Clapper fertilization with a water level of 15cm so that the bottom of the pond is exposed to sunlight. Additional fertilizers are also needed to support the availability of clapper in the pond. The content of nitrate in the ponds is needed to stimulate the growth of clapper, plankton and moss as the main natural food for milkfish. Clapper fertilization with a water level of 15cm so that the bottom of the pond is exposed to sunlight. Additional fertilizers are also needed to support the availability of clapper in the pond. The content of nitrate in the ponds is needed to stimulate the growth of clapper, plankton and moss as the main natural food for milkfish.

## Conclusions

The conclusion from this research is that the research location points are included in the Very Suitable (S1) category at point 2 and represent a cultivated area of 17,147 Ha, while those represented by sampling points 1, 3, 4 and 5 are included in the Suitable (S2) and represents a cultivated area of 650.5314 Ha. Production capability based on DO values ranged from 1,290-3,408Kg / Ha / cycle while based on the clapper content of 27.18-308Kg / Ha / cycle.

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