Return Cost Ratio Analysis on Seed Production N1 (Nursery 1) of Sangkuriang Catfish Variety (*Clarias gariepinus burchell*) With Different Stocking Density of Eggs Using Filtration System

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Return Cost Ratio Analysis on Seed Production N1 (Nursery 1) of Sangkuriang Catfish Variety (*Clarias gariepinus burchell*) With Different Stocking Density of Eggs Using Filtration System

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Abstract. The success of high density catfish cultivation increases seed demand to support the cultivation. Seed cultivation supported by clean water system has succeeded in producing N1 (Nursery 1) seed. The aim of the research was to analyze the production return cost ratio (R/C) and benefit of N1 seed (*Nursery 1*) of catfish varieties sangkuriangthe on various egg density in tanks using filtration system. The research was conducted in The Catfish Teaching Factory of Fisheries and Marine Science Faculty,Diponegoro University, from December 2017 to February 2018. The research was performed on seeds ofSangkuriang catfish varietieswhich were hatched and being observed for 17 days. The method of the research was experimental method with three treatments and three repetitions, namely T1 (density of egg: 50gr), T2 (density of egg : 60gr), and T3 (density of egg: 70gr).The seeds produced were sold, The price was 40 IDR per fish, the total income was analyzed with ANOVA, then proceed with the least difference test.The result showed that seed production performance recorded asT1 yielded seed = 25,321 seeds;T2 = 23,874 seeds and T3 = 21.952 seeds. The price of seeds per individual is 40 IDR,the best total revenue is T1 = 1,012,840 IDR, -; and then T3 = 954,960IDR andT2 = 878,080 IDR. The total cost T1 = 366,217.3 IDR;T3 = 356,217.3 IDR and P2 = 346,217.3 IDR. R/C calculation results show T1 = 2.77; T3 = 2.68 and T2 = 2.54, reach R/C ratio ≥ 1 indicates that the production of N1 (Nursery 1) Sangkuriang catfish with different stocking density of eggs using filtration system or clean water system wasvery profitable.

1. Introduction

The increase in population results in an increase in food demand. If the food production fails to provide adequate food supply, famine is likely to happen.There are three main activities contributing for food production, namely farming, aquaculture, and fisheries [1].Catfish farming has given the opportunity to increase food production as well as entrepreneurship, so that catfish farming in Indonesia has experienced rapid development. For example, in Central Java, the production of catfish in 2012 had reached 62.686tonnes and in 2013 increased to 75.236tons or 20.02% [2].Catfish farming has also contributed to the farmer's income. Biofloc-based farmers have the opportunity to get monthly profit as much 626,784.17IDR if they use the density of 3,300 catfish [3].If they need to obtain 2,000,000IDR/month, they should be able to harvest three ponds of catfish.

The increasing production of catfish wasin line with the increasing need of fingerlings. Based on the data mentioned above, the production of catfish in Central Java in 2013 was 75,236tons, so the demand of fingerlings was 940,450,000 fingerlings. If the price of fingerling was 100IDR, the economic value of catfish fingerlings in Central Java in 2013 had reached 94,045,000,000 IDR. To increase catfish fingerling production, catfish hatchery technology should be developed. Until now, there are still many farmers who depend on traditional fish hatching. Thus, the results are very dependent on the conditions of the season. Catfish seeds will develop well if the water quality meets the standards of Indonesian National Standards [4]. It mentioned that the temperature should be between 25-30^{o}C, the minimum oxygen level is 3mg/l, the maximum level of ammonia is 0.01mg/l. Good water management techniques are needed to ensure that the requirements of the National Standards for water quality in catfish hatching are fulfilled.The innovation of hatchery has been focused on the management of water quality. The method being developed is clean water system using filtration system [5,6]. The purpose of installing the system is maintaining the water quality for the hatchery, which was proven by successful P1 fingerling production. Filtration method wasable to produce 25.323±345.01 fingerlings in fingerling production 1[7].The aim of thisstudy was to analyze the total cost and revenue for fingerling production 1 of African catfish (*Clarias gariepinus*) based on various egg densities in ponds using filtration system.

2. Research Methods

The material and method of seeds producing was based on previous study [7], i.e.:

Test fish: Eggs of African catfish (*Clarias gariepinus*Burchell) was having various density for each treatment: density of T1 (Treatment 1) was 50 gr/m^3; density of T2 was 60 gr/m^3, and density of T3 was 70 gr/m^3.

Pond: The pool was made of tarpaulin, with 3m diameter and 6mm iron frame. The total volume of water in each pool was 1,000L and was equipped with the same number of *kakaban*, and weighed catfish eggs. The eggs was adapted and put in the pools randomly.

Feed Preparation: The feed was given until all the fingerlings are well fed, which was seen from their stomach. After the fifth day, the yolk was replaced by tubifex worms until the eighteenth day when grading was conducted and the number of fingerlings was recorded.

Pool Preparation: Before the eggs were laid, clean water was prepared in the pool. The water height should be 15cm to reach the optimal volume ± 1 m^3 and added by 200grof salt. The water was replaced periodically when the variables had exceeded the maximum threshold.

Pool Filtration: The filters were made of plastic baskets having the dimensions 40cm height, 25cm upper diameter and 15cm lower diameter. The baskets were filled with bioballs and covered by acrylic wool (3cm thickness), then layered with net. A 33-watt pump supported each filter.

Experiment Design: Weighed eggs were put randomly into the pool based on the treatments, i.e. T1 weighed 50gr/1 m^3; T2 weighed 60gr/m^{3}and T3 weighed 70gr/m^3. The eggs are hatched and the larvae are kept until they become seedling nurseries 1 (P1) and sold for 40 IDR/fingerling. After that, the calculation for total revenue, total cost and profit were conducted, and then analyzed to observe the best revenue based on the R/C ratio, and finally, the results were descriptively analyzed.

Revenue Cost Ratio: The Calculating the total revenue compared to the total cost. If the ratio of R/C is >1, it means that the production is feasible [8].

3. Results and Discussion

3.1 Results

3.1.1Catfish Seed Total Cost Production

The results show that the catfish filtration system was successful, but for this technology to be downstreamed, or disseminated, economic studies such as analysis of the costs and benefits of P1 fingerling production (fingerling production 1) were needed.

There are costs for the production process, which can be divided into variable cost andfixed cost.The variable cost for seed producing P1 can be seen in table 1, which is described as follows:

1. Feeding cost Yolk for the firstfeeding three days after hatching.
2. Feeding cost Tubifex for the fifth day to the eighteenth day.
3. Electricity cost for 2 water pumps (70 watt x 30days: = 4,200 IDR)
4. Water cost 1.5 m^3 = 3,000 IDR
5. The cost of purchasing eggs, the price of a pair of catfish was 100,000 IDR,which was estimated to produce 150gr of eggs.

Table 1. Total Variable Cost (IDR)

Treatment	Yolk Feeding Cost	Tubifex Feeding Cost	Electricity	Water	Cost of Purchasing Eggs Catfish	Total Variable Cost
T1	4,000	281,683.64	4,200	3,000	33,333.3	326,217
T3	4,000	265,016.97	4,200	3,000	40,000	316,217
T2	4,000	248,350.30	4,200	3,000	46,666.7	306,217

The fixed costs for seed producing P1 can be seen in table 1, which is described as follows:

1. Tarpaulin pool supported by iron frame, which is estimated for 5-year or 60-month use. The price was 1.250.000 IDR/pool and monthly depreciation cost is estimated as 20,833.333 IDR/month
2. Two filters, made of several materials, which are estimated for 5-year or 60-month use. Each filter costs 200,000IDR and monthly depreciation cost is estimated as 6,667 IDR/month
3. Two water pumps, which are estimated for 24-month use. Each pump cost 150,000 IDR and monthly depreciation cost is estimated as 12,500 IDR/month

Table 2. Total Fixed Cost (IDR)

Treatment	Tarpaulin Pool	Filtration	Water pump	Total Fixed Cost
P1	20,833.33	6,667	12,500	40,000.33
P2	20,833.33	6,667	12,500	40,000.33
P3	20,833.33	6,667	12,500	40,000.33

3.1.2 TotalRevenue

Catfish fingerling production was started by preparing the pools, selecting the spawned catfish, spawning and hatching process. After the hatching, larvae should be managed well to obtained qualified fingerlings. Larvae were fed by yolk from the third day to the fifth day after hatching, and continued by giving tubifex worm using ad libitum method until the eighteenth day.

The fingerlings are cannibals. To avoid cannibalism, fingerlings should be selected. The process is called as fingerling production 1, which is the fingerling production from egg to 17-day age fingerlings sized 1-2 cm [4].

The price or each fingerling sized 1-2 cm is 40 IDR. The result shows that the best revenue was T1 = 1,012,853IDR, followed by T3 = 954,960IDR and T2 = 878,106,7IDR. While the R/C ratio was P1 = 3.56, followed by P3= 3.20 and P2 = 3.02. All the calculations are presented in table 3

Table 3. Calculation ofR/C Ratio

Treatment	Total Revenue (IDR)	Total Cost (IDR)	Benefit (IDR)	R/C ratio
T1	1,012,853	366,217.30	646,635.7	2.77
T3	954,960	356,217.30	598,742.7	2.68
T2	878,106.70	346,217.30	531,889.40	2.54

4. Discussion

The first cost in the research was the cost for purchasing eggs to obtain the yolk. Feeding larvae with yolk is important since the larvae was at the beginning of its growth period, and entering the transition period where larvae starts to consume external food, or first feeding, instead of absorbing yolk. The period is a critical period [9]. The cost for purchasing eggs for the yolk was not expensive, yet it is important for the next phase of growth.

The five-year old larvae are fed with tubifex [10]. Tubifex feeding were conducted from day 5 until day 18, and continuously done in aquaculture media (water). If the feed runs out, tubifex will be added into the media so that the fish larvae will not starve. The record shows that tubifex feeding costs around 70% from the total cost (Table 2). Tubifex was chosen since *Tubifex* sp. contains 57% protein, 13.30% fat, 2.04% carbohydrate [11]. Tubifex feeding has proven to support catfish nursery from larvae to seed, and the feeding has been a common practice among the farmers although it is considered as costly (Table 1). Until now, tubifex has been the main option to feed larvae. catfish larvae and seed can be fed with freshwater rotifers with *Artemianauplii*,resulting in a very good growth rate, but if it is used to replace tubifex, the cost is much higher [12].

A high success rate is shown from the research, such as T1 yielded seed = 25,321 seeds; T2 = 23,874 seeds and T3 = 21.952 seeds. The price per seed was 40 IDR, so the best total revenue is T1 = 1,012,840 IDR, and then T3 = 954,960 IDR and followed by T2 = 878,080 IDR. The result of analysis on revenue showed that T1 was the Treatment with the best revenue. It means that filtration and recirculation system in catfish seeding help farmers to obtain high revenue, which is in line with the previous research [13] which mentioned that applying recirculation system in catfish nurseryshows the highest survivability rate,measured as 66.00%, in egg-stocking density 20 fish/l.

Even though, the ammonia loading rate will increase along with increase of density [5,14], and it will give bigger impact to biofilter, but the total revenue obtained from all treatments was bigger than the total cost. The R/C ratio of all treatment showed greater value than 1, which means all Treatments of the nursery are profitable[8].

5. Conclusion

The result shows that using filtration system up to Nursery 1 is essential. The biggest revenue was obtained in Treatment 1, and for all treatments, the R/C ratio shows greater value than 1, which means that all Treatments are profitable.

Recommendation

Based on the research, it is advised to use filtration system and consider egg-stocking density measured in 50grams of eggs in 1.5 $m^3$of water.

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