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EFFICIENCY OF PANGASIUS PRODUCTION IN KOTA GAJAH SUBDISTRICT

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Abstract: The purpose of this study is to analyze the factors that influenced Pangasius production, analyze the economic scale of Pangasius culture business, and analyze the economic efficiency of Pangasius culture business using local feed in the Kota Gajah Subdistrict. The research location is determined intentionally (purposive). The number of samples taken was 41 people. The results showed that: (a) Significant factors affecting Pangasius production in the study area were pool area, initial manufacturer's feed (P1), advanced manufacturer's feed P2, advanced P3 feed, salted fish as local feed ingredients, and fine bran as local feed ingredients, while the number of seeds and non-permanent labor did not significantly influence the production of Pangasius. The business of Pangasius culture in the research area is not yet efficient, both technically and economically. (b) The value of the production elasticity of Pangasius culture in the study area is 1.151, which means the Production Elasticity (EP) is >1, meaning that the economic scale of production of Pangasius culture business is in the condition of increasing return to scale, specifically, the addition of production factors will cause additional output with a larger amount. (c) The use of production factors such as the area of ponds, seeds, factory feed 1, factory feed 2, and factory feed 3 is still possible to be increased so that the profits derived by Pangasius culture business in the study area are optimal. On the other hand, the salted fish variables, fine bran, and labor are not efficient, so the use of these factors of production must be reduced.

Keywords: Pangasius, efficiency, production, economical, technical, and local feed

Abstrak: *Tujuan penelitian ini adalah menganalisis faktor-faktor yang mempengaruhi produksi ikan patin, menganalisis skala ekonomis usaha budidaya Ikan Patin, dan menganalisis efisiensi ekonomis usaha budidaya ikan patin dengan menggunakan pakan lokal di Kecamatan Kota Gajah. Lokasi penelitian ditentukan secara sengaja (purposive). Jumlah sampel diambil sebanyak 41 orang. Hasil penelitian menunjukkan bahwa: (a) Faktor-faktor yang signifikan mempengaruhi produksi ikan patin di daerah penelitian yaitu luas kolam, pakan pabrikan awal (P1), pakan pabrikan lanjutan P2, pakan lanjutan P3, ikan asin sebagai bahan pakan lokal, dan dedak halus sebagai bahan pakan lokal; sedangkan jumlah benih dan tenaga kerja tidak tetap tidak berpengaruh secara signifikan pada produksi ikan patin. Usaha budidaya ikan patin secara teknis dan ekonomi di daerah penelitian belum efisien. (b) Nilai elastisitas produksi usaha budidaya ikan patin di daerah penelitian adalah 1,151 yang berarti Elastisitas Produksi (EP > 1), artinya skala usaha ekonomi produksi usaha budidaya ikan patin berada pada kondisi increasing return to scale, yaitu penambahan faktor-faktor produksi akan menyebabkan penambahan produksi dengan jumlah lebih besar. (c) Penggunaan faktor-faktor produksi seperti variabel luas kolam, benih, pakan pabrikan 1, pakan pabrikan 2, dan pakan pabrikan 3 masih dimungkinkan untuk dapat ditambah agar keuntungan yang diperoleh pelaku usaha budidaya ikan patin di daerah penelitian optimal. Adapun variabel ikan asin, dedak halus, dan tenaga kerja tidak efisien, sehingga penggunaan faktor-faktor produksi tersebut harus dikurangi.*

Kata kunci: *ikan patin, efisensi, produksi, ekonomis, teknis, dan pakan lokal*

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INTRODUCTION

Fish production is obtained through freshwater fisheries, fishponds, and marine fisheries. Freshwater fisheries production is accomplished through fish farming activities in ponds, minapadi, cages (karamba), and cages floating (KJA floating). Freshwater fisheries have high business opportunities due to high market demand, increased per capita consumption, increased community income in developing added value through processing, and expanding employment opportunities (Rahmawati and Hartono, 2012).

Fish production must be increased continually in order to meet the animal food needs for population consumption. Fish production in Lampung Province reached 749,643,269 (thousand), and 91.43% came from freshwater aquaculture in ponds. The detailed data of freshwater aquaculture in ponds by regency/city is shown in Table 1.

Table 1 shows that the area of ponds, production, the number of households, and the value of freshwater fishery production in ponds in Lampung Province are most numerous in Central Lampung Regency. The contribution of the area of ponds reached 6,158.69 tons (45.32%), the production of fish produced reached 27,373.90 tons (53.80%), and the value of fish production reached IDR350,135,150 (51.08%) with the amount households involved were 12,046 families (35.66%) of the total number in Lampung Province (BPS of Lampung Province, 2012). Types and production of Pangasius in Central Lampung Regency can be seen in Table 2.

Table 2 shows that the types of fish cultivated in ponds in Central Lampung Regency are Pangasius, lele dumbo, mas, tawes, nila, gurame, mujair, bawal, and tambakan. While the largest fish production was supplied by Pangasius, which was 11,838 tons (35.24%) in 2014. Patin is the local name of fish from Indonesia (pangasius). In general, the name Pangasius is used as the majority of fish in the family pangasidae. The main characteristic of Pangasius in Indonesia, in general, is that the body shape is slightly flattened, has no scales, small mouth, and is lively. The great potential of fisheries in the Central Lampung Regency in 2013 made the city listed as one of minapolitan areas. The highest production center for freshwater fish ponds in Central Lampung Regency is in Kotagajah District with production reaching 4,768 tons in 2014 (BPS, Central Lampung Regency, 2015).

Table 1. Freshwater aquaculture data in 3 large ponds by district/city

District/City	Area (ha)	Production(ton)	Number of households (kk)	Production Value (thousands)
East Lampung	1,587.00	6,381.81	2.556	83,986,460
Central Lampung	6,158.69	27,373.90	12.046	350,135,150
North Lampung	1,935.20	1,166.33	2.111	18,700,321
Total	13,590.18	50,879.54	33.776	685,406,434

Source: Central Statistics Agency of Lampung Province (2012)

Table 2, Types and Production of Fish in Central Lampung District in 2014

Type of fish	Production (ton)	Value (IDR)
Lele Dumbo (African Catfish)	8,633.00	110,501,100.00
Mas (Carp)	1,202.70	26,388,100.00
Tawes	165.80	2,480,000.00
Nila	5,461.00	81,915,000.00
Patin (Pangasius)	11,838.00	150,740,000.00
Gurame	5,572.00	129,759,000.00
Tambakan	62.20	8,494,000.00
Mujair (Tilapia)	339.00	5,057,000.00
Bawal	321.80	4,302,600.00

Source: BPS Central Lampung regency, 2015

Pangasius is an economical fish that is quite popular with the community. Fish farmers in Kota Gajah Subdistrict cultivate Pangasius intensively. For the efficiency of feed costs derived from manufacturer feed, farmers use alternative feed from local raw materials such as fine bran, salted fish, and corn. The business of Pangasius farming is profitable, while one that influences profits is production (Lukas, 2012). Management of fisheries is an absolute and important thing to do to produce maximum production and profits (Rahardi et al. 2001). Sutarni et al. (2016) state that investments in Pangasius culture in Kota Gajah District are feasible to run, and Pangasius culture is susceptible to changes in input and output prices. The contribution of feed costs to the overall costs of Pangasius culture costs reached 73.198% of the total cost of the total effort. In addition, the results of research on the production of African Pangasius in the Central Lampung Regency showed that it is strongly influenced by artificial feed and the number of seeds (Sutarni, 2008). The scale of fisheries business in Central Lampung Regency is in the condition of increasing return to scale, meaning that the addition of production factors (feed) by units will increase the production of larger fish (Fitriani and Sutarni, 2011). Based on the results of the study, the potential for freshwater fish production can still be increased through the use of optimal production factors, so that the expectations of fish farmers' profits can increase.

The profit of a fishery business is determined by three components, namely the production results , the selling price of the fish, and the cost of production. The success of a fish farming business can be seen from 2 indicators, namely technical efficiency and economic efficiency. Technical efficiency measures physical production levels, while economic efficiency is linked to selling price factors. The main problem faced by farmers in the cultivation of freshwater fisheries in ponds is the low knowledge and skills of fish farmers in aquaculture, causing the use of production factors not optimal, and the cost of feed very high. At present, the cost of fish feed is very high, reaching more than 70% of the total production cost. Freshwater fishery business in ponds that depend on artificial feed from factories causes high costs so that the business profit is not maximal. Alternative uses of artificial feed made from local raw materials themselves are starting to be developed, but the quality is not yet comparable to factory-made feed, so production is not optimal. Hayandani et al (2013) also stated that alternative feed has quite high competitiveness, and conversely, the use of pellet feed (manufacturer's feed) does not provide competitiveness to Pangasius farming business because the input costs are high. Research on technical efficiency has been carried out by Susanti et al (2017), stating that the average lobster enlargement effort has an average level of technical efficiency of 0.91 and the number of seedlings, feed, and cultivation time Are the production inputs that have a significant influence. Lasmini, et al, 2015 states the distribution of technical efficiency values in the use of inputs to produce rice farming reaches 79%. Based on the previous description, we identified the problems of this study as follows: (1) What factors are technically affecting the production efficiency of Pangasius aquaculture business using local feed in the City of Gajah Subdistrict, (2) How is the economic scale of the Pangasius Fish Cultivation business using local feed-in Kota Gajah Subdistrict, and (3) Is the business of Pangasius culture using local feed-in Kota Gajah Subdistrict economically efficient. This research aims are as follows: analyzing the factors that influence the production of Pangasius farming business using the local feed in the City of Gajah Subdistrict; analyzing the economic scale of the Patin Fish Cultivation business using the local feed in the City of Gajah Subdistrict, and analyzing the economic efficiency of the Pangasius.

METHODS

This research was conducted in Kotagajah District, Central Lampung Regency. The research location was determined purposively, with the consideration that Kota Gajah Subdistrict had the highest amount of pond freshwater fish production in Central Lampung District of 5,024 tons in 2014. Production data and the number of households of pond freshwater fisheries can be seen in Table 3

Table 3 shows that farmers who cultivate freshwater fisheries in the ponds of Kota Gajah District reach 414 kk, and this area also has adequate irrigation flow. The ratio of the number of freshwater pond fisheries production per household occupies the highest ratio, reaching 12.135 tons per household. The research was conducted for 6-8 months, from April to November 2017.

Table 3. Production and Household Data Freshwater Fisheries huge pool 5 Central Lampung regency According to the District 2014 (in tons)

District Name	Production (ton)	Households (kk)	Production ratio with fisheries households originating from ponds
Punggur	1633	385	4.242
Kotagajah	5024	414	12.135
Seputih Raman	3541	428	8.273
Seputih Banyak	1853	284	6.525
Bandar Surabaya	2007	461	4.354

Source: Central Statistics Agency for Central Lampung Regency (2015).

The population of this study was farmers who cultivated freshwater fish in ponds in the City of Gajah Subdistrict as much as 414 kk (Central Statistics Agency, Central Lampung Regency, 2015, and the Lampung Livestock and Fisheries Office Middle, 2015). The number of samples for fish farmers was taken from 10% of the population, 41.4 (41) families, who cultivate freshwater fish. The sample size of fish farmers refers to Singarimbun and Efendi (1989), which states that the number of samples used can be taken about5-10% of the population and the determination of the number of samples following the minimum parametric statistical requirements is 30 samples. The sample selection is made using snowball sampling technique; this is because the population of Pangasius farmers is difficult to determine with certainty (Susanti et al. 2018).

The data collection technique of this study was carried out by survey methods. The data used in this study are divided into two, namely primary data and secondary data. Primary data were obtained through direct interviews with respondents using a questionnaire prepared in advance. The sample of this study is farmers who are freshwater fish farmers. Secondary data were obtained from various related institutions.

Research data will be analyzed through qualitative and quantitative descriptive. Data will be tabulated, analyzed mathematically, and analyzed statistically according to the purpose of the study. Data is processed using a computer with Microsoft Excel programs and software SPSS. Analysis of technical and economic efficiency of ponds freshwater fisheries is used multiple regression statistical analysis with the equation estimating the production function Cobb Douglas as follows:

$$Y = bo.\ X1^{b1}.\ X2^{b2}.X3^{b3}.X4^{b4}.X5^{b5}.X6^{b6}.X7^{b7}.X8^{b8} + u$$

$$LnY = bo + b1LnX1 + b1LnX2 + b3LnX3 + b4LnX4 + b5LnX5 + b5LnX6 + u$$

where: X1 (Total pool area (m^2)), X2 (Amount of seed normalized by pool area (amount/m^2)), X3(Manufactured feed 1 (kg)), X4 (Manufactured feed 2 (kg)), X5 (Manufactured feed 3 (kg)), X6 (Salted fish (kg)), X7 (Fine bran (kg)), X8 (Labor workers (HOK)), and U (error term). Expected parameter expected is b1, b2, b3, b4, b5, b6, b7, b8> 0.

Two prerequisite conditions must be met to achieve maximum profit. The condition is a must condition (necessary condition) and terms of adequacy (sufficient). Requirements must indicate technical efficiency, i.e. marginal products (PM) equal to average production (PR). Adequacy requirements indicate the production process is achieving economic efficiency with the Marginal Product Value (NPM) indicator with the input price (Pxi) equal to one. The efficient use of production factors (Maximum profit) can be seen if the Marginal Production Value (NPM) of each additional unit of output is equal to the price of each unit of input (Px). The formula measures the economic efficiency of a freshwater pond fishery business is:

$$\frac{NPMx1}{Px1} = \frac{NPMx2}{Px2} = \frac{NPMxi}{Pxi}$$

If the resulting ratio is higher than one, the use of production factors xi is less or inefficient, so it needs to be increased. Whereas if the ratio is less than one, the use of production factors xi is more or not efficient, so it needs to be reduced.

The calculation for the economies of scale for Pangasius cultivation is done by adding up the bi coefficient value (∑bi). Three possibilities can occur in determining the business scale, namely: Business scale with decreasing return to scale occurs when the addition of inputs exceeds the increase in the production produced (bi <1); Business scale with a constant increase (constant return to scale), if the addition of inputs will be proportional to the addition of output (bi = 1); Scale business with increasing return scale occurs when the addition of inputs will produce additional production proportionally higher (bi> 1) (Koutsoyiannis, 1982).

RESULTS

Production inputs used in Pangasius culture in Kota Gajah Subdistrict consist of fixed inputs and variable inputs. Fixed inputs used in Pangasius production include pond buildings, buildings where feed and equipment, water pumps, suction hoses, exhaust hoses, hoes, scythes, waring, drains, buckets, barrels, tarps, dips, scales, rickets basketball, and nets. Whereas the input variables used in Pangasius production are seeds, manufacturers feed, local feed, engine fuels, and labor. Manufacturers' feeds consist of initial feed, usually smaller feed sizes, the trademark PF1000 and advanced feed such as LP1, LP2, plain LP, 781-1, 781-2, 781-3, Optimax, and others. Local feed comes from local ingredients such as fine bran, corn, salted fish, drops, medicines, and vitamins. Labor consists of workers in the family and workers outside the family. Workers are paid in the form of wages based on daily work and permanent workers who are paid monthly. Monthly laborers do all routine work such as making an artificial feed from local raw materials and feeding. The types of production activities carried out include pond preparation and cleaning, seed stocking, feeding, maintenance, water management, harvesting, and post-harvesting.

The business of Pangasius culture in the study area is in one production cycle, which is an average of 4.47 months per cycle, with production from pond preparation to the fastest harvest of 4 months and the longest of which is six months. The pond used for Pangasius culture in the study area is a ground pond. The pool is made by using an excavator machine. The average effective pond area used for cultivation is 808.7 m2. The production period ranges from 4-6 months with an average of 4.47 months. Harvested fish have three standards: (a) standard one which is 1 kg containing 3-4 fish, (b) standard two which is 2 kilograms containing three fish or 1 kg containing 1.5 fish, and (c) standard three which is 1 kilogram includes three fish.

Analysis Results of the Classic Assumption Test

Before the estimation results of the parameters in the model are used in the analysis, a classic assumption test must be carried out. The purpose of the classic assumption test is to see whether the selected regression model of the Pangasius production function produces the results of an analysis of BLUE (best, linear, unbiased estimator). The classical assumption tests include multicollinearity, heteroscedastic, normality, and autocorrelation tests. Based on the results of the classic assumption test, the results of the estimation of the regression model have fulfilled the requirements as a good model and are free from factors that cause the estimation results to be biased and inefficient. The tests areexplained below:

Multicollinearity test

Multicollinearity test aims to test whether the regression model found a correlation between independent variables. Multicollinearity can be seen from the variance inflation factor (VIF), and the value of tolerance and its opponents (Ghozali, 2009). The test results of the VIF values of all variables can be seen in Table 4.

The numbers in Table 4 indicate that multicollinearity does not occur in the variable because the VIF value is at 0 <VIP>10, which means there is no correlation between the independent variables whose values are higher than 95%. Thus it can be stated that there is no multicollinearity in the prepared regression model.

Tabel 4. Variance Inflation factor (VIF)

Independent Variable	Variance Inflation factor (VIF)
Pool Area (X1)	3.798
Number of seed normalized by pool area (X2)	1.222
Manufacturers Feed 1 (X3)	1.357
Manufacturers Feed 2 (X4)	1.955
Manufacturers Feed 3 (X5)	5.258
Salted fish BB Local feed 1 (X6)	4.333
Fine bran BB Local feed 2 (X7)	7.265
Labor workers (X8)	1.566

Heteroscedastic test

This heteroscedastic test aims to test whether there is an unequal variance from the residuals of one observation to another in the regression model. Heteroscedastic test can be done using graphical methods. If there is no clear pattern and the points spread above and below the number 0 on the Y axis, then heteroscedasticity does not occur. The result of the scatter plot show that the data points of the dependent and independent variables (Figure 1) spread randomly in the area around the scale of 0. It shows there is no heteroscedasticity in the regression model.

Normality test

The normality test aims to test whether confounding or residual variables have a normal distribution in the regression model. The method used to conduct the normality test is graph analysis. The results of the histogram graph in Figure 2 show that the residuals are normally distributed and are symmetrical in shape. In the normal graphs of probability plots, the scattered points are located around the diagonal line, which means that the residuals are normally distributed.

Estimation of the Production Function of the Pangasius Cultivation Business

The parameters are estimated using multiple regression analysis conducted in SPSS software version 16, and the parametric tests are performed at the level of significance (a) 1%, 5%, and 10%. The results of the estimation of the production function parameters of the Patin Fish Cultivation Business can be seen in Table 5.

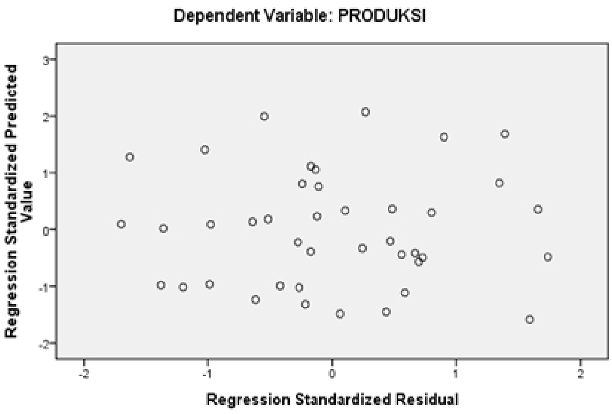

Figure 1. Scatter plot of production variable

Based on the results of the estimation of the model, the production function equation can be arranged as follows:

$$LnY = 1,188 + X_1^{0,306} + X_2^{0,121} + X_3^{0,029} + X_4^{0,158} + X_5^{0,228} + X_6^{0,181} + X_7^{0,121} + X_8^{0,007} + u$$

where: Y = Pangasius production (kg), X_1 = Total pool area (m^2), X_2 = Amount of seed normalized by pool area (amount/m^2), X_3 = Manufactured feed 1 (kg), X_4= Manufactured feed 2 (kg), X_5 = Manufactured feed 3 (kg), X_6 = Salted fish (kg), X_7 = Fine bran (kg), X_8 = Labor workers (HOK), and u = error term. Expected parameter is b1, b2, b3, b4, b5, b6, b7, b8> 0.

Simultaneous Regression Analysis

The results of Cobb-douglas estimation of the production function parameters of Pangasius farming gives the value of the coefficient of determination (R2) 0.968, which means that the diversity of variables can explain the diversity of production of Pangasius culture by 96.80%, and the remaining 3.20% is explained by other variables not included in the model. The F-count value of 120.320 with a real level of 1% indicates that the model is quite good (the goodness of fit), because it can explain the influence of independent variables (area of ponds, seeds, manufacturer feed 1, manufacturer feed 2, manufacturer feed 3, salted fish as raw material for local feed 1, bran as raw material for local feed 2, and labor). Thus simultaneously the variable area of ponds, seeds, manufacturer feed 1, manufacturer feed 2, manufacturer feed 3, salted fish as raw material for local feed 1, bran as raw material for local feed 2, and labor (as independent variable) included in the model has a significant effect on the production variable of Pangasius (Y) aquaculture with a real level of 1%.

The estimation of the production function parameters of the Pangasius farming business simultaneously is quite good because it can explain the independent variables on production. However, some of the variables in the model either have significant influence, while some others does not have significant influence in partial. Variables that significantly influence the production of Pangasius culture are: Overall Pond Area (in m2) (X1), number of seeds (X2), Initial manufacturer feed (in kg) (P1) (X3), Advanced manufacturer feed (in kg) (P2) (X4), Advanced manufacturer feed (P3) (in kg) (X5), Salted fish as raw material for local feed 1 (in kg) (X6), and fine bran or rice bran as raw material for local feed

2 (in kg) (X7). Variables that did not significantly affect the production of Pangasius culture in the model are the number of seeds (X2) and labor (X8).

Partial Regression Analysis

The results of the partial regression analysis of the production function of the Pangasius culture business can be described as follows:

The positive sign of the pond area parameter is in line with expectations and have a significant effect on production at 1% level. This means that the higher the area of the pond used in Pangasius farming, the higher the products produced. The estimated regression coefficient variable X1 is 0.306, meaning that the area of the pond has increased by 10 percent, so the production of Pangasius farming will increase by 30.6 percent, and vice versa.

The parameter number of seeds (X2) has a positive sign, meaning that it is in line with expectations and has no significant effect on the production of Pangasius farming at a real level of 10%. This is caused by empirical data in the field showing that the higher the population or stocking density, the production of Pangasius will be increased, but this must be balanced with good management of aquaculture business, especially the management of feed both manufacturers and local feed. In addition, not only the number of seeds but the quality of seeds also determines the success of Pangasius enlargement efforts (Witoko et al. 2013)

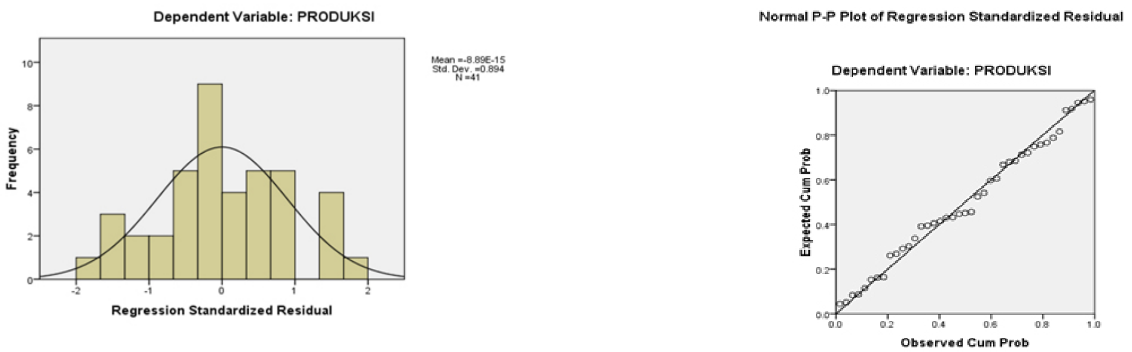

Figure 2. Histogram of production

Tabel 5. Regression result of production function on Pangasius cultivation

Independent Variable	Regression Result		
	Coefficient	t-test	Sig.
Intercept	1,188	2,2776	0,009
Pool area (X1)	0,306	4,629	0,000***
Amount of seed normalized by pool area (X2)	0,121	1,574	0,125
Manufactured feed 1 (X3)	0,029	2,777	0,009 *
Manufactured feed 2 (X4)	0,158	2,894	0,007 *
Manufactured feed 3 (X5)	0,228	4,361	0,000 ***
Salted fish BB local feed 1 (X6)	0,181	3,158	0,003 **
Fine bran BB Local feed 2 (X7)	0,121	1,758	0,089 *
Labor workers (X8)	0,007	0,156	0,877
Calculated F		120,320	0,000 ***
Coefficient of determination (R2)		0,968	
Durbin-Watson (DW)		1,938	
EP	1,151		

Notes: *** : Denotes significance at 1%, ** : Denotes significance at 5%, and * : Denotes significance at 10%

Type 1 of the feed manufacturer used for Pangasius culture is PF1000. This type of feed is used for initial fish feed. The size of the initial feed is still small according to the fish's mouth. The parameter manufacturer feed 1 (X3) has a positive sign, meaning that it is in line with expectations and significantly influences the production of Pangasius business at a real level of 10%. This is caused by empirical data in the field showing that the manufacturer's feed influences fish production. The quality of the manufacturer's feed is relatively good, so that it meets the nutritional needs for fish growth at the beginning of the cultivation business.

Types of manufacturers feed 2 used by respondent farmers for Pangasius culture business are LP-1, CP-1, 781-1, cargil1, optimac 1, LP-2, 781-2, and optimac 2. The type of advanced feed used for the cultivation of Pangasius is quite varied, this is due to the personal experience of the respondent farmers in the use of feed to the amount of production, experience from friends, the purchase price of feed, quality considerations and information from sellers or other parties such as group leaders and counseling. This second follow-up feed has a larger size than the first feed because it is adjusted to the age of the fish and the size of the fish's mouth that is already large. The parameter Manufacturers feed 2 (X4) has a positive sign, meaning that it is in line with expectations and significantly influences the production of Pangasius business at a real level of 10%. This is due to empirical data in the field showing that manufacturer feed 2 influences Pangasius production.

The manufacturers' feed 3 used for Pangasius culture are Cargil 3, Cargil plain, LP-3, 781-3, 781, and Optimak 3. The size of the advanced feed 3 has a larger size than that of the advanced feed 2. The parameter Manufacturers Feed 3 (X5) has a positive sign, meaning that it is in line with expectations, and significantly influences the production of Pangasius business at a real level of 10%. This is due to empirical data in the field showing that manufacturer feed 3 influences Pangasius production.
The parameter Salted fish as local feed (X7) has a positive sign, meaning that it is in line with expectations and significantly influences the production of Pangasius business at a 5% level. This is caused by empirical data in the field showing that salted fish as local feed (X7) influences Pangasius production. Salted fish is a food ingredient that has a high protein content, so it is best used for fish feed. Fish are used as a mixture of artificial feed ingredients with bran or fine bran.

The parameter bran / rice bran as local feed (X6) has a positive sign, meaning that it is in line with expectations and significantly influences the production of Pangasius business at a real level of 10%. It is because the empirical data in the field shows that the bran / rice bran variable as local feed (X6) influences Pangasius production. Fine bran is a by-product of rice milling activities. This bran has a high nutrient content that can be used as ingredients for making feed. The availability of locally-made bran is beneficial for respondent farmers to make fish feed ingredients as a substitute or complementary in the provision of Pangasius feed in the study area. This effort was carried out by the respondent farmers to minimize the cost of manufactured feed which was relatively expensive, causing high costs in the production of Pangasius. Thus, it can be concluded that the variable feed manufacturer and local standard alternative has influence on Pangasius production. This is consistent with the research of Susanti et al (2017) that feed has a significant impact on lobster enlargement efforts.

The parameter labor use (HOK) (X8) has a positive sign, but no significant effect on Pangasius production at a real level of 10%. The labor force used in Pangasius culture consists of 2 types of permanent and daily laborers. The workforce continues to do the work as a whole in the business, while the daily labor effort is calculated from pool cleaning, seed stocking, feeding, and harvesting. This is because there are some daily labor jobs which are also assisted by permanent workers.

The Economic Return to Scale

Production is an activity that converts inputs into outputs. All forms of change from input to output are called production. The scale of economic effort can be obtained by adding up the estimated parameter value (Σbi) in the production function Cobb-Douglas. The amount of bi is the elasticity of production from the production function Cobb-Douglas. The value of the production elasticity of Pangasius culture in the study area is 1.151, which means Production Elasticity (EP) > 1. The amount of the estimated parameters indicate that the economic scale of the production business of Pangasius culture is in the condition of increasing return to scale, i.e. the addition of production factors will cause additional production with a larger amount. This is in accordance with the research of Fitriani and Sutarni (2011) which states that the scale of the enlargement of African Pangasius business in Central Lampung Regency is in the condition of increasing return to scale, meaning that the addition of production factors by the units will increase greater fish production (Hernanto, 1991; Mubyarto, 1987, and Soekartawi, 1989).

EP of Pangasius farming in the study area obtained 1.151 (EP > 1). This means that as long as the EP is still higher than 1, there is an opportunity for farmers to rearrange the combination and use of production factors in such a way that the same number of factors of production results in higher total production. In other words, when EP> 1, to produce the same output, it can be said that less production factors can be used. The production stage that is technically rational or efficient is in area II, where 0 <EP <1. Since the production of Pangasius culture in the EP research area is still higher than 1, there is an opportunity for respondent farmers to rearrange the combination and use production factors such as pond area, seed, factory feed, local feed, and labor in such a way that the same number of production factors results in higher total production (Hernanto, 1991, Mubyarto, 1987, and Soekartawi, 1989). This condition describes only physical/technical efficiency but not necessarily price efficiency (economic efficiency). To arrive at the stage of economic efficiency it is still necessary to know the prices, both the prices of products and the prices of factors of production (Mubyarto, 1987).

The efficiency of the Use of Production Factors

According to Soekartawi (2003), efficiency is defined as an effort to use the smallest production inputs to get maximum production. The condition of using production inputs is efficient if the marginal production value (NPM) of a production input is the same as the price of that input. The efficient use of production factors (Maximum profit) can be seen if the Marginal Production Value (NPM) of each additional unit of output is equal to the price of each unit of input (Px). If the resulting ratio is higher than one, the use of production factors xi is less or inefficient, so it needs to be increased. Whereas if the ratio is less than one, the use of production factors xi is more or not efficient so it needs to be reduced. The level of efficiency in using the production factors of Pangasius culture can be seen in Table 6.

Table 6. The level of efficiency in using the production factors of Pangasius culture

Variable	Xi	Pxi	Xi. Pxi	bi	bi Y. Py	NPM/ BKM	
Pond Area (X1)	1074.58	1230.5	1322270.69	0.306	20685104.18	15.644	BE
Amount of Seeds (X2)	17682.92	186.24	3293267.021	0.121	8179403.94	2.484	BE
Manufacturers Feed 1 (X3)	27.31	14269.23	389692.6713	0.029	1960353.011	5.031	BE
Manufacturers Feed 2 (X4)	190.36	9680.92	1842859.931	0.158	10680543.99	5.796	BE
Manufacturers Feed 3 (X5)	259.39	8755.55	2271102.115	0.228	15412430.57	6.786	BE
Salted Fish BB Local Feed 1 (X6)	5272.19	3126.82	16485189.14	0.181	12235306.72	0.742	TE
Bran BB Local Feed 2 (X7)	5017.07	2356.65	11823478.02	0.121	8179403.94	0.692	TE
Labor Workers (X8)	69.02	61848.08	4268754.482	0.007	473188.6577	0.111	TE
Average Production				4819.22			
Price				14026.83			
EP				1.151			

BE : Not yet efficient, TE : Not efficient

Table 6. shows that the variable area of pond, seed, factory feed 1, factory feed 2, and factory feed 3 have a comparative value between bi Y. Py = Xi Pxi or NPMxi = Pxi or (NPM / BKM) is not efficient. Efficient conditions are achieved if NPMxi equals input prices, or bi Y ratio. Py / Xi Pxi = 1, if it is greater than one then it is not efficient and needs to be added, and if it is smaller than one, then it needs to be reduced (Soekartawi, 2003).

The use of production factors in variables such as area of ponds, seeds, factory feed 1, factory feed 2, and factory feed 3 are still possible to be increased so that the profits derived by Pangasius aquaculture businesses in the study area are optimal. While salted fish variables, fine bran, and labor are not efficient, so the use of these factors of production must be reduced. The use of these three factors in the production by farmer respondents have been excessive so that to maximize profits, their use must be reduced. Farmer respondents tend to use these factors of production because feed ingredients and fine bran are available locally, so the price of the factor of production is lower. Thus it can be concluded that the business of Pangasius culture with local and technical feed is not yet efficient in the study area. This is consistent with the results of research by Hasanudin (2011) which states that the technical efficiency of Pangasius hatchery business reaches 79%. Susanti et al. (2017) stated that the average lobster enlargement effort had an average level of technical efficiency of 91%, Lasmini et al. (2016) stated that the distribution of technical efficiency values in the use of inputs to produce farming reached 79%. This means that technical efficiency in the business has not reached 100%.

Managerial Implications

The implications resulting from the analysis of the efficiency of Pangasius production are the use of manufactured feeds and alternative feeds that are still used in aquaculture because they affect the production of Pangasius, but the amount of alternative feed needs to be done with the right combination of local raw materials, so that the quality of the nutritional content of feed is well-maintained. Laboratory scale testing of local feed content is needed for the sustainability of Pangasius culture. The farmers have low knowledge in making alternative feeds, so they require training/ counseling on how to manufacture, the content of the ingredients, the ingredients composition, and others.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Based on the results and discussion, it can be concluded that: (a) Significant factors affecting Pangasius production in the study area are pool area, initial manufacturer feed (P1), Advanced manufacturer feed P2, Advanced manufacturer feed P3, salted fish as local feed ingredients, and fine bran as local feed ingredients, while the number of seeds and non-permanent labor did not significantly influence the production of Pangasius. The business of cultivating Pangasius with local and technical feed is not yet efficient in the study area. (b) The value of the production elasticity of Pangasius culture in the study area is 1.151 which means Production Elasticity (EP) > 1, which means that the economic scale of production of Pangasius culture business is in the condition of increasing return to scale, namely the addition of production factors will cause the addition of production with a larger amount. (c) The use of production factors such as area of ponds, seeds, factory feed 1, factory feed 2, and factory feed 3 is still possible to be increased so that the profits derived by Pangasius culture business in the study area are optimal. While salted fish variables, fine bran, and labor are not efficient, so the use of these factors of production must be reduced.

Recommendations

The amount of seed stocked must also be considered, so as to obtain the right stocking density. Fish populations affect the use of feed. The size of the feed depends on the weight of the fish. For this reason, it is necessary to further study the optimization of inputs used in Pangasius culture.

REFERENCES

[BPS] Badan Pusat Statistic Propinsi Lampung. 2012. *Lampung dalam Angka.* Bandar Lampung: Badan Pusat Statistic Propinsi Lampung.

[BPS] Badan Pusat Statistic Kabupaten Lampung Tengah. 2015. *Lampung Tengah dalam Angka.* Gunung Sugih: BPS.

Dinas Peternakan dan Perikanan Lampung Tengah. 2015. *Data produksi, Luas Lahan, dan Rumah Tangga Perikanan Air Tawar di Kabupaten Lampung Tengah.* Gunung Sugih: Dinas

Peternakan dan Perikanan Lampung Tengah.

Fitriani, Sutarni. 2011. Penentuan skala produksi pembesaran ikan lele dumbo di Kabupaten Lampung Tengah. *Jurnal Esai* 5(1):1–12.

Hasanudin. 2011. Efisiensi teknis dan pendapatan usahatani pembenihan ikan patin di Kota Metro. [Skripsi]. Bogor:IPB.

Hayandani S, Firdaus M, Rindayati W. 2013. Daya saing usaha budi daya ikan patin di Kabupaten Indragiri Hulu Provinsi Riau S. *Jurnal Manajemen dan Agribisnis* 10(3): 137–145.

Hernanto, Fadholi. 1991. *Ilmu Usahatani.* Jakarta: Penebar Swadaya.

Ghozali I. 2009. *Aplikasi Analisis Multivariate dengan program SPSS.* Semarang: Badan Penerbit Universitas Diponegoro.

Koutsoyiannis A. 1982. *Modern Microeconomics.* Hongkong:The Macmillan Press LTD.

Lukas. 2012. Analisis biaya produksi dan pendapatan budidaya ikan patin di Kabupaten Kapuas. *Jurnal Ilmu Hewani Tropika* 1(1):36–39.

Lasmini F, Nurmalina R, Rifin A. 2016. Efisiensi teknis usaha tani padi petani peserta dan petani nonpeserta program SL-PTT di Kabupaten Sukabumi. J*urnal Manajemen dan Agribisnis* 13(1): 59–68. https://doi.org/10.17358/JMA.13.1.59.

Mubyarto. 1989. *Pengantar Eonomi Pertanian.* Jakarta: LP3ES.

Rahardi F, Kristiawati R, Nazaruddin. 2001. A*gribisnis Perikanan*. Jakarta: Penebar Swadaya.

Sutarni, Fitriani, Unteawati B. 2016. Switching value of feasibility investment on patin aquaculture business in Kota Gajah Central Lampung. Proceeding International Conference 1st SHIELD University of Lampung 2-3 Noverber 2016. Bandar Lampung. http://shield.unila.ac.id

Sutarni. 2008. Analisis faktor-faktor yang mempengaruhi efisiensi teknis usaha pembesaran ikan lele dumbo di Kabupaten Lampung Tengah. *Jurnal Manajemen, Akuntansi Dan Bisnis (MABIS)* 6 (Edisi Khusus): 1–7.

Sutarni, Saty FM, Unteawati B. 2018. Distribution analysis of the supply chain of catfish (Pangasius) agribusiness in Kota Gajah District, Central Lampung, Indonesia. *IOP Conference Series: Earth and Environmental Science* 209(1):1–15.https://doi.org/10.1088/1755-1315/209/1/012023.

Soekartawi. 1997. *Agribisnis. Teori dan Aplikasi.* Jakarta: PT Raja Grafindo Persada.

Soekartawi . 2003. T*eori Ekonomi Produksi: Dengan Bahasan Analisis Fungsi Cobb-Douglas*. Jakarta: PT Raja Grafindo Persada.

Singarimbun M, Effendi E. 1989. *Metode Penelitian Survei.* Jakarta: LP3ES.

Rahmawati H, Hartono D. 2012. Strategi pengembangan usaha budidaya ikan air tawar. *Jurnal Penelitian Pengelolaan Sumber Daya Alam dan Lingkungan* 1(2):129–134.

Susanti ENN et al. 2017. Efisiensi teknis usaha pembesaran lobster di Pulau Lombok, Nusa Tenggara Barat. *Jurnal Manajemen dan Agribisnis* 14(3):230–239.https://doi.org/10.17358/jma.14.3.230.

Witoko P, Syarief R, Raharja S. 2013. Kelayakan dan strategi pengembangan usaha pembenihan ikan patin di CV Mika Distrindo. *Manajemen IKM: Jurnal Manajemen Pengembangan Industri Kecil Menengah* 8(2):115–122. https://doi.org/10.29244/mikm.8.2.115-122.