Jurnal Perikanan dan Kelautan
Volume 8 Nomor 2. Desember 2018
Halaman : 144 – 154

p – ISSN 2089 – 3469
e – ISSN 2540 – 9484

Efisiensi Alokatif Faktor-faktor Produksi Usaha Budidaya Udang Vaname di Kecamatan Grabag, Kabupaten Purworejo, Jawa Tengah

(Allocative Efficiency of Production Input of Pacific White Shrimp Farming in Grabag District, Purworejo Regency, Central Java)

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Diterima : 28 November 2018 / Disetujui : 2 Februari 2019

ABSTRAK

Penelitian ini bertujuan untuk mengetahui faktor-faktor yang mempengaruhi produktivitas usaha budidaya udang vaname, efisiensi secara alokatif dan keuntungan usaha budidaya udang vaname di Kecamatan Grabag, Kabupaten Purworejo, Propinsi Jawa Tengah. Metode yang digunakan pada penelitian ini adalah analisis deskriptif. Pemilihan sampel penelitian dilakukan secara purposive sampling yaitu petambak udang vaname di Kecamatan Grabag dengan total responden dalam penelitian ini adalah 51 orang. Variabel produksi dalam penelitian ini adalah benur, pakan, probiotik, kapur, tenaga kerja, umur petambak, pendidikan petambak dan pengalaman usaha petambak. Metode analisis yang digunakan adalah analisis regresi linear dari fungsi produksi Cobb-Douglas untuk menentukan faktor-faktor yang mempengaruhi produktivitas usaha budidaya udang vaname sehingga dapat menganalisis efisiensi alokatif, selain itu dilakukan analisis keuntungan. Hasil analisis menunjukkan bahwa: (1) faktor-faktor yang mempengaruhi produktivitas usaha budidaya udang vaname adalah penggunaan pakan, probiotik dan pengalaman usaha petambak, (2) penggunaan faktor produksi pakan dan probiotik belum efisien secara alokatif sehingga harus ditingkatkan penggunaannya, (3) Rata-rata keuntungan usaha budidaya udang vaname sebesar Rp 996.116.056,00 dengan rata-rata luasan lahan tambak 7.011,76 m^2/petambak sehingga rerata tiap petambak mendapatkan keuntungan Rp 142.063,63/m^2/tahun.

Kata kunci : efisiensi alokatif, keuntungan, produksi, udang vaname

ABSTRACT

This study aims to determine the factors that affect the productivity of white shrimp farming business, allocative efficiency and profit of white shrimp farming in Grabag District, Purworejo Regency, Province of Central Java. The method used in this study was descriptive analysis. Selection of the study sample was done by purposive sampling that was farmer of white shrimp in Grabag District with total respondent in this study were 51 people. Production variables in this study were shrimp seed, feed, probiotics, lime, labour, farmer age, farmer education and farmer's experience. The analytical method used in this study was linear regression from Cobb-Douglas production function, to determine the factors that influenced the productivity of white shrimp farming business

so that it could analyze the allocative efficiency, besides the profit analysis. The result of the analysis showed that: (1) the factors that influenced the productivity of white shrimp farming were feed, probiotics and farmers' experience, (2) the use of feed production and probiotic factor was not allocatively efficient so its use should be increased, (3) Average profit of white shrimp farming business was 996.116.057 IDR with average of pond area of 7.011,76 m^2 / farmer so that average of each farmer got profit 142.063,63 IDR/m^2/year.

***Keywords**: allocative efficiency, production input, profit, white shrimp.*

INTRODUCTION

Shrimp farming in ponds is the fastest growing aquaculture business sector in recent decades. Shrimp commodities even have the highest economic value compared to other farming commodities (Rimmer *et al*., 2013). One kind of shrimp that is produced in Indonesia is white shrimp. White shrimp (*Litopenaeus vannamei*) comes from America and began to enter Indonesia in 2001. White shrimp commodities have spread to all parts of Indonesia and have been successfully developed by the farmers (Yustianti *et al*., 2013). Andriyanto *et al*. (2013) in their study, factors which significantly affects the number of white shrimp production are labor, fertilizer, feed, and stocking density. The result shows that labour, fertilizer, feed, and stocking density as production factors is not efficient.

In order to support government policy to increase national shrimp production, white shrimp farmers in Purworejo Regency using intensive technology in their shrimp farming. Intensive technology is high-cost technology. On the other hand, the white shrimp farmers in this area dominated by small-scale farmers. In production, small-scale farmers are often faced with the problem of scarcity of resources as their inputs of production due to limited capital. The level of efficiency in using resources is one of the important factors to improve the aquaculture farms production. The efficiency of resources used such as feed, probiotic, labor and other inputs will ensure sustainability of production (Andriyanto *et al*., 2013).

The development of shrimp farming in Purworejo spreads from the coastal region from east to west. All sub-districts experienced a decrease in shrimp production except for Grabag sub-districts. Several examples of common research of white shrimp farming in Purworejo Regency are conducted by Mustofa (2016) about business analysis of white shrimp farming case in Ngombol District and Utomo *et al*. (2012) about the feasibility study of white shrimp farming, but there is no study in grabag sub-district which is currently developing white shrimp and become the highest White Shrimp production region in Purworejo with amount of production in 2016 was 1,357,534 kg. This is the basis for the author to study the allocative efficiency in Grabag District to prevent a decline in production as in other sub-districts and get the maximum profit. The existence of shrimp farming has reduced unemployment and crime rates in Grabag District. It is expected that the results of this study can contribute to minimize the number of farmers who suffer losses so that they can create occupations and improve the economy for the communities.

Potential fisheries in Purworejo which is shrimp farming supports the development of white shrimp farming at the coastal areas in Purworejo. Therefore, for the development of white shrimp farming, its necessary to study the factors that affect the productivity of shrimp in order to achieve allocative efficiency so that farmers get the maximum profit. This study aims to (1) determine the factors affecting the productivity of white shrimp farming; (2) knowing allocative efficiency factors which affect the productivity of white shrimp farming and (3) knowing farmers profit from the shrimp farming business in Grabag District, Purworejo.

RESEARCH METHOD

Location and Data

Location in this study purposively picked with a consideration that Grabag District is one of the centres of white shrimp farming in Purworejo. The Samples were taken from five villages in the district Grabag, Kertojayan, Munggangsari, Ketawangrejo, Patutrejo and Harjobinangun. Study data consist of primary data and secondary data. The primary data were obtained through interviews with white shrimp farmers in Grabag District. The number of respondents were 51 people picked by using accidental sampling method. This technique was used because farmers were not always present in the location, thus interview conduct to any farmers found in the location.

Data Analysis

Analysis of productivity

The model analysis used to determine the factors that affect the productivity of white shrimp was an Ordinary Least Squares (OLS) regression as follows:

$$\text{Ln } Y = \ln\beta_0\ \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \ldots\ldots + \beta_8 \ln X_8 + e$$

Information :

Y = Shrimp Production (kg)
X_1 = Number of seeds / fries (tail)
X_2 = Feed (kg)
X_3 = Probiotics (liters)
X_4 = Labor (HOK)
X_5 = $CaCO_3$ (kg)
X_6 = shrimp farmers age (years)
X_7 = Length of shrimp farmers education (years)
X_8 = Experience farmer enterprises (years)
Ln β_0 = Intercept (scale parameter)
e = Fault or error (*disturbance term*)

Allocative efficiency

Allocative efficiency factors that affect the productivity of white shrimps determined by calculating the value of NPM / Px or Ki (efficiency index) of each factor of production. Price efficiency was achieved if the ratio between the value of the marginal productivity of each input (NPMxi) at a price of inputs (vi) or ki =

1. Index allocation efficiency of each factor of production (ki) could be determined by the formula:

$$Ki = bi.\frac{Y}{Xi}.\frac{Py}{Pxi}$$

Information:

bi = elasticity of production factors of production
Y = production (output)
Py = output prices
Xi = the amount of use of production factors
Pxi = the price of production factors

Analysis of revenues and profits

Farming profit calculation was different from that of other businesses. In farming, the costs divided by actual cost (explicit costs) and calculation cost (implicit cost). Explicit cost was all costs incurred during the farming process while the calculation cost was all costs that were not incurred but calculated economically. Profit was the total revenue minus explicit cost and implicit cost.

a. Total Revenue

According to Soekartawi (2003), Total revenue calculates by multiplying white shrimp production in kilograms with the prevailing price. Total revenue was systematically formulated as follows:

$$TR = P \times Q$$

Information:
TR = Total Revenue (IDR)
P = Price (IDR)
Q = Total production (kg)

b. Profit Analysis (π)

According to Soekartawi (2003), Profit Analysis is the difference between total revenue with overall business costs which is formulated as follows:

$$\pi = TR - TC \text{ (explicit + implicit), or}$$
$$\pi = QP - TC$$

Information:

π = Profit
TR = Total Revenue (IDR)
TC = Total Cost (IDR)
P = Price (IDR)
Q = Total production (kg)

RESULTS AND DISCUSSION

Use of Production Inputs

White shrimp farming uses production input which is an important aspect because it can affect production results so as to determine the success of the business being carried out. Some inputs used by white shrimp farmers in Grabag

Subdistrict, Purworejo Regency include ponds, shrimp seed, feed, probiotics, $CaCO_3$, and labour. Data on input usage and production in a year can be seen in descriptive statistics in Table 1.

Table 1. Input and production

Input	Lowest	Highest	Average
Shrimp pond area (m^2)	1,000	33,800	7,011.76
Shrimp Seed (Tails)	300,000	10,140,000	1,998,823
Feed (Kg)	4,200	193,200	36,545.49
Probiotic (L)	3	640	137.01
$CaCO_3$ (Kg)	6.1	1,030,900	121,144.33
Labor (HKO)	344.38	4,329.29	832.33
Production (Kg)	3,600	156,800	27,494.51

Estimation of production function

The estimation of white shrimp production function in this study is the Cobb-Douglas production function models in natural logarithm so it is much easier to know the view of the similarities that exist. These estimations are used to determine the factors that affect the productivity of white shrimp. The productivity of white shrimp was used as the dependent variable, while the independent variables were shrimp seed (tails), feed shrimp (kg), probiotics (liter), $CaCO_3$ (kg), labour (HKO), the age of farmers (years), education of farmers (year), and the farmers business experience (years).

Table 2. Analysis of productivity

Variables	Coefficient	T stat	Sig
Intercept	0.509	0.522	0.604
Ln Shrimp Seed (X1)	0.028 ^{ns}	0.195	0.846
Ln Feed (X2)	0.841***	6.847	0.000
Ln Probiotics (X3)	0.083**	2.379	0.022
Ln $CaCO_3$ (X4)	0.003 ^{ns}	0.206	0.837
Ln Labor (X5)	- 0.018 ^{ns}	- 0.249	0.804
Ln Age Farmers (X6)	0.006^{ns}	0.045	0.964
Ln Farmers Education (X7)	- 0.013 ^{ns}	- 0.141	0.889
Ln Experience Enterprises (X8)	0.140**	2.297	0.027
R^2	0.973		
Adjusted R^2	0.968		
F		192.135	0.000

Information:
* = Significance at the 90% confidence level (α = 10%), T Table = 1.6802
** = significance at the 95% confidence level (α = 5%), T Table = 2.0181
*** = significance at the 99% confidence level (α = 1%), T Table = 2.6981
Ns = not significant

Based on Table 2. The estimation results of the production function of white shrimp were the production factors, namely shrimp seed, feed, probiotics, $CaCO_3$, labour, the age of farmers, education of farmers and business experience. It was known that production factors that significantly affected the productivity of white

shrimp were feed, probiotics and business experience, Meanwhile, the production inputs of shrimp seed, lime, labour, age and education farmers did not significantly affect the productivity. A description of the independent variables that influenced whether or not a significant influence on the productivity of white shrimp was as follows.

Shrimp feed used by the shrimp farmers in Grabag was factory feed (pellets). The regression coefficient of 0.841 indicated that the relationship between the use of feed on the productivity of white shrimp farming was positive. If the amount of feed given usage increases by 1%, then the white shrimp farming productivity will increase by 0,841%, assuming the other independent variables from the regression model fixed (ceteris paribus).

Survival of white shrimp in treatment had the percentage of feed for 20-50% of the weight of the biomass/day which was an ideal size so that the shrimp were not deprived of feed or excess feed, even by way of feeding was conducted four times a day which did not make white shrimp able to scramble in finding eat so it was supposed to prevent cannibalism that can lower the value of the survival rate. Good feed conversion was 1.8 to 2. This meant that to produce 1 kg of shrimp, the feed required was as many as 1.8 to 2 kg. Feed conversion on respondents can be seen from a comparison of the average feeding and tiger shrimp production. The lower the conversion rate then feed of the tiger shrimp is getting better (Febrina *et al*., 2016).

Probiotics are microorganisms that have a positive effect in white shrimp farming. Regression coefficients were in Table 1. The use of probiotics was 0.083 indicating that the relationship between the use of probiotics on the productivity of white shrimp farming was positive. If the amount of use of probiotics given increases 1%, then the white shrimp farming productivity will increase by 0.083%, assuming the other independent variables from the fixed regression model (ceteris paribus). Probiotics play an important role to improves the growth rate, improves the quality of the aquatic environment, improves the immune system of shrimp and improves the efficiency of feed conversion (Azhar, 2013). The use of probiotics is generally mixed with the feed to the fermentation process. Besides probiotics, there are also deployed in water to maintain water quality by pressing the pathogenic bacteria. According to Romadhona et al., (2016), how the growth of plankton through fertilization and farming criss probiotic fermentation. Convenient water conditions for the life of white shrimp due to the routine input every week of probiotic *Baccilus* sp. and *Nitrobacter* spp., which is always applied to assist the process of decomposition of organic material in the pond. Besides probiotics can reduce total vibrio in the pond so that it will reduce the risk of disease. Convenient water conditions for the life of white shrimp due to the routine input every week probiotic *Baccilus* sp. and *Nitrobacter* spp., which is always applied to assist the process of decomposition of organic material in the pond. Besides probiotics can reduce total vibrio in the pond so that it will reduce the risk of disease (Herdianti et al., 2015).

The result of the study conducted by Dahlan *et al.*, (2017) showed that the administration of probiotics provided a significantly different effect on the survival, the average absolute growth, specific growth rate, feed efficiency, feed conversion ratio and protein retention. It was widely perceived that the best treatment is obtained on the use of probiotics biofloch with the addition of 1.010

CFU/mL. The results of measurements of water quality parameters showed that the range was still appropriate for white shrimp farming.

White shrimp farming experience has a very close relationship with the way farmers manage white shrimp farming. The long experience in cultivating white shrimp farmers, the more skilled the farmers in managing the business of farming. Based on Table 2. The regression coefficient white shrimp farming experience was 0.14. This means that the increasing experience of the shrimp farmers will increase shrimp production efficiency. Shrimp farming experience will provide learning for the farmers to improve business performance and reduce errors. Most of the shrimp farmers in Grabag District have undergone shrimp farms over 3 years. Each cycle of farming growers learn things that are still considered to be less and study on farmers around the farming work. Through the experience, the farmers will increase knowledge and skills will increase.

Allocative Efficiency

Allocative efficiency indicates how much a business is carried out using an optimal combination of inputs used to achieve maximum benefit. If additional inputs in an effort to maximize profits, it can be said that the allocative efficiency has been achieved. It can be seen from the value of the marginal product (NPM) compared to the value of inputs (PXI) in order to get the value of the index allocative efficiency or Ki (Arta *et al*., 2014)

a. If the value of Ki = 1 or the value of marginal product (NPM) is equal to the price of inputs, it is the efficient use of inputs.
b. If the value of Ki < 1 or the value of marginal product (NPM) is less than the price of inputs, it is the inefficient use of inputs.
c. If the value of Ki > 1 or the value of marginal product (NPM) is more than the price of inputs, it is the inefficient use of inputs.

Allocative efficiency analysis is only performed on the factors of production which has a significant influence on the production of white shrimp only. Based on the results of the study conducted on white shrimp farming in Grabag District and data analysis has been done, then the result is that production factors which significantly affect the production is feed, probiotics and business experience. However, for business experience variable, allocative efficiency analysis was not done because the business experience can not be determined the magnitude of the mean use of inputs and the cost of its production facilities, therefore allocative efficiency analysis was conducted only on two other variables such as feeds and probiotics.

Based on Table 3 it can be seen that the feeding and probiotics in white shrimp farming in Grabag District yet reached the level of allocative efficiency. This was indicated by the k value, i.e the value of the ratio between the value of the marginal product with the price of production factors of the use of feed and probiotics > 1. The k value obtained was then tested using the t test to determine the real difference between the value of k obtained against the value of 1 as the control. A value of 1 is used as a control, which means that the use of factors of production in white shrimp farming is not efficient.

Feeding by farmers in allocative inefficiency shown by the comparison value NPMxi / PXI or k greater than 1 is equal to 3,13. K value is then tested using the t test and obtained sig. 0,000 (<α), so that H_0 was rejected, meaning that

the k value the observation is significantly different with 1 (control). On the average of shrimp feeding by the farmers in Grabag District amounted to 36.545 kg/year. Farmers can increase the white shrimp production by increasing the use of feed for white shrimp maximize growth so that production becomes more efficient. According to the study by Ahmadi *et al*. (2012) on the other fishery products namely fish catfish, it showed that an increase in the daily growth rate of catfish fish is directly proportional to the addition of probiotics.

Table 3. Use of the allocative efficiency shrimp farming production input vaname in District Grabag, Purworejo Regency Year 2017

Input	NPMxi	Pxi	NPMxi / Pxi (K)	Sig. t test	Explanation
Feed	1,748,966,295.69	558,261,420	3.13	0,000	Under-utilization
Probiotics	166,835,969	9,948,254.9	16.77	0,000	Under-utilization

Information
NPMxi : The value of the marginal product of factors of production
PXI : The price of the average production factor

Extra feeding is expected to increase the size so that the selling price of white shrimp will be higher in accordance with the size shrimp produced. The average price of shrimp feed IDR 15,276 / kg, while the selling price of shrimp average of IDR 75,753.65 / kg. The high price of shrimp with size will increase the profits of the big farmers in the farming of white shrimp. According to Widyarto (2013), in conducting shrimp farming, it is necessary to note the appropriate quality feed. With high-quality feed and feeding in proportion to the results achieved will lead to efficient production.

The use of probiotics by farmers in allocative inefficiency shown by the comparison value NPMxi / PXi or k greater than 1, was equal to 16.77. K value is then tested using the t test and obtained sig. 0.000 (<α), so that H_0 was rejected, meaning that the k value the observation is significantly different with 1 (control). The average use of probiotics by farmers in Grabag District amounted to 137.01 liters/year at an average price of IDR 15,892.91 / liter. Probiotics is the microorganisms that have a positive effect in shrimp farming.

Probiotics contribute to improve the growth rate, improves the quality of the aquatic environment, improves the immune system of shrimp and improves the efficiency of feed conversion. Probiotic bacteria are mixed with the feed consumed by the shrimp and be absorbed into the digestive tract. According to Gunarto *et al.*, (2009), the use of a dose of 5 mg / L fermentation probiotics, is able to produce a better survival rate and also efficient in feed utilization, as indicated by the value of feed conversion ratio (FCR) which is lower than the value of FCR obtained at a dose of fermented probiotic 3 and 1 mg / L. The addition of probiotics is expected to make white shrimp production more efficient and the results obtained will also increase profits white shrimp farming.

Analysis of White Shrimp Farming Profit in Grabag District

Shrimp production is the result obtained from shrimp farming process, while productivity is the result obtained per unit land area. Production and productivity are closely related to the revenue that the farmers of the white shrimp farming

activities being operated. Based on the calculation of production data, it could be viewed in Table 4

Table 4. Average revenue per year production and white shrimp farming business Grabag District in Purworejo

Production per farmer (kg)	**Production per m^2 (kg)**	**Price (IDR / kg)**	**Revenue per farmer (IDR)**	**Revenue per m^2 (IDR)**
27,495	3.94	75,754	2,082,856,230	298,470

Based on Table 4. white shrimp farming run by farmers in Grabag District had average production per farmer in one year amounted to 27,495 kg with an average area of land per farmer was 7,011.76 m^2, making it known to the productivity of white shrimp commodities in Grabag District amounted to 3.94 kg / m^2. The selling price of shrimp average of IDR 75,754 / kg so that the size of the average revenue by per farmer was IDR 2,082,856,230 in one year.

White shrimp farming profits are derived from revenue minus total variable costs and fixed costs used in shrimp farming vaname. Variable costs may include the cost of means of production: the cost of shrimp seed, feed, probiotics, $CaCO_3$, labour, fuel and other costs. As for the fixed costs, it includes the cost of land rent, depreciation and maintenance of instruments. The average size of the production costs and profits earned white shrimp farming business owners can be seen in Table 5.

Table 5. Average costs and profits for the area average of 7000m^2 per year white shrimp farming In Grabag, Purworejo

Information	**Total (IDR)**
Revenue	2,082,856,230
Means of Production	698,495,289
Labor	31,777,451
Miscellaneous expense	264,120,314
Total Explicit	994,393,054
Land lease	42,647,059
Depreciation and maintenance tool	49,700,061
Total Implicit	92,347,120
Total Cost	1,086,740,174
Profit	996,116,056
Profit per m^2	142,063.60

Based on Table 5, it can be seen the average total explicit costs incurred for one year was IDR 994,393,054. Average total costs incurred by the implicit farmers in three seasons stocking shrimp for one year was IDR 92,347,120. The total average of costs incurred in one year farmers was IDR 1,086,740,174. The mean of white shrimp farmers in one year was IDR 996,116,056 with an average of 7011.76 m^2 land area of farms/farmers so that the average each farmer profit was IDR 142,063.60/m^2/year. This advantage is not much different from the results by Diatin et al. (2008), it showed that the white shrimp farming company can not optimally allocate the cost of production. Under optimal conditions of the

use of the production cost was IDR. 2,403,220,000. With optimal input use, the advantages that can be obtained IDR. 1,949,247,705 while on the actual profits was IDR. 1,510,040,411. The amount of revenue and costs incurred by farmers to make production processes affect the profits of the white shrimp farmers. Implementation of price efficiency (allocative) of the production factors can reduce production costs and increase profits of white shrimp farming.

CONCLUSION AND SUGGESTION

Factors that affect productivity white shrimp farming are feed, probiotics and business experience. The use of factors that affect productivity feed and probiotics has not been efficiently allocated.

Average profit per year of white shrimp farming in Grabag District is very high but it still can be increased in value by optimizing the use of factors that affect the productivity of feed and probiotics until the value efficient.

White shrimp farmers should increase the use of feed and probiotics to increase the productivity of white shrimp and to be more efficient allocatively to increase profits. White shrimp farmers need to be given intensive training and counselling on procedures efficient and optimal shrimp farming from the government or stakeholders so that improvement is obtained an understanding of shrimp farming.

REFERENCES

Ahmadi, H., Iskandar, & Kurniawati, N. 2012. Pemberian Probiotik dalam Pakan terhadap Pertumbuhan Lele Sangkuriang (*Clarias gariepinus*) pada Pendederan II. *JPB Perikanan*, *3*(4), 99–107.

Andriyanto, F., Efani, A., & Riniwati, H. 2013. Analisis Faktor-Faktor Produksi Usaha Pembesaran Udang Vanname (*Litopenaeus Vannamei*) di Kecamatan Paciran Kabupaten Lamongan Jawa Timur ; Pendekatan Fungsi Cobb-Douglass. *Jurnal ECSOFiM*, *1*(1), 82–96.

Arta, S. B., Darwanto, D. H., & Irham, I. 2014. Allocative Efficiency Analysis of Sorghum Production Factors in Gunungkidul District. *Agro Ekonomi*, *24*(1), 78–83.

Azhar, F. 2013. Pengaruh Pemberian Probiotik dan Prebiotik terhadap Performa Juvenile Ikan Kerapu Bebek (*Comileptes altivelis*). *Buletin Veteriner Udayana*, *6*(1), 1-9..

Dahlan, J., Hamzah, M., & Kurnia, A. 2017. Pertumbuhan Udang Vaname (*Litopenaeus Vannamei*) yang Dikultur pada Sistem Bioflok dengan Penambahan Probiotik. *Jurnal Sains Dan Inovasi Perikanan*, *1*(1), 19–27.

Diatin, I., Arifianty, S., & Farmayanti, N. 2008. Optimalisasi Input Produksi pada Kegiatan Budidaya Udang Vaname (*Litopenaeus Vannamei*): Studi Kasus pada UD Jasa Hasil Diri di Desa Lamaran Tarung, Kecamatan Cantigi, Kabupaten Indramayu. *Jurnal Akuakultur Indonesia*, *7*(1), 39–49.

Febrina, L., Suryana, A. A. H., & Riyantini, I. 2016. Analisis Optimasi Faktor-

Faktor Produksi dan Pendapatan Usaha Budidaya Udang Windu di Kecamatan Cilebar Kabupaten Karawang. *Jurnal Perikanan Kelautan*, *VII*(2), 128–139.

Gunarto, G., Mansyur, A., & Muliani, M. 2009. Aplikasi Dosis Fermentasi Probiotik Berbeda pada Budidaya Udang Vaname (*Litopenaeus Vannamei*) Pola Intensif. *Jurnal Riset Akuakultur*, *4*(2), 241–255.

Herdianti, L., Soewardi, K., & Hariyadi, S. 2015. Efektivitas Penggunaan Bakteri Untuk Perbaikan Kualitas Air Media Budidaya Udang Vaname (*Litopenaeus Vannamei*) Super Intensif. *Jurnal Ilmu Pertanian Indonesia*, *20*(3), 265-271.

Mustofa, A. 2016. Analisis Usaha Pembesaran Udang Vannamei (*Litopenaeus Vannamei*) Studi Kasus di Kecamatan Ngombol Kabupaten Purworejo. Universitas Sebelas Maret.

Rimmer, M. A., Sugama, K., Rakhmawati, D., Rofiq, R., & Habgood, R. H. 2013. A Review and SWOT Analysis of Aquaculture Development in Indonesia. *Reviews in Aquaculture*, *5*(4), 255–279.

Romadhona, B., Yulianto, B., & Sudarno, S. 2016. Fluktuasi Kandungan Amonia dan Beban Cemaran Lingkungan Tambak Udang Vaname Intensif dengan Teknik Panen Parsial dan Panen Total. *Saintek Perikanan*, *11*(2), 84–93.

Soekartawi. 2003. Prinsip Dasar Ekonomi Pertanian Teori dan Aplikasi. Raja Grafindo, Jakarta.

Utomo, N. B., Istiyanti, E., & Zulfanita. 2012. Analisis Usaha Budidaya Udang Vannamei (*Litopenaues Vannamei*) di Desa Gedangan Kecamatan Purwodadi Kabupaten Purworejo. *SURYA AGRITAMA*, *I*, 78–84.

Widyarto, T. 2013. Analisis Efisiensi Produksi Komoditas Udang Windu di Kabupaten Pati dengan Pendekatan Fungsi Produksi Frontier Stochastic. *Economics Development Analysis Journal*, *2*(3), 137–147.

Yustianti, Y., Ibrahim, M. N., & Ruslaini, R. 2013. Pertumbuhan dan Sintasan Larva Udang Vaname (*Litopenaeus Vannamei*) Melalui Substitusi Tepung Ikan dengan Tepung Usus Ayam. *Mina Laut Indonesia*, *01*(01), 93–103