

Assisting The Culture of Vannamei Shrimp (*Litopenaeus vannamei*) Biofloc Tarpaulin Pool System in Daarul Hasanah Balunijuk Islamic Boarding School, Bangka Belitung

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Abstract

Fishery culture activity, by raising vannamei shrimp conducted by the Daarul Hasanah Islamic Boarding School at Balunijuk Village, is one of the blue economy concept applications. This community service activity was aimed at transferring knowledge dealing with vannamei shrimp culture to Daarul Hasanah Islamic Boarding School. It is being carried out from March to October 2022 consisting of culture preparation, shrimp farming, feeding process, and pool water quality monitoring. This shrimp culture is located in a tarpaulin bioflock tank in the surrounding yard area of Daarul Hasanah Islamic Boarding School at Balunijuk Village, Bangka Belitung Province. A participatory method is delivered to emphasize the role and participation of the school administrator as participants in culturing the vannamei shrimp through a bioflock system using Probio_FmUBB technology. Results obtained during this activity indicate that participants are directed to be good manners of entrepreneurs. Furthermore, the knowledge transfer of farming the vannamei shrimp using a bioflock system can upgrade the knowledge of teachers (ustads) or the boarding school administrators. Participants are expressed to be skilled in preparing to build a 3-m rounded tank, making bioflock, stocking the shrimp fry process, farming the shrimps using a bioflock system with Probio_FmUBB technology, transporting seawater, operating electrical Genset, measuring and controlling water quality, and understanding feeding technique and theoretical knowledge of shrimp harvest. That knowledge enables to support of soft skills of students and teachers to stimulate new business for the boarding school.

Keywords: Blue economy, farming, water quality, yard, vannamei shrimp

INTRODUCTION

Balunijuk is a village with a cover area of 12.02 km², and a population of 5,055 peoples. Population livelihoods comprise three sectors agriculture, forestry, and fishery. Most of them are farmers and fishermen as well as stockbreeders. Natural resources produced in this village are like rice farms, dried-season crops including vegetables and beans, pepper, tuber, rubber, palm oil, fish, and cultured fish (BPS Kab. Bangka, 2021). In terms of social community life, the existent Daarul Hasanah Rumah Qur'an Roudhotul Hasanah Foundation or known as Daarul Hasanah Balunijuk Islamic Boarding School (Pesantren), organizes Islamic education activity desiring highly to contribute to establishing bright Muslim generations through theology, social knowledge, and science. Being one of the Islamic boarding schools in Balunijuk village, the community economic development has carried out by that school to farming freshwater fish as its side business like tilapias (Adibrata *et al.*, 2021) catfish, and now the school is trying to raise vannamei shrimp (*Litopenaeus vannamei*) in a bioflock tarpaulin tank. An in-depth review of this commodity has been conducted by Emerenciano *et al.* (2022) dealing with its production system, nutrition, and breeding. Raising this shrimp both experimental and commercials have been published in many journals with different techniques and results also its economic potential conducting in some countries like Brazil (Maia *et al.*, 2016), Vietnam (Anh *et al.*, 2019), Bangladesh (Washim *et al.*, 2020), and India (Chethurajupalli & Tambireddy, 2020). This shrimp is favorable commodity for farming in several location in Indonesia (Wijayanto *et al.*, 2017; Koto and Fauzi, 2019; Muchtar *et*

al., 2021; Annisa *et al.*, 2022). Farming this commodity also had been affected by socio-economic factors like happening in Thailand (Tammaroopa *et al.*, 2016).

Developing a community economy cannot stop at the policy level and must be grounded on the implementation. The development sustainably should be planned through levels of policy, strategy, programs, and activity implementation (Permen PPN/Bappenas, 2019; Adibrata *et al.*, 2022). Furthermore, fishery farming activity through raising vannamei shrimp is one of the concept implementations of the blue economy. Raising the vannamei shrimp in a pond is likely capital intensive. Fortunately, the Balunijuk Daarul Hasanah Islamic School bravely attempts to culture the shrimp in a tarpaulin bioflock tank. Bioflock originally comes from *bios* meaning life, and *flock* means clump. Bioflocks are clumps of various organisms like fungus, bacteria, algae, protozoans, worms, and others, gathering in clumps. Also, bioflock consists of phytoplankton and organic materials from undecomposed wastes (Pantjara *et al.*, 2010). Bioflock is a technology that is involved in integrating farming waste handling and reducing amounts of water use (Amir *et al.*, 2018).

Raising vannamei shrimp is new for the Islamic school that needs the persistence to succeed. An absence of human resources in the fishery at the school becomes an obstacle to objectifying farming the vannamei shrimp. At this point, the school requires academician assistance from Bangka Belitung University in the fishery field to raise the shrimp on the right path. Assisting the school is expected to lead to an entrepreneurship way with good manners in point of the fishery. Entrepreneurship is a condition that creates a new business of courage to take risks expecting profits (Burdus, 2010).

Balunijuk village is well known as a vegetable producer in Bangka Regency. Farming the vannamei shrimp brings out a new atmosphere of business in the fishery sector for local people. The knowledge transfer dealing with farming activities (tank preparation, fry handling, and distribution, feeding, measuring, and controlling water quality) is an important aspect that pays attention to success in the fishery business. This community service activity aimed to transfer knowledge on how to culture the vannamei shrimp for the Balunijuk Daarul Hasanah Islamic Boarding School.

METHOD

This community service starts from March to October 2022. It began with preparation, farming, feeding, water quality monitoring, and harvest. Writing this article, when the shrimp fries got PL-36 days old (post larva – PL) on June 25, 2022, since they were stocking at PL-8 days old (post larva – PL) on May 28, 2022. Rearing the vannamei shrimp is located in the yard of Daarul Hasanah Islamic Boarding School (Pesantren) at Balunijuk Village, Merawang District, Bangka Regency, Kepulauan Bangka Belitung Province.

Materials of the community service activity consisted of 5,000 vannamei shrimp fries, Probio_FmUBB, molasses, and feed pellets in three sizes a starter (powder), grower (granule), and finisher (grain pellet). Support tools for rearing the shrimp composed of a ruler-meter, scales, mercury thermometer, hand refractometer, pH meter, DO meter, Test Kit for nitrate and phosphate, electrical power and electric generator set (Genset), a set of Robin engine, water reservoir tank, knives, container, aerator and blower set, hose, three units of tarpaulin 3-m diameter tanks, and seawater.

The participative method was carried out to express on role and participation of the school as the fostered school in conducting the vannamei shrimp farming. Transferring knowledge took through collaborating theoretical lecture, discussion, demonstration, and direct practice of rearing the shrimp. Steps of this assistance start from preparing the tank, stocking fry, and feeding arrangement, until monitoring the water quality of bioflock tarpaulin tanks. Farming the vannamei shrimp is not discussed till the harvest process because this article is being written, the shrimp did not harvest yet. Each step of assisting shrimp farming is detailed as follows.

Preparing the Farming Tank

The bioflock tarpaulin tanks were built with an iron frame and roofed by zinc sheets. Aerated tanks using a Resun 1.000 for 24 hours. Air from the aerator was flowed via pipes and sprayed out by holes of four blowers. To input, the seawater was filled using a Robin pump machine until it reached the height of 80 cm. Tanks outlet set in the center using a pipe towards disposal channel. The seawater was fermented using five bottle cups of Probio_FmUBB mixed with 500 ml of molasses for 3-5 days until shaped flocks for feeding the shrimp fries. These tarpaulin tanks consisted of two farming tanks and a water reservoir tank.

Stocking Fries

Fries were put in two rearing tanks at PL 8-days old (PL is a post larva state). Priorly to inserting shrimp fries into the 3-m diameter tarpaulin tanks, they got an acclimatization process to the new environment to avoid stress. After the temperature acclimatization process for 30 minutes, these fries were released into tanks deliberately. The density of shrimp in each tank is about 300 fries/m². All fries for both farming tanks are 5,000 shrimps.

Administring Feed

Feeding shrimp fries began a week after the stocking process. For a week before being fed, these shrimp fries consume the prepared flocks. Three types of feed used in this shrimp culture, according to shrimp life phase, are starter (powder), grower (granule or crumble), and finisher (graining pellets). The needs for the feed in each phase were arranged and monitored according to the reared shrimp condition. A portable sampling bucket or well known as anco is used to monitor the shrimp size and condition.

Measuring Water Quality Parameters

Measuring the water quality parameters is taken mainly for some important parameters such as pH, Dissolved Oxygen (DO), water temperature, nitrite, nitrate, and phosphate. Those water parameters should be in the range of ideal condition or not exceeds the carrying capacity or sea water standards for suitable life of shrimps.

RESULTS

Data of Daarul Hasanah Balunijuk Foundation is listed in Table 1.

Table 1. Data of Daarul Hasanah Balunijuk Foundation

No	Name	Position	Details
1	Abdul Aziz Al-Hafizh	Chief	Decree of the Minister of Law and Human Rights on December 07, 2018 Number AHU-0017063.AH.01.04
2	Taqiyudin Al-Hafizh, S.Th.I	Secretary	Year 2018 about Legalisation of Establishing Baluinjuk Daarul Hasanah Foundation and According to Notary Deed of Feni Kusma Pertiwi, SH., M.KN Number 04, on December 04, 2018.
3	Aryadi Al-Hafizh	Treasure	

Table 2. Water Quality Parameters for Farming the Vannamei Shrimps

No	Parameters	Unit	Standards	Initial Measurement	End Measurement
1	Dissolved Oxygen (DO)	mg/L	3-7,5* ; >4** ; >5***	4,8	5,12
2	Amonia (NH ₃)	mg/L	0,01-0,05* ; <0,1**	0,05	0,16
3	Nitrite (NO ₂)	mg/L	-	0,05	0,06
4	Nitrate (NO ₃)	mg/L	0,06***	1,0	1,22
5	Phospate (PO ₄)	mg/L	0,1-5* ; 0,015***	0,03	0,40
6	Clarity	%	30-40*	50	30
7	Depth	cm	>80**	50	80
8	Temperature	°C	28-33*	31,2	26,26
9	Salinity	‰	15-25* ; 30-33**	24	14,16

No	Parameters	Unit	Standards	Initial Measurement	End Measurement
10	pH	--	7,0-8,5***	7,2	7,52

Sources: Ministerial Decree of Fishery and Marine Affairs Number 28 year of 2004(*), BSN-SNI 8037.1:2014(**), and Government Acts Number. 22 year of 2021 at appendix VIII(***) (Adibrata *et al*, 2022).

Table 3. Knowledge Transfer Dealing with Vannamei Shrimp Farming

No	Parameters	Annotation
1	Preparation of install rounded-tarpaulin tanks	Fair skilled, difficulty in making tutorial video
2	Making bioflocks	Fair skilled, difficulty in finding out proper dosage
3	Stocking process of shrimp fries	Skilled
4	Transporting seawater and operating the electrical generator set	Skilled, difficulty when sea water source for tanks is only depends on high tide which is occurred on night and ought to be transported.
5	Controlling water quality in the tarpaulin tanks	Fair skilled, difficulty when power plant shut off, the electrical generator should be prepared well.
6	Administrating feeds	Skilled, difficulty which is should be patience during lifting and dropping portable sampling buckets (<i>Anco</i>).
7	Theoretical knowledge of harvesting shrimp	Fair skilled.

DISCUSSION

Balunijuk Daarul Hasanah Foundation or well known as Balunijuk Daarul Hasanah Islamic Boarding School is a school with its organization structure as seen in Table 1. This boarding school has the vision to be a qualified institution of the Qur'an to enact Al-Qur'an as life guidance and a source of people's happiness. To achieve the vision here are five missions have been determined. 1) to generate outstanding memorizers of the Qur'an and to be able to meet the needs of people (ummah) in the teaching and learning process of the Qur'an; 2) to organize the educational process of teaching the Qur'an and prophet's hadiths; 3) to assist students to be smart Muslims in terms of theology and social; 4) to ground the memorizing (hifzhul) program of Qur'an in around Nusantara (Indonesia); and 5) to present good manner generations (akhlakul karimah). Implementing these missions, the school attempts to combine its current potency to become a side business and a new economic source model. The local-based potency entrepreneurship is now being strengthened to create young entrepreneurs in the surrounding villages. This condition is in line with the third and fourth school' missions such as stock of knowledge in theology and social science should be implemented simultaneously. Therefore, students and alumni of the school can become good manners and role models for entrepreneurial independence in the location where the school existed.

The economic wheels can move through entrepreneurial independence, including entrepreneurial spirit from Islamic boarding schools, even though no success guarantees entrepreneurship. Burdus (2010) expressed an entrepreneur is able to attain benefits of establishing a new business such as (1) self-reliance and opportunity to achieve desired goals and to acquire profit based on hard work of him/her self; (2) chance to observe the differences in knowledge which he/she is being studied and then it is blended with social skills for a better life; (3) opportunity to utilize his/her potentials; (4) chance to get huge profits from initiating new business; (5) effort of recognizing and contributing on achieving social goals like to be respected

as an entrepreneur; (6) time to distribute the preferred desire like developing business referring to hobbies.

Assisting by educating communities regarding their local potency changed to establish new businesses and scale up villagers' economy, especially during the current pandemic of Covid-19 (Aisyah *et al.*, 2022). The entrepreneurial self-reliance conducted in the Balunijuk Daarul Hasanah Islamic Boarding School is able to attend to food security attempts during pandemic Covid-19 at Balunijuk Village, especially relying on the family food security. Self-reliance can not be separated from the awareness and insight of the open-minded school administrators towards life. That Islamic Boarding School does not only provide religious learnings but also delivers social role models. Good knowledge can lift awareness and motivation of families in increasing families' food security independently by boosting the nutritional status and health levels of families (Setyaningsih dan Dwi, 2021).

Farming the vannamei shrimp using a bioflock tarpaulin system is new for that boarding school which needs assistance to succeed in the future. Some important aspects that should look at in farming shrimps are the biology of the organism, farming preparedness, fries stocking, administering feed and water quality looking after, and the harvesting process. This article will discuss the shrimp culture starting from farming preparedness, feed administration, and water quality monitoring of tanks. Deliberately discussing the harvesting process due to this article being written, the shrimp is not old enough to be harvested yet.

Preparedness of Farming

Assemble the construction of two 3-meter diameter rounded tarpaulin tanks for farming the vannamei shrimp. This activity accompanied simultaneously by delivering a tutorial on how to construct the tarpaulin tank. After the construction process was over, sea water filled these two tanks. To fill the sea water into these tanks was not an easy task. A challenge found in this process is low tide during the day at the seashore. The farming team should wait for high tide to occur at night to collect seawater and then transport it into the farming location. As soon the seawater in tanks reached the desired level, the Probio_FmUBB probiotic was added into the water and left for days for the fermentation process. This process generated flocks. Assisting on how do fishery farming needs to apply simple farming methods with understable and applicable, and one of them is to add probiotics (Setyowati *et al.*, 2021). According to Jannah *et al.* (2018), adding the probiotic into the vannamei shrimp farming can enhance the survival rate and immune system of vannamei shrimp. Bioflock is an alternative method to overcome problems of disposal water quality in aquaculture (Faridah *et al.*, 2019). This technology or active mud is adopted from biological treatment technology of active mud wastewater using microorganism activity to escalate carbon and nitrogen. An indication of using probiotics worked well, is flocks of microorganisms (bacteria and mold) shaped after five days in the bioflock tank (Athariq *et al.*, 2021). Briefly, bioflock is an environmental-friendly technology due utilizes organic materials as the feed from microbial that can degrade waste or feces without any chemical compound. Flocks in the water become food for the raised biota. The bioflock used in this vannamei shrimp farming is the Probio_FmUBB. This Probio_FmUBB works to restructure probiotic bacteria and forms flocks, and then they are eaten by shrimp fries and become a good protein source for the shrimps. The use of 3 m-diameter bioflock tarpaulins indicates highly applicable to be set in yards (Figure 1). This tank tarpaulin of bioflock system can meet the comfort life of vannamei shrimp. It can be carried out for household-scale shrimp farming by the community (Amir *et al.*, 2018).

Stocking Fries of Vannamei Shrimp

Stocking fries was carried out carefully into in a tank, as many as 2,500 individuals. A superior fry usually is distinguished by transparent color with unbreaking intestinal content, moved actively, enabling it to go against the current with head towards lower. The stocking of the PL-8 days old (8-days post larva) fries ought to have perfect body organs, fluffing tails, and free disease. These fries are certified bringing in from PT. Centra Proteina Prima Hatchery Kalianda, South Lampung (Figure 2).

Administering Feed

In the starter phase, the feed is delivered to the shrimp by powder. Until reach PL-15 (15-days post larva), as much as 270.86 grams of powder feed were poured into each tank three times a day: at 07:00, 11:00, and 19:00. or PL-15 days old, the fry weight is about 4 grams per individual. At the grower phase, the granule feed is delivered to the shrimp. In this phase, the fry is at PL-45 days old. Collecting data were taken until fries at PL-36 days old with a total weight of 620.24 grams/tank. Feeding periods were changed to be four times a day: 07:00; 11:00; 15:00; and 19:00. At this age, the weight of vannamei shrimp is about 10 grams/individual. The population density of the shrimp and samplings were taken using *Anco* in some positions of both tanks. Shrimp samples were measured in their length and weight (Figure 3). Based on theory, at the grower phase, the shrimps are fed by granule or scrumble until got PL-45 days old. Moreover, at the finisher phase, the pellet feed was delivered to them until harvesting.

Water Quality of Tanks

Before shrimp fries stocking in tarpaulin tanks, the water quality parameters were checked for initial data (Table 2). Water quality parameters were maintained until harvest. The skill of measuring water quality, conducted by Mitra in this case the school administrators, is important. It simplifies controlling the water carrying capacity that has been exceeded or not. Main parameters, such as temperature, salinity, pH, and dissolved oxygen, are successfully determining the main factors of farming the vannamei shrimp (Atthariq *et al*, 2021). Decreasing water quality indicates that the Mitra (school operators) should take action of improvement to take care of the shrimp to be still in optimal condition and to avoid disease attacks. This measuring water quality parameter is useful to assign the carrying capacity of the culture (Hertika *et al*, 2021).

Based on data listed in Table 2, almost all water quality parameters indicate no problems found except ammonia which is slightly above its threshold (Figure 4). The un-excessive ammonia can be broken down into nitrate, however, the dissolved oxygen (DO) in the water will be lower if the ammonia is above its threshold. The water pollution that occurs in the tarpaulin tanks causes some problems for the shrimp such as its growth becoming stunting, lower disease resistance, and even being in worst conditions like a mortal. That condition will occur as a result of the ammonia produced from shrimp feces and leftover feed. These two materials then are changed by *Nitrosomonas* bacteria becoming nitrite. Furthermore, the nitrite is adjusted to be nitrate, and in another hand, the nitrobacteria require oxygen in the water. This condition makes the dissolved oxygen become low. One of the parameters has exceeded its threshold indicating water exchange is a must to be taken to escalate the water quality parameters to achieve their standard. Nitrate is a primary inorganic compound necessitated by phytoplankton as a food chain. A decrease of dissolved oxygen in a medium amount will decline the physiological activity of organisms in the water including lower appetite, growth, and swimming speed.

Knowledge Transfer of Vannamei Shrimp Farming

Yard use in the surrounding Balunijuk Daarul Hasanah Islamic Boarding School is at least able to be a food and nutritional source for the school residents. Knowledge transfer of this farming is an important breakthrough that still can be improved in Balunijuk Village. Based on the evaluation during assistance, the school signifies that school administrators can absorb all assistance materials, both theory and practice of rearing the shrimp. The school can produce the household scale vannamei shrimp to meet their consumption needs and for fishing baits. This success confirms that shrimp culture can be carried out in the bioflock tarpaulin tank on a household scale. The assisted group (in this case the Islamic boarding school) can manage its resources and produce vannamei shrimp at a household scale in two category sizes, consumption and fishing bait (Muhsin *et al*, 2020).

The knowledge transfer conducted by the Bangka Belitung University to the Balunijuk Daarul Hasanah Islamic Boarding School is a mutual leap of cooperation and triggers a passion to build up knowledge of religion and society. It finally upgrades the expertise and skills of the school's educators and administrators. They are expressed to be skilled in dealing with steps of farming the vannamei shrimps starting from preparing the tanks, making bioflock, stocking fries, looking after using *Probio_FmUBB* technology, transporting seawater, operating the electrical Genset,

measuring and controlling water quality parameters, feeding technique, and knowing how to harvest. This collaboration between two institutions has to be kept well to increase intimacy among institutions in this village, grow up new business for the boarding school, and to enable supporting soft skills of students and teachers in bolstering new business around the school.

CONCLUSIONS AND RECOMMENDATIONS

Assisting the boarding school dealing with farming the vannamei shrimp can be guided toward good manner entrepreneur. Transferring knowledge to the school's teacher or administrators about bioflock shrimp culture can scale up their technical skills. They are conveyed to be skilled in relating to steps of farming the vannamei shrimps in 3 m-diameter rounded tanks starting from preparing the tanks, making bioflock, stocking fries, looking after using Probio_FmUBB technology, transporting seawater, operating the electrical Genset, measuring and controlling water quality parameters, feeding technique, and knowing how to harvest. This skill indeed bolsters the soft skills of students and teachers that can trigger growing new business in that boarding school.

ACKNOWLEDGMENTS

Authors thank to (1) the head of LPPM Bangka Belitung University on financing this community service through a project scheme of Pengabdian Masyarakat Tingkat Universitas (PMTU) with a contract number of No.196.G/UN50.11/PM/2022. Furthermore, our gratitude to (2) MBKM students for their dedication to this project especially Ahmad Baharudin and Ratma Yuda. The good participation of our Mitra, (3) the Balunijuk Daarul Hasanah Islamic Boarding School, regarding its support and facilities makes this project can be published and become one of the references for related programs, particularly in Bangka Belitung.

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APPENDIX



Figure 1. Teachers (Ustad) Are Listening Theoretical Farming Of Vannamei Shrimp



Figure 2. The Leader Of University Level Community Service Spreading Vannamei Shrimp Seeds In The Trapaulin Tank



Figure 3. Anco (Left) And Measuring Process Of Vannamei Samples (Right)



Figure 4. Measuring DO, Nitrit, Nitrat, Posphate Of The Vannamei Shrimp Culture Water