Advance Sustainable Science, Engineering and Technology (ASSET)
Vol. 6, No.2, May 2024, pp. 02402023-01 ~ 02402023-14
ISSN: 2715-4211 DOI: https://doi.org/10.26877/asset.v6i2.18610

Sustainability Strategies of Traditional Vannamei Shrimp Cultivation in East Java: A Case Study in Kudu Hamlet, Lamongan District

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Abstrak. The research investigates small-scale farming practices, particularly vannamei shrimp cultivation, in Kudu Hamlet, focusing on how traditional farmers have adopted technology over two decades. Conducted over two years, the study sampled 17 farmers out of 38, analyzing various variables such as age, education, and economic factors. Farmers, predominantly older, have engaged in shrimp farming for nearly two decades, despite fluctuating incomes. Education levels vary, impacting farmers' understanding of new technologies and market trends. Most farmers own their pond land, managing it carefully for shrimp cultivation. Polyculture systems, combining vannamei shrimp with other species, enhance productivity but face challenges like disease outbreaks and market price fluctuations. The choice of feed, predominantly artificial, significantly affects shrimp yields. Farmers also engage in side jobs to supplement income. Overall, enhancing farmers' capacity through education and sustainable practices is crucial for the long-term viability of shrimp farming.
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Keywords: Vannamei Shrimp; Traditional Farmers; Traditional Ponds, Sustainable Aquaculture Farming

Received 2024-03-09, Accepted 2024-04-29, Available Online by 2024-04-30)

1. Introduction

Indonesia is a significant producer of aquaculture commodities globally, contributing to food security in the aquatic sector. Indonesia ranks second in Asia in terms of aquaculture biota production, with a total output of 14,845 thousand tons or 13.22% of the global production, including finfish (46.9%), mollusks (14%), and crustaceans (9.5%) [1], [2], [3]. Within the crustacean category, Indonesia's aquaculture sector contributes significantly to the export of *Litopenaeus vannamei* or whiteleg shrimp, which remains high annually. Shrimp cultivation in Indonesia contributes 7% of global shrimp production [4].

If traditional farmers are aware that Indonesia significantly contributes to global aquaculture biota production [5], They will be better able to address global environmental issues such as climate change and declining water quality that can impact the sustainability of fisheries cultivation [6], [7]. Traditional fish farmers understanding that Indonesia is a major aquaculture producer globally will help them grasp the importance of the global market in determining demand and prices for aquaculture products. This will assist in planning production and marketing more effectively [8].

Initially, *Litopenaeus vannamei* shrimp were introduced from Latin America to Indonesia by the government in the early 2000s to support large and medium-scale shrimp industries, which had declined due to the White Spot Syndrome Virus (WSSV) outbreak in black tiger shrimp (Penaeus monodon) [9]. Over time, small-scale shrimp farmers adopted this technology, utilizing traditional ponds for vannamei shrimp cultivation. Generally, vannamei shrimp are more profitable when cultivated on a large or medium scale, either intensively or semi-intensively. However, traditional systems are more beneficial for black tiger shrimp (Penaeus monodon) cultivation [10], [11]. Traditional vannamei shrimp cultivation may be less profitable, but many conventional farmers persist, employing various methods to cultivate vannamei shrimp in their own or leased ponds.

Traditional farmers typically contribute about 5-5% of annual shrimp production, while medium-scale operations contribute 15%. Most large-scale vannamei shrimp production is concentrated among only three to four entities or corporations, accounting for most annual shrimp production (70-80%) [12]. The small contribution from household-scale farmers contrasts with the number of Production Household Units (PHUs) in the majority group. They generally use traditional or extensive technology in earthen ponds with low stocking densities and without precise management practices.

A similar phenomenon occurs in Gresik and Lamongan Regencies, where more than 90% of the current pond area is managed by traditional farmers cultivating vannamei shrimp for decades. Small-scale farmers can participate in shrimp industrialization, as some have good access to certified seedlings and have been using artificial feed [9]. Access to shrimp seedlings from hatcheries and formulated feed is readily available. Based on field observations, the location factor and the presence of numerous intermediary traders for both seedlings and artificial feed aid traditional farmers in obtaining these vital inputs.

As a country with the most significant number of small-scale aquaculture producers globally, alongside Bangladesh and Vietnam [12], scientific studies on small-scale cultivation would greatly benefit its development. Negative stigmas regarding small-scale farming practices, related to environmental unfriendliness and sustainability threats, must be addressed through science, technology, and innovation (STI) initiatives. This research aims to provide a general profile of traditional farmers in Kudu Hamlet engaged in vannamei shrimp cultivation and describe how these traditional farmers' strategies in Kudu Hamlet, serving as small-scale producers, have successfully adopted vannamei shrimp cultivation technology for almost two decades, enabling their ponds to continue producing shrimp.

2. Methods

2.1. Time and Location

This research was conducted over two years, from March 2022 to June 2022 and June 2023 to September 2023. Data was collected in Kudu Hamlet, Weduni Village (Figure 1), Lamongan Regency, East Java.

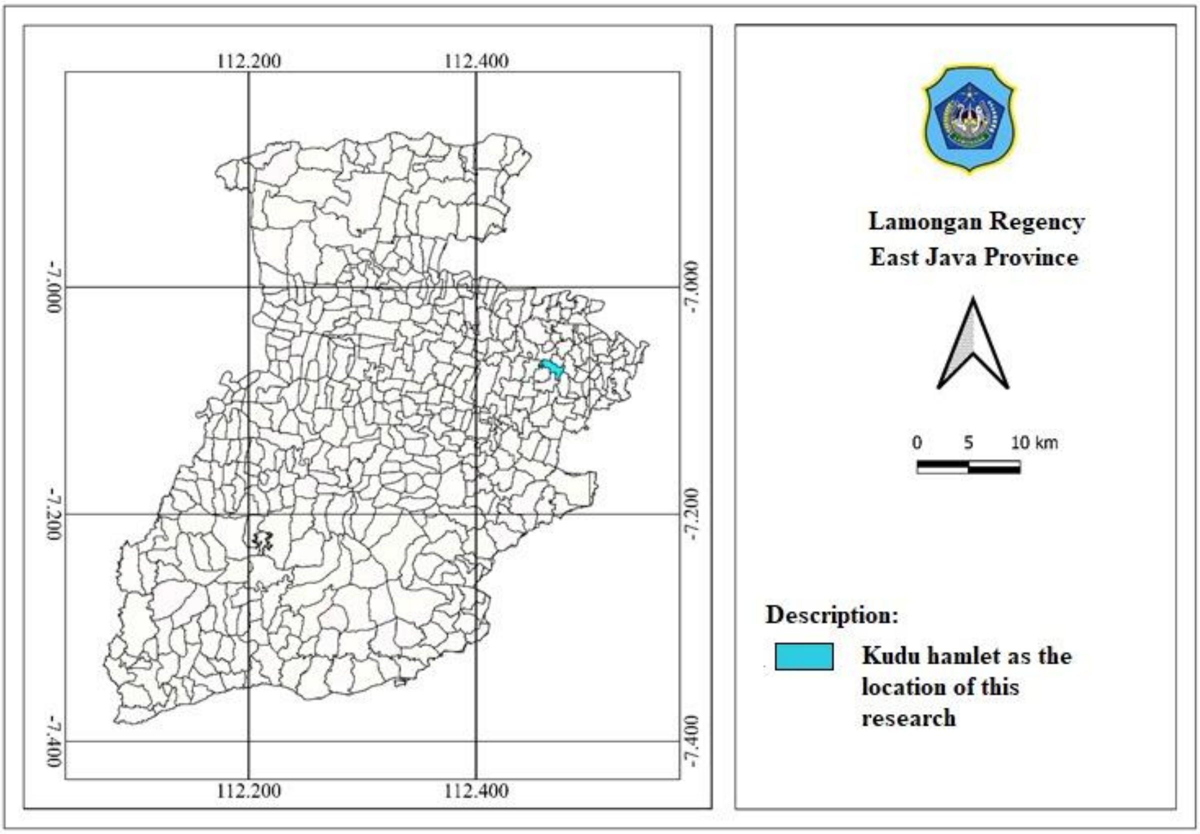


Figure 1. Map of Lamongan Regency

2.2. Population and Sample

The population of this study is traditional farmers from Kudu Hamlet who will be interviewed, with a total of 38 farmers in Kudu Hamlet. Out of the 38 conventional farmers, a sample of 17 individuals was used—the method of selecting the 17 individuals involved matching data from 2021 and 2022. To obtain the sample, the researcher first visited representatives of the Kudu Hamlet management to seek guidance on which residents of Kudu Hamlet were engaged in farming activities. After receiving advice on the names of farmers in Kudu Hamlet, the next step was to visit these farmers and inquire whether they were available for interviews. The criteria for selecting the 17 samples had the same criteria, namely the use of the same number of seedlings and cultivation locations top of Form.

Kudu Hamlet is a hamlet in Weduni Village, part of the Deket District, Lamongan Regency, East Java. Kudu Hamlet covers an area of 410,000 m² and has a population of 125 households, with residents working as farmers, traditional fishermen, and entrepreneurs. There are 88 conventional farmers in Kudu Hamlet. The head of Kudu Hamlet is Mr. Nasim Hadi Prayitno. Facilities in Kudu Hamlet include a practicing midwife, an elementary Islamic school (Madrasah Ibtidaiyah), a Quranic school (TPQ), and the Darul Hikmah Islamic boarding school.

Most farmers in Kudu Hamlet use traditional methods to cultivate vannamei shrimp in earthen ponds, with an average pond area ranging from 5,500 m² to 6,200 m² [13]. These farmers utilize water sources from rivers or rainwater catchment. Characteristics of traditional ponds include the use of simple technology, irregular pond shapes, shrimp stocking densities ranging around 60 per hectare, and the use of natural feeds [14].

2.3. Research Procedure

This study selected main shrimp farmers as respondents, not pond caretakers. The interview sessions lasted an average duration of 60 – 90 minutes. During the interviews with traditional farmers in Kudu

Hamlet, the discussion focused on three variable categories, namely farmer variables, input usage variables, and economic variables in vannamei shrimp cultivation [15]. Farmer variables included the farmer's name, age, education level, side job, address, and the year they started shrimp farming. Input usage variables included probiotics, shrimp seed stocking density, other commodities, feed consumption, and the feed used. Economic variables in vannamei shrimp cultivation included the price of shrimp seeds, feed, probiotics, shrimp harvest quantity, and other commodities, total income from commodities other than vannamei shrimp, and the price of vannamei shrimp per kilogram.

2.4. Research Variables

Table 1. Defined Variables

Variables	Variables Questions During Interview
Farmer Variables	Farmer's name, farmer's age, farmer's educational level, farmer's side job, farmer's address, year of starting vannamei shrimp farming, ownership status of pond land, pond land area, intention to continue farming activities continuously, source of farming knowledge, participation in farmer communities, and the cultivation system used for vannamei shrimp.
Input Usage Variables	the number of shrimp seed stockings, other cultivated commodities, brand or type of feed used, amount of feed used, and use of probiotics.
Economic Variables in Vannamei Shrimp Cultivation	Price of shrimp seeds used, price of feed used, price of probiotics used, quantity of shrimp and other commodities harvested, total income from harvesting commodities other than vannamei shrimp, and price of vannamei shrimp per kilogram.

The categorization of the variable categories above is to facilitate and understand the overall picture of farmers' social and economic profiles, indicating farmers' economic flexibility for the long term, and for the key evaluation of economic efficiency in sustainable shrimp farming.

2.5. Data Analysis

The analysis method used in this study is a descriptive qualitative and quantitative analysis using SPSS and Microsoft Excel tools [16]. Qualitative data to be analyzed using Microsoft Excel will be presented as diagrams, including land ownership status, pond productivity, and side jobs. Meanwhile, quantitative data to be analyzed using SPSS will be presented in t-tests with a significance level of 95%.

3. Results and Discussion

3.1. Profile of Farmers in Weduni Village

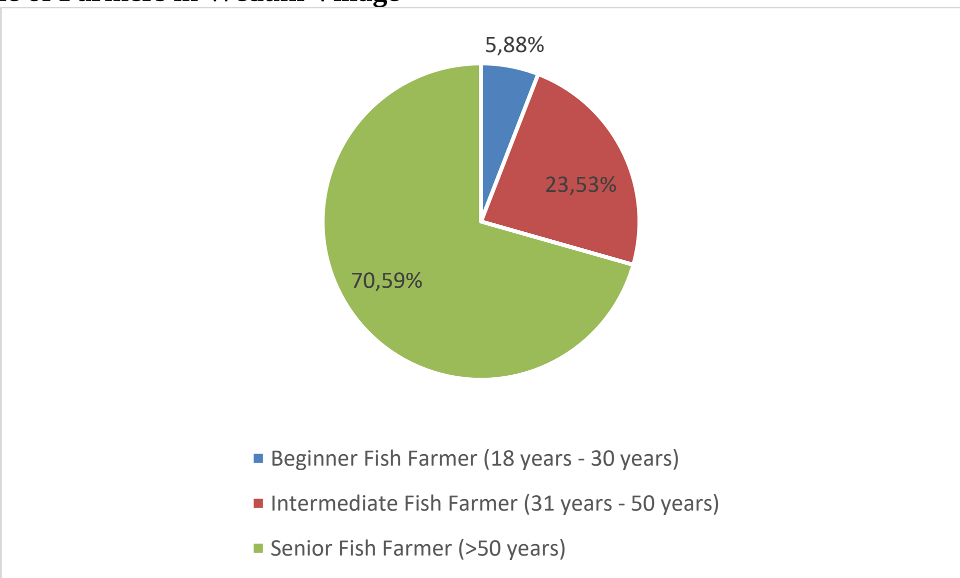


Figure 2. Age of Farmers in Kudu Hamlet, Weduni Village

Farmers' ages can generally be classified into three categories: 18 - 30 years (novice farmers), 31 - 50 years (intermediate farmers), and >51 years (senior farmers) (Sarwana et al., 2019). In Kudu Hamlet, Weduni Village, in 2022, research results regarding the age of farmers yielded an average of 54.29±10.60 years. Farmers in Kudu Hamlet have been engaging in traditional vannamei shrimp farming since 2006, approximately 18 years ago. These farmers engage in traditional farming activities for various reasons: some see it as a flexible additional activity without a fixed schedule, while others make it their primary job due to a lack of alternative options. Despite fluctuating and relatively modest incomes from farming, they remain loyal to these traditional farming practices.

According to previous research, productive farming activities typically occur between the ages of 31 and 50 because farmers are still energetic enough to carry out various farming activities such as preparing land, managing pond operations, and harvesting. Furthermore, previous research indicates that farmers' age reflects their experience in farming; the older the farmer, the more experienced they are in aquaculture [17].

Older farmers typically have years of farming experience. They face various challenges and find solutions to the issues they encounter. By discussing their experiences with younger farmers and the next generation of farmers, this valuable knowledge is passed on, enabling more effective and efficient farming practices. The higher the average age, the more years of experience farmers have in shrimp farming. This is a valuable asset as they have faced various challenges and have extensive knowledge of farming practices. However, without proper succession planning, this knowledge and experience can be lost.

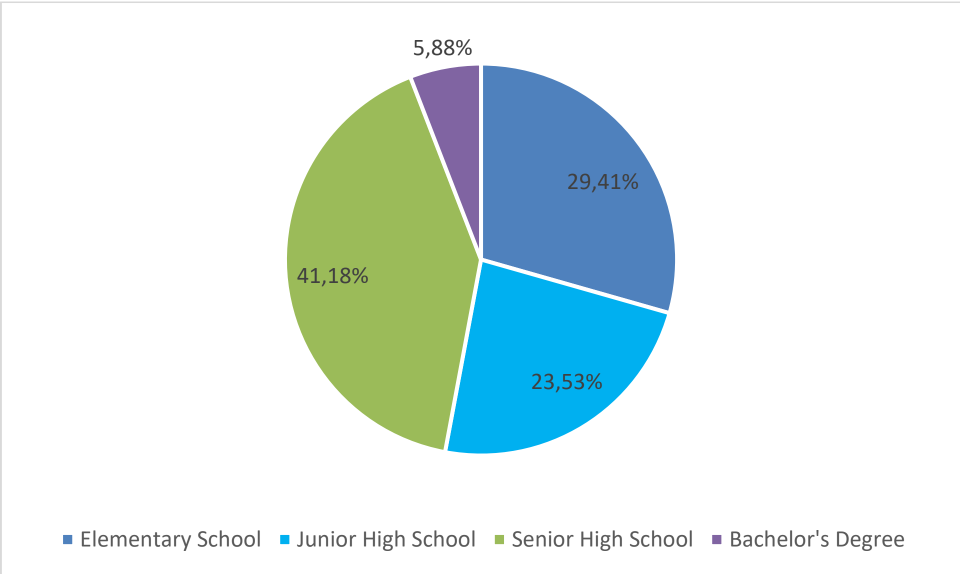


Figure 3. Education Level of Farmers from Kudu Hamlet, Weduni Village, Lamongan Regency

Education is one of the most influential aspects for every individual, as it provides valuable information, insights, and experiences for their future. Education can enhance the quality of individuals' knowledge and social skills. The research diagram in Kudu Hamlet, Weduni Village, depicts four categories of education levels: Elementary School (29.41%), Junior High School (23.53%), Senior High School (41.18%), and Bachelor's Degree (5.88%).

Farmers with higher levels of education tend to have a better understanding of agricultural concepts, resource management, and new technologies. They may be able to assess the benefits and risks of new technologies more effectively. Higher education also enhances farmers' analytical skills to identify problems, understand market trends, and plan more effective agricultural strategies. Higher education often stimulates innovation and creativity. Educated farmers are more likely to try new approaches in farming practices and may be more open to innovative ideas that enhance productivity and sustainability [18].

Table 2. The characteristics of the pond land owned by the farmers of Dusun Kudu, Lamongan.

Aspect	Years 2021	Years 2022
Land Area (m^2)	6.236±4.302,37	5.529±2.826,83
Land Owned By The Farmer Status:		
Owned (%)	88%	88%
Rent (%)	12%	12%

In Table 2, it is explained that 88% of farmers stated that they own their pond land privately, while 12% of farmers stated that they still rent land from others, with rental rates ranging from Rp10,000,000.00 to Rp15,000,000.00 per year. The average land area of Kudu Hamlet farmers is 5,529±2826.83 m^2. "own pond land" means that farmers own the land they manage. This means they have full control over the management of the pond, including decisions regarding cultivation techniques, investments, and marketing strategies. The ownership of these ponds is typically inherited from their parents and is continuously utilized for vannamei shrimp cultivation.

The land area operated for polyculture shrimp farming by the farmers of Dusun Kudu ranges from 5,529 to 6,236m2 (Table 2). The farmers slightly reduced the area of ponds operated in 2022, possibly due to some land being sold or leased to other farmers, possibly to raise funds for purchasing seed and buying some inputs for farming activities. The ownership status of the land is mostly self-owned (88%), with only a small portion (12%) being leased. Ownership status is related to farming behavior, with landowners generally treating their ponds more carefully than tenants, in terms of the use of medicines and inputs that leave negative residues on soil fertility.

In efforts to enhance the role of traditional farmers in national shrimp production, increasing capacity plays a crucial role. The intended capacity enhancement involves providing traditional farmers greater capacity and production efficiency. They are more inclined to adopt new technologies, better cultivation techniques, and sustainable management practices.

3.2. The Strategy to Persist in Cultivating Vannamei Shrimp Using Traditional Shrimp Farming Systems

Implementing Polyculture Cultivation System

Based on this research, all farmers in Kudu Hamlet apply a polyculture cultivation system to cultivate vannamei shrimp in their ponds. These species include milkfish and tilapia. Polyculture is a cultivation technique in which various biota are raised within one area. By using this method, benefits such as high productivity levels are obtained. Technically, polyculture ponds can be established in almost all areas with sufficient brackish water supply. However, economically, careful consideration of the costs of building and operating polyculture ponds is needed to ensure profitability and avoid losses [17], [19]. The combination of polyculture between vannamei shrimp (Litopenaues vannamei), milkfish (Chanos chanos), and tilapia (Oreochromis niloticus) is considered beneficial because it not only produces three different types of commodities but also because vannamei shrimp acts as a filter to clean the water for the tilapia. Conversely, milkfish and tilapia can act as a balance for the vannamei shrimp population [20], [21].

Furthermore, the long-term sustainability of multi-crop planting systems can be threatened if disease outbreaks occur frequently and cause significant losses. High disease prevalence can jeopardize the economic viability of multi-species cultivation by reducing profitability and increasing operational risks. Therefore, economic analysis of multi-species cultivation should consider the potential impact of disease spread and incorporate risk management strategies to ensure system resilience and sustainability [22].

The next challenge is the limited availability of fertilizers, animal feed, and seeds, which is caused by the frequently changing climate. The prices of feed and fertilizers also pose a challenge to traditional farmers because each year the prices of fertilizers and feed increase, and there are restrictions on their purchase. These challenges can affect the selling prices and the level of productivity of the cultivated commodities.

Table 3. Harvest results of vannamei shrimp (kg/year) cultivated in polyculture by farmers from Dusun Kudu in 2021 and 2022.

Aspect	Years 2021			Years 2022		
	Rerata ± SD	Min	Max	Rerata ± SD	Min	Max
Harvest results of vannamei shrimp (kg/year)	181,18 ± 276,95	35	1200	180,12 ± 348,92	16	1500

Harvest results of vannamei shrimp (kg/year) 181.18 ± 276.95 35 1200 180.12 ± 348.92 16 1500 The average harvest of vannamei shrimp per farmer per year in 2021 and 2022 remains relatively stable at around 180-181 kg/year within an area of approximately 0.5 hectares (as per land area data in Table 2). Over the two-year period, they only carried out one production cycle per year due to constraints posed by the extended seasons and floods longer than in previous years. Generally, the shrimp harvest volume can reflect the level of fertility or productivity of the land in Dusun Kudu, which is considered good, as it is equivalent to the productivity of traditional soil pond land, which generally yields a total vannamei shrimp harvest of 300 kg/year. The factors influencing the productivity of vannamei shrimp in a region are genetic, environmental conditions, and capital in farming activities. The genetic factor refers to whether the cultured vannamei shrimp are resistant to disease attacks or otherwise. Environmental conditions refer to factors that can affect the productivity of vannamei shrimp because if the environment is supportive and soil fertility is maintained, productivity will increase. Capital is one of the factors influencing productivity because it is used to purchase vannamei shrimp seeds, medicines, feed, and fertilizers [23].

A very high variation in total vannamei shrimp harvest was found among farmers. Some farmers obtained very low vannamei shrimp harvests (16 kg/year in 2022), while others achieved high harvest yields (1500 kg/year in 2022). The high variation in total harvest is caused by frequently changing weather conditions and floods that hit the Dusun Kudu area, causing vannamei shrimp to escape to other ponds. The implementation of polyculture farming techniques helps vulnerable farmers who may face crop failures to still earn income. In this study, the number of farmers vulnerable to vannamei shrimp crop failure dominated, accounting for 52% of the total respondents in both 2021 and 2022. These are the farmers who obtained total vannamei shrimp harvests of less than 100 kg/year. Additional income received by farmers from co-cultured species is shown in Figure 4.

Figure 4 shows the production data of co-cultured fish alongside vannamei shrimp.

Figure 4. Harvest Revenue of Milkfish and Tilapia

Kudu Hamlet is one of the hamlets that produce milkfish and tilapia in the Lamongan area. The harvest revenue of milkfish and tilapia in Weduni Village in 2021 and 2022 is as follows: in 2021, the harvest revenue of milkfish was Rp6,741,176±Rp4,870,839.10, and the harvest revenue of tilapia in 2021 was Rp4,705,882±Rp4,815,530.94. Meanwhile, in 2022, the harvest revenue of milkfish was Rp3,920,588±Rp3,905,887.34, and the harvest revenue of tilapia in 2022 was Rp2,423,529±Rp1,518,440.57.

Although the revenue from milkfish and tilapia decreased in 2022, the farmers still earned income from other species, namely vannamei shrimp. The revenue from vannamei shrimp in 2022 reached approximately Rp8,950,000±17,491,102.47. The indicators causing the decrease in milkfish, tilapia, and vannamei shrimp harvests are extreme weather conditions in the Kudu Hamlet area of Weduni Village. Heavy rainfall causes rivers to overflow, leading to many fish and shrimp escaping from several ponds. Some farmers install crickets or nets around the pond walls to reduce the risk of losses due to floods.

External factors influencing income fluctuations include market prices. Market prices are influenced by various factors such as supply and demand, weather conditions, and geopolitical factors. When market prices decrease, the income of farmers and other economic actors also tends to decrease, resulting in income fluctuations. Conversely, when market prices rise, sales increase and can offset minor fluctuations [24]. Additionally, changes in consumer demand can also cause income fluctuations. Changes in consumption trends , customer preferences, or macroeconomic conditions can affect demand for certain products or services. When demand for specific agricultural products increases, farmers' income also increases. However, a decrease in demand leads to negative changes in income [25].

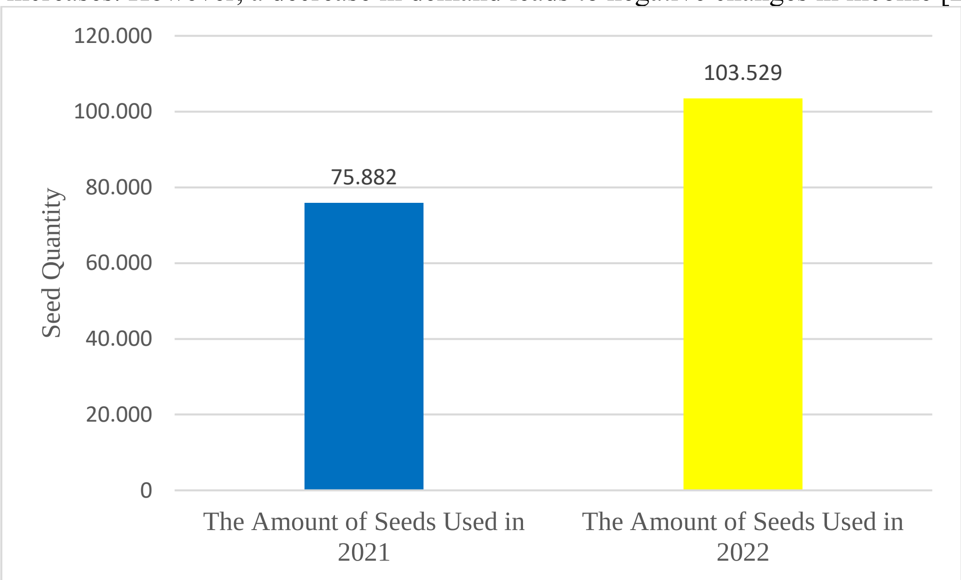


Figure 5. Number of vannamei shrimp seeds used (individuals) in Kudu Hamlet

The above figure illustrates a difference in the number of shrimp seeds used over the two decades. In 2021, the number of seeds used was 75,882±62,405.81 individuals, while in 2022, the number of vannamei shrimp seeds used was 103,529±107,001.24 individuals. The farmers increased the number of vannamei shrimp seed usage in 2022 because they wanted to increase the production of their vannamei shrimp.

Table 4. T-test results of the number of seeds used (individuals) in Kudu Hamlet in 2021 and 2022.

t-Test: Two-Sample Assuming Unequal Variances

	The Amount of Seeds Used in 2021	*The Amount of Seeds Used in 2022*
Mean	75882,35294	103529,4118
Variance	3894485294	11449264706

Observations	17	17
Hypothesized Mean Difference	0	
Df	26	
t Stat	-0,920253844	
P(T<=t) one-tail	0,182950057	
t Critical one-tail	1,70561792	
P(T<=t) two-tail	0,365900114	
t Critical two-tail	2,055529439	

The t-test results indicate that the average number of seeds used in 2022 was 103,529 individuals, while in 2021, it was 75,882 individuals, with a difference between them of 27,647 individuals. The two-tailed p-value obtained is 0.365, indicating that this value is greater than the significance level of 0.05. Thus, the number of seeds used is the same between 2022 and 2021.

Artificial feed is used with various types and brands of feed.

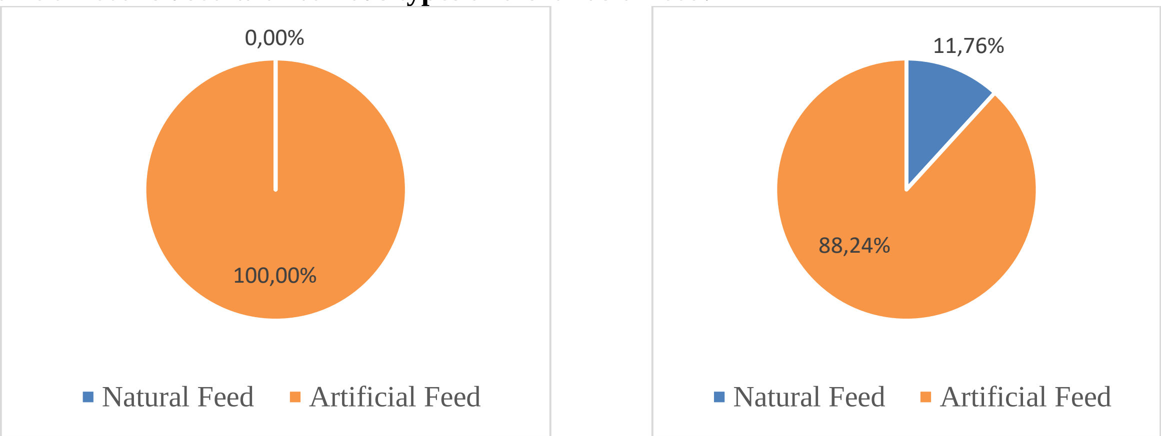


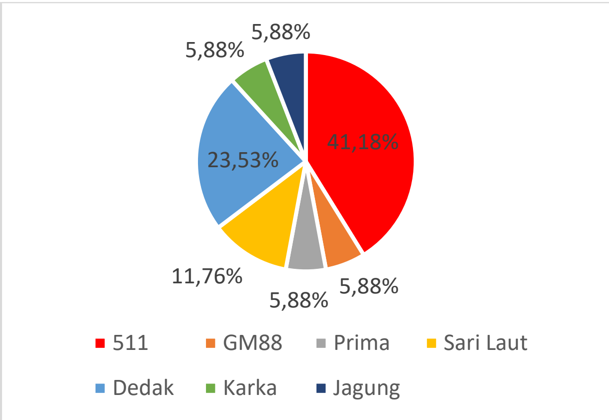
Figure 6. Farmers using feed in 2021 and 2022

Generally, extensive farming tends to rely on natural feed, while semi-intensive or intensive farming uses additional feed to meet nutritional needs optimally. Feed serves as a vital support for the sustenance of life and can enhance the growth rate of the commodities cultivated by farmers [26]. Feeds can be categorized into two types: natural feeds, typically derived from phytoplankton and plankton found in pond waters, and artificial feeds, usually sourced from factories [27].

In Figure 6, it is explained that in 2021, most farmers in Weduni Village used artificial feed. Meanwhile, in 2022, 88.24% of farmers in Weduni Village used artificial feed, while 11.76% used natural feed. Of the 11.76% of farmers using raw feed, it is because they aim to reduce expenses on purchasing feed, as natural feed is readily available from nature and doesn't require additional feed. When comparing the use of natural feed versus artificial feed concerning shrimp yields, the use of natural feed resulted in relatively low yields ranging from 16 kg to 25 kg. In comparison, using artificial feed yielded significantly higher results ranging from 40 kg to 1500 kg.

Stated that food should be distributed evenly so that each shrimp can receive the same amount of food as other shrimp. By feeding evenly, you can avoid competition for food. If conflicts can be avoided, cannibalism can also be avoided. Good shrimp feed requirements include: a) a flat physical surface condition, b) fresh, musty smell, dry and not musty, c) Food packaging is not damaged, d) If pellets are damaged, then pellet stability in water is good. They can survive underwater for at least 2-3 hours. e) Adjust pellet size correctly according to shrimp feeding capacity and shrimp opening size. f) Fresh fish meal has a sweet taste when chewed, and g) appealing. Shrimp feed will be consumed more quickly if using quality feed [28], [29].

Good feed quality is determined by the protein, fat, visible fiber content, and several other nutrients needed for shrimp growth. According In addition to having sufficient protein content, its fat content is also not too high, so that the shrimp get enough feed for their growth [30], [31].



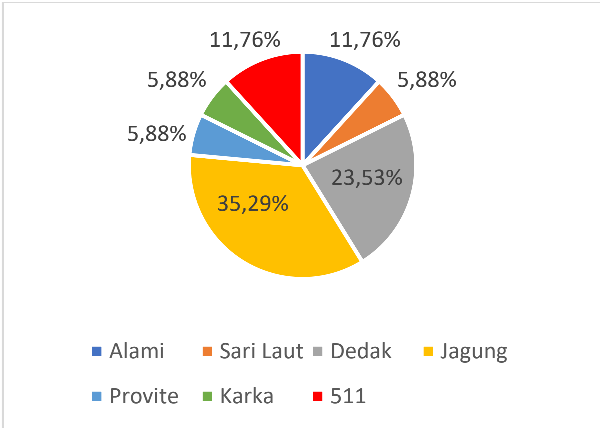


Figure 7. Use of artificial feed brands in 2021 and 2022.

Generally, each artificial feed has its own brand, and each feed has different compositions. In 2021, farmers in Weduni Village used formulated feed brands including 41.18% brand 511, 23.53% bran, 11.76% brand Sari Laut, 5.88% brand GM 88, 5.88% brand Karka, and 5.88% corn. Meanwhile, in 2022, it is known that farmers in Weduni Village used artificial feed brands, including 35.29% corn, 23.53% bran, 11.76% brand Karka, 11.76% natural feed, 5.88% brand Hi-Provite, 5.88% brand Sari Laut, and 5.88% brand 511.

The feed brands used by farmers in Kudu Hamlet, Weduni Village, in 2021 and 2022 can be categorized into two types of artificial feed: animal feed and fish feed. Animal feed consists of bran, corn, brand 511, and GM88. Meanwhile, fish feed consists of Karka, Sari Laut, Prima Feed, and Hi-Provite. Some farmers use animal feed because animal feed is less expensive than fish feed. Thus, farmers can reduce expenses on feed costs. The effect of feeding the cultivated commodities with animal feed is optimal growth and adequate nutrition fulfillment.

Economic Analysis

Table 5. Economic analysis of shrimp harvest (kg/year)

Aspek	Years 2021			Years 2022		
	Rerata ± SD	Min	Max	Rerata ± SD	Min	Max
Shrimp Harvest (kg/tahun)	181,18 ± 276,95	35	1200	180,12 ± 348,92	16	1500
Shrimp Price (Rp/kg)	46.471 ± 6.829,33	30.000	52.000	48.412±6.354,71	45.000	70.000
Total Income From Shrimp Harvest (Rp)	8.652.941 ± 13.896.891,18	1.050.000	60.000.000	8.950.000 ± 17.491.102	720.000	75.000.000

Farmers who obtained the smallest harvest explained that the low harvest was due to In 2021, the farmers obtained shrimp harvests of 181.18 ± 276.95 kg/year with the lowest harvest being 35 kg and the highest being 1200 kg. In 2022, the total shrimp harvest slightly decreased to 180.12 ± 348.92 kg/year with the lowest harvest being 16 kg and the highest being 1500 kg., ranging from 16-1500kg.

Table 6. Economic Analysis Polyculture Cultivation System

Components	Years	
	2021	2022
Total Revenue	16.923.529,41±9.681.543,877	15.294.117,65±19.956.476,18
Total Expenditure	4.215.529,42±4.922.114,76	4.185.911,76 ± 4.956.611,63
Income	12.708.000 ± 7.758.470,77	11.108.205,88 ± 15.373.833,11

The total revenue referred to in table 3 is the average gross profit from the farming activities conducted in 2021 and 2022, amounting to 16,923,529.41 ± 9,681,543.877 and 15,294,117.65 ± 15,294,117.65 respectively. Total expenditure is the overall expenditure on farming activities such as seed purchases, fertilizer purchases, feed purchases, and probiotic purchases, with an average total expenditure in 2021 and 2022 of 4,215,529.42 ± 4,922,114.76 and 4,185,911.76 ± 4,956,611.63 respectively. Income itself is the net income received by farmers from gross income minus expenditure during the farming activities, with average income in 2021 and 2022 of 12,708,000 ± 7,758,470.77 and 11,108,205.88 ± 15,373,833.11 respectively.

Having a Side Job

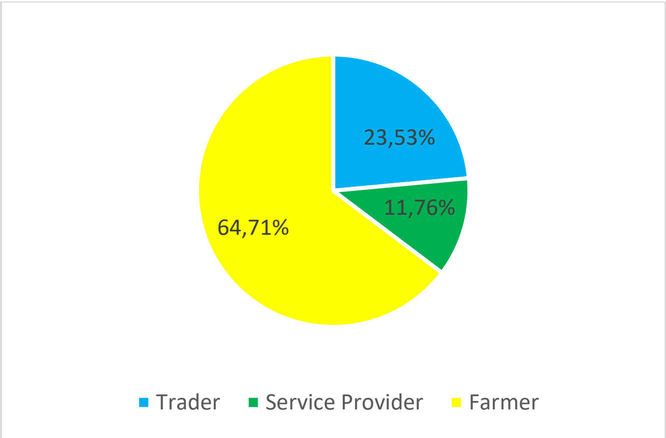


Figure 9. Side Jobs of Kudu Village Fish Farmers

Picture 9 illustrates three categories of side jobs among Weduni Village fish farmers: traders, service providers, and farmers. Fish farmers working as traders account for 23.53%, service providers for 11.76%, and farmers for 64.71%. These fish farmers have side jobs because the income from traditional fish farming activities cannot meet their daily needs, as it often fluctuates from year to year. Therefore, the fish farmers in Weduni Village do not rely solely on fish farming as their profession. Based on the research findings, they stay in the fish farming profession because extensive (traditional) fish farming activities can be done simultaneously with other side jobs.

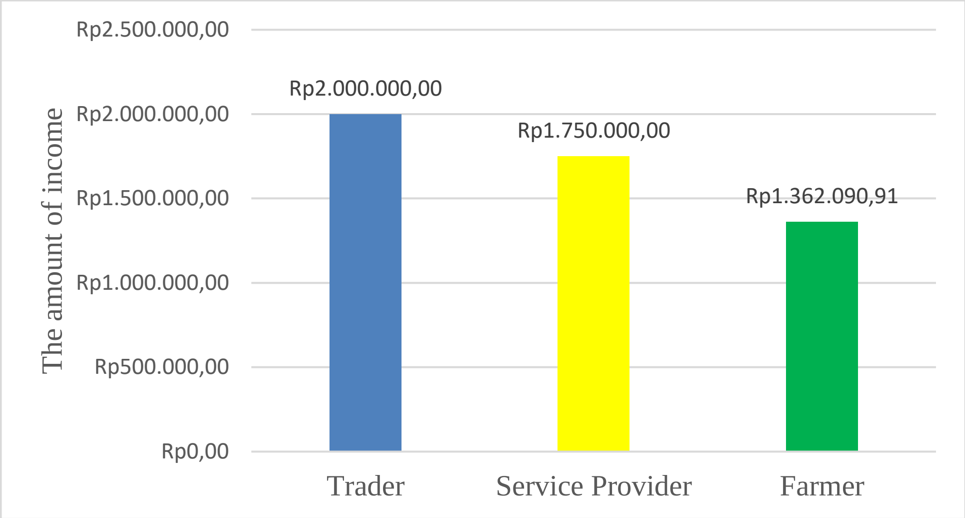


Figure 10. Side Job Income

Side jobs as traders have an income of Rp 2,000,000 ± 1,224,744.87 per month, side jobs as service providers have an income of Rp 1,750,000 ± 353,553.39 per month, and side jobs as farmers have an income of Rp 1.362.090,91±1.111.316,20per month.

Conclusions

In conclusion, the age distribution of farmers in Kudu Hamlet, Weduni Village, reveals a predominantly older demographic, with an average age of 54.29±10.60 years. These farmers have been practicing traditional vannamei shrimp farming for approximately 18 years, with the majority engaging in it as their primary occupation. Despite facing fluctuating incomes, they remain loyal to these traditional practices. Previous research suggests that farmers aged between 31 and 50 are the most productive, leveraging their experience and energy for various farming activities. Moreover, older farmers typically possess extensive experience and knowledge, which they pass on to younger generations, fostering more effective farming practices.

Education plays a pivotal role in enhancing farmers' understanding of agricultural concepts, resource management, and new technologies. Higher levels of education equip farmers with analytical skills to identify problems, understand market trends, and innovate in their farming practices, ultimately improving productivity and sustainability. However, challenges such as limited access to fertilizers, animal feed, and seeds, exacerbated by changing climate conditions, pose obstacles to traditional farmers.

Polyculture cultivation systems, widely adopted by farmers in Kudu Hamlet, facilitate increased productivity through the cultivation of multiple species, including vannamei shrimp, milkfish, and tilapia. While offering economic benefits, this approach also presents challenges, such as disease outbreaks and fluctuations in market prices. The implementation of polyculture systems requires careful consideration of costs and risk management strategies to ensure profitability and sustainability.

The choice of feed type significantly impacts shrimp yields, with artificial feed resulting in higher yields compared to natural feed. Additionally, the brand and composition of feed used by farmers vary, influenced by factors such as cost and nutritional value. Farmers also engage in side jobs to supplement their income, highlighting the need for diversified livelihood strategies.

Overall, enhancing the capacity of traditional farmers through education, technology adoption, and sustainable practices is crucial for improving their livelihoods and ensuring the long-term viability of shrimp farming in the region.

Acknowledgments

We thank Dr Guenwoo Lee and Dr Ayu Pratiwi for the support from Japan Society for the Promotion of Science (JSPS) KAKENHI and Maj and Tor Nessling Foundation are gratefully acknowledged.

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