Training Needs and Landscape Assessment of Shrimp Sector in East Java, Indonesia

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Introduction

Shrimp is the most traded aquaculture species in the International market. FAO (2020) estimated that the values of shrimp trade are about US$ 28 billion per year, with mostly from farms in Asia and Latin America. The global farmed shrimp market continues to grow faster than other aquaculture species. In Asia, intensification tends to mean higher stocking density at the expense of stringent controls from farm protocols, leading to euthrophycation, diseases, and susceptibility to climate change. There have been some positive advancements in biosecurity, and farmers are more aware of the need for greater international cooperation in biosecurity protocols.

Diseases are still a major problem for shrimp aquaculture, particularly in Asia and parts of Latin America, and it seems that every few years, new strains of disease pop up, causing farmers to resort to drugs. Food fraud in fisheries remains a concern for a large part of the global shrimp industry. The EU28 has the highest incidence of fraud for imported seafoods, including practices related to unapproved treatment and/or processing (30%), replacement, dilution and removal of products (30%), labelling (33%) and others (7%).

The Covid-19 pandemic reduced overall demand for shrimp in 2020. While international and domestic shrimp markets were characterized by strong retail trade, the foodservice sector encountered huge losses. For export market, supplies increased from the top two exporters i.e. Ecuador and Indonesia during the first half of 2020. Ecuador was supported by record low export prices and increased sales to the United States of America, while Indonesia's exports of processed shrimp grew in 2020.

The US foodservice sector that takes the lion share of shrimp sales (75%) during normal years, suffered 70-80% declines in revenue due Covid-19 in the first half of 2020. However, during summer period, shrimp sales increased as many restaurants across United States of America switched to take-away and delivery services.

Global food supply chains are severely disrupted as governments move swiftly to implement trade restrictions to protect domestic food suuplies, a move that has and still continue to impact countries dependent on food imports. Fish and aquatic food value chain is currently witnessing a medley of challenges ranging from shutdown of operations, changing consumer demands, market access and logistical problems, and transportation and border restrictions.

Indonesian Shrimp Industry at a Glance

Despite Indonesian government's ambitions to increase shrimp export values up to 250% by 2024, like many other Southeast Asian countries, shrimp farmers in Indonesia have been suffering chronic loss due to disease outbreaks. As an example, the largest shrimp farms in Lampung started to experience major loss since 2008 due to IMNV outbreaks. Overtime, Indonesian shrimp production was then shifted to other areas like West Java, East Java and West Nusa Tenggara to cover the shortage of supplies through intensification and expansion, while shrimp prices were high in 2014. The highest national shrimp production was once recorded in 2015 (300k MT) when farmers intensified their production capacity whilst also expanding new farms. However, introduction and wide spread of new diseases continued to cause national shrimp production to decline years after. Shrimp production in the last 5 years has been up and down following the trends of disease status and shrimp prices (global shrimp prices were low in 2018 due to "over supply" created by India and Ecuador).

Currently, Indonesian shrimp production is estimated about 290k MT, with around 270k MT share for export whilst the remainings are sold/marketed locally/domestic. As usual, production center like East Java continued to contribute about 10-15% from national production. Shrimp production in East Java has its peak in 2016 when intensification and expansion were recorded. For the last few years, while major shrimp production centers struggle with disease outbreaks, major shrimp farm development continued to take place along southern part of Java Island, western part of Sumatra or eastern region of Indonesia such as West Nusa Tenggara and areas across Sulawesi Island. Yet, production efforts in new areas are still challenging due to minimum infrastructure.

Table 1. Indonesian Shrimp Industry Volume Data (2014-2020)

Description	2014	2015	2016	2017	2018	2019	2020*
Shrimp Production (MT)	250,000	300,000	280,000	260,000	270,000	270,000	290,000
Feed Production (MT)	330,000	380,000	390,000	320,000	360,000	360,000	370,000
Shrimp Export (MT)	164,070	162,260	171,880	180,590	197,430	207,650	239,000

Source: Modified from MMAF (2020)

Current shrimp production centers like north/east coast of Java and Lampung/South Sumatra have shown to experience serious technical and environmental issues that led to chronic disease outbreaks. The cumulative impact of waste and cross contamination have been severely impacting the ability of the farms to perform their optimum capacity (see Photo 1 and Photo 2 below as examples). Some farms are even located in bay area or were built on mangrove areas where carrying capacity is low thus could not maintain sufficient supply of "clean" water for farming. Therefore, without proper planning and regulation, the ambitions to increase shrimp production will continue to face major challenges.

Photo 1 and Photo 2. Satellite image of large-scale shrimp farm in Lampung and Karawang, showing ponds are highly concentrated in one area and pollution trap in the coast

East Java has been famous as shrimp production center since the monodon era in 1990s and followed up with the development of "vannamei village" initiated in 2002. Situbondo and Banyuwangi are among the districts that have major intensive farms in East Java. Studies have been carried out in both districts to observe status of shrimp farming, with special focus on local policies, production status and challenges, certification, and training needs.

Shrimp Farming Status in Situbondo

Shrimp production in Situbondo has been growing overtime, from only 4600 MT in 2014 to 9700 MT in 2019 (DKP Situbondo, 2020). Most intensive shrimp farms in Situbondo are located in Panarukan (130.2 ha), Mlandingan (122.3 ha), Kapongan (99.6 ha), Banyuputih (76.8 ha) and Suboh (56.4 ha). However, total area of intensive farms in Situbondo was recorded more than 750 hectares.

Both central government and local government are fully supportive to the development of shrimp production in Situbondo. Central government has a technical unit (BPBAP Situbondo) specifically mandated for brackishwater aquaculture development located in the district. The unit is specifically tasked to conduct/disseminate aquaculture R&D, technical assistance, production technology, and laboratory testings to support regional aquaculture development. The technical unit is also regularly updating shrimp farmers and local government on the status of disease and environment under monitoring program. The results of the disease and environmental program are made available at BPBAP Situbondo.

Based on district regulation of Situbondo, the potential areas for development of farmed shrimp production were 1300 hectares, specifically on Besuki, Mlandingan, Kendit, Suboh, Panarukan, Mangaran, Kapongan, Arjasa and Banyuputih. Despite whether scientific-based carrying capacity study was made for the potential farming areas, DoF strategic program continued to promote aquaculture through the development of integrated zone for bio-industry and aquaculture innovation and development of innovation center for grouper, mud crab and vannamei innovation center.

Based on the results of site visit to DoF Situbondo in December 2020, a senior official in the office mentioned that local government has been very supportive to the development of shrimp aquaculture despite challenges on following central government regulation on the use of water and energy resources. He mentioned that shrimp farms in Situbondo have utilised 70-80% of the allocated areas stated in the legal document, meaning there is still 20-30% room for expansion. However, expansion of new farms is facing new challenges as local communities see that farms start to causing noises and odors.

Few years back, ASTIN (intensive shrimp farmers association) was established to accommodate common interests of intensive shrimp farmers in Situbondo. Currently, there are about 60 members actively participated in the association. The organization has been working with local government and BPBAP Situbondo to discuss various issues in relation to shrimp farming development, including permits and environmental management. However, 42% respondents did not see benefits of becoming member of farmer organization, as they believed that organization's activities or events still could not help solve the main issues in shrimp production (e.g. licensing/permit, disease outbreaks).

Based on interviews with 40 large-scale farmers in Situbondo, only 15% of them rented the farms from others, whilst most of them operated their own farms. All respondents raised only vannamei shrimp with average farm area of 2.5 ha. Most of them operated relatively small pond size (around 2500 m2) with similar proportion on concrete and plastic-lined type of ponds. From all respondents, only 16% did not have waste treatment ponds. For those who treated the waste, average sizes of treatment ponds were 0.18 ha.

In terms of intensity, most farms stocked the ponds at high density level from 100-250 PL/m2 with average stocking density of 140 PL/m2. Farmers also reported more than 2 crops a year. The success rate of the production was high, showed by high survival rate averaging 80% and pond productivity of 5 MT per pond or (can be said) around 20 MT per ha per crop, with 100% implementing partial harvest approach. The feeding efficiency was also high with FCR averaging 1.3 when using feeds with 31-32% protein content.

Most farms (92.5%) were well managed and were certified by Indonesian farm standard (called CBIB), while one farm was also BAP certified. The farms maintain proper recording (paper-based or electronically) for feed use and about 93% of respondents use automatic feeders. For water management, most of them (78%) use both deep well and direct intake for seawater sourcing, with average salinity of 31-32 ppt in the farm, and average 4-5% water exchange per day. They also mentioned that chemicals were used but properly recorded.

All respondents said diseases are still the primary issues in shrimp production, although all of them had standard written SOP and ~~and~~ even 25% respondents had laboratory facility. For marketing, only one respondent sold directly to processing plant while most farmers sold their harvests to middlemen.

All farms believed that certified seed had significant impact to success. Situbondo has quite many certified hatcheries, but most respondents mainly purchased from reputable hatcheries like those belong to Ayen, Agape, CPB, Ndaru Laut and Raja Benur. Agape, CPB and Raja Benur

are located in Situbondo. Some hatcheries are also holding active BAP certification as requested by international market.

In terms of social aspect, average number of farm workers were 15 people per farm, and some of them (42%) were not coming from local neighborhood. Eventhough most respondents (87.5%) said average wage was lower than standard minimum pay regulated by the government (IDR 1.94 million), most workers accepted the terms since they believed that bonus would be provided if the farms perform well. All respondents said there has been no social jealousy in regards to the recruitment policies and no cases of social dispute was recorded so far, eventhough farms are located close to community settlements (95%).

On the environmental aspect, 25% respondents believed the farms were built on mangrove areas. Most respondents did not know about EIA although most of them mentioned they had EIA document (which are not required for farms <50 ha). About 62.5% respondents had proper record of waste disposal and all farms had proper record of water quality in the farms and public waters surrounding the farms. Surprisingly, almost all respondents have not seen any support/benefit provided by government. When asked, most respondents expected government could assist farmers on permit/licensing and provide subsidy to energy costs.

Shrimp Farming Status in Banyuwangi

Historically, District of Banyuwangi was major shrimp production center in Indonesia since early 1990s during golden era of "monodon" production. Banyuwangi also pioneered the introduction of Pacific white shrimp aquaculture in late 1990s. For the last 30 years, shrimp farming in Banyuwangi has proved to stand strong against various production challenges, shrimp viral diseases in particular. Currently, Banyuwangi is transitioning to the second generation of shrimp farming, with a younger and more educated farmers play significant role in production. Banyuwangi also has the most improvement projects due to active shrimp farmer association or club.

Based on legal document, total areas allocated for shrimp farming were 1381 hectares with specific designation on Wongsorejo, Kalipuro, Banyuwangi, Kabat, Rogojampi, Muncar and Tegaldlimo. Currently, shrimp farm areas in Banyuwangi are about 1115 hectares, with utilisation rate of 80.7%. Amongst these farms, about 67.3% are intensive farms which are mainly located on Wongsorejo, Kabat, Banyuwangi, Kalipuro, and Rogojampi. Farms in Muncar and Tegaldlimo are generally extensive farms due to the nature of both locations. Total shrimp production in Banyuwangi was recorded 19974 MT in 2019 (DKP Banyuwangi, 2020).

Local government has been promoting integration of shrimp production and eco-tourism to attract tourists to come for the purpose of local income generation. To strengthen the program, the government promoted the establishment of "Pokmaswas" which is a group of local people mandated to monitor any economic activities that could impact social and environmental properties. Moreover, local government also pays more attention to shrimp farming permit renewal, ensuring farms to comply with shrimp production and eco-tourism integration.

Public election to select new administration has just completed. Previous District Head of Banyuwangi (and likely also the new one) urged the integration of shrimp farms and eco-tourism to attract people to come to Banyuwangi. Local government also urged shrimp farmers to contribute to local income and live in harmony with local people/community. Both shrimp farmers and local government are still finding ways to agree on mutual concensus to allow benefits to all parties. The local policies seemed to favor social and environmental drivers towards a more friendly and responsible shrimp farming in Banyuwangi.

As previously mentioned, most shrimp farmers in Banyuwangi were well educated and graduated from University (79%) and owned their own farms (60.7%). Uniquely, about 32% respondents said they had a "partnership" business scheme (shareholder) in the operation. All farms raised vannamei shrimp only and had average farm and pond areas of 5.5 hectares and 2900 m2 respectively. Only 25% respondents used earthen pond for farming, whilst the remaining used a combination or both plastic-lined and concrete ponds. Surprisingly, 89% respondents allocated 0.4 ha in average for waste water treatment pond.

In terms of intensity, shrimp farmers stocked the ponds at high density level, averaging 143 PL/m2 and ranging from 100-180 PL/m2. Productivity was considered high as most respondents reported high shrimp survival rate (83%). Shrimp farmers also reported more than 2 crops a year with average harvests of 5.6 MT per pond or (can be said) 19.3 MT per ha per crop. Feeding management was good as 100% respondents maintained proper recording and only 1 respondent did not use automatic feeder. FCR was recorded 1.34 in average when using feeds containing 32-33% protein.

All respondents in Banyuwangi also believed that certified seed is strongly related to farming success as all of them selected those from certified hatcheries. Most respondents purchased seed from Ndaru Laut, Raja Benur and Summa Benur hatcheries. Both Raja Benur and Summa Benur are located in Situbondo.

In terms of water quality management in farms, all farms implemented 4% water exchange per day and 71% of them used both deep well and direct intake for seawater source. Surprisingly, average salinity was only 24 ppt, showing that larger volume of water was derived from deep well in Banyuwangi compared to Situbondo. Just like farmers in Situbondo, chemicals were also used in Banyuwangi but properly recorded in log book.

Almost all respondents said that diseases were still the key challenges in shrimp production, with only one respondent said water quality is the main challenge. Although 96% respondents said they had written shrimp farming SOP and were certified by national standard (CBIB), and even 57% of them had laboratory facility, they could see that farm level certification was not enough to mitigate the risks. However, 89% respondents still believed certification is required for international marketing. In regards to marketing, 90% respondents sold the shrimp to middlemen with only 36% respondents implemented partial harvest method.

In terms of social aspect, average number of farm workers was 20 people per farm and about 40% of them were local people in average. Although 68% respondents mentioned that wage level was below standard from government regulation (IDR 2.3 million), recruitment process

did not create any social jealousy as owners/managers maintained equal rights amongst each other through provision of bonus. However, there was one conflict with local community ever recorded, eventhough only 47% farms are located nearby community villages. About 93% respondents were member of local association like shrimp club or forum for technology, but only one respondent stated of "no benefit" of being part of membership.

In terms of environmental aspect, 96% respondents said that the farms were not built on mangrove areas. But surprisingly, 82% respondents believed that they had EIA document, eventhough not required. It is believed that they mixed up between EIA document and generic environmental monitoring document. Although all respondents maintained proper record of water quality in the farms, however, only 29% and 46% respondents reported proper record of waste disposal into public waters and environmental water quality monitoring respectively.

All respondents said that government support to farmers was very poor as farmers have been struggling to renew their business permits. Shrimp farmers also felt that shrimp prices have been consistently declining thus reducing profits. Other assistances requested by farmers included some aids to support infrastructure, laboratory and subsidy to energy costs.

Certification Status

The government of Indonesia, in this regards the MMAF, has been promoting a national standard/certification called CBIB (for farm), CPIB (for hatchery) and CPPIB (for feed production). Since 2019, all standards have been merged into a single standard called IndoGAP and are listed in BSN (national standardization agency) criteria. More than 7000 aquaculture facilities were certified before the integration into IndoGAP. The IndoGAP will soon be launched this year as new standard for domestic aquaculture facility certification, involving LSPro as certification body.

Third party certifications have also been enforced to response the requirement for international marketing. BAP, for instance, has been promoted in the last 10 years to target production facility that produces specific species e.g. shrimp, which is mainly exported to US market (65%). ASC also had received good recognition from key retailers like Walmart, which is very important since Walmart sourced high volume of shrimp from Indonesia.

Third party certifications will continue to receive better perceptions, as long as the messages are delivered in the correct way. Most farmers still have yet seen the impact of certification to improving sustainability. Better collaborations amongst shrimp industry stakeholders are critical to ensure better adoption of certification standards for the purpose of food safety, quality, traceability and sustainability.

Training Needs Assessments

Shrimp farmers in Banyuwangi had the most trainings compared to those in Situbondo. Based on interviews with farmers in Situbondo, only 20% respondents received training in the past. Surprisingly, 79% respondents in Banyuwangi reported to have received trainings in the past. About 50% respondents in Situbondo reported to have received training provided by

technical people from feed companies while 37.5% respondents received it from Shrimp Club Banyuwangi. Meanwhile, 77% respondents in Banyuwangi also received training from feed companies and about 45% received from Shrimp Club Banyuwangi.

The training aspects received by respondents mainly covered the aspect of basic/advanced shrimp aquaculture, water quality management and shrimp health management. Most respondents requested advanced trainings on shrimp health management in Situbondo (50%) and Banyuwangi (37%). Some respondents were also interested in getting advanced training on water quality management for shrimp farming in Situbondo (37%) and Banyuwangi (11%). Interestingly, most respondents (44%) in Banyuwangi requested training on advanced shrimp production technology.

In terms of time and venue for training, most respondents in Situbondo preferred training to be conducted in the morning time (57%) than afternoon (43%), while respondents in Banyuwangi preferred afternoon (74%) than morning (12%). Surprisingly, no respondents in Situbondo and only 44% respondents in Banyuwangi wanted to have training on farms.

The preferences on the training topic by respondents were strongly related to the situation of shrimp farming in both study areas. Situbondo and Banyuwangi have experienced chronic disease outbreaks in the last few years. Most farmers believed that they need to improve their farm management and control, while improving self-awareness on environmental management (e.g. waste treatment and environmental monitoring). Farm control would involve stronger control on seed quality (PCR testing) and water quality (laboratory testing). Farmer organization like Shrimp Club, on the other side, continue to push and strengthen the incorporation of waste treatment for each farm.

Based on consultant's justification, training topics should cover, but not limited to, bio-security, carrying capacity for shrimp farming and environmental management and monitoring. Advanced topics could also be provided such as soil and water quality management and or shrimp feed nutrition and feeding management. The training methods should avoid 100% class tutorial, but should include site visit, laboratory exercises, and or simulation (games). Some experts from universities and feed companies should be part of the trainers. Target trainees should not only cover farmers, but also hatcheries, extensionists, and other input suppliers.

Target partners to work for the training should include Shrimp Club in Banyuwangi and Astin in Situbondo. However, if trainings are involving large number of participants at a certain location, local government should serve as co-host to ensure preparation and implementation would adhere to local regulation. Last but not least, in order to better introduce ASC certification, it is considered good also to ask people from processing plant to speak about trends on international marketing and certification requirement.

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Appendix 1. Shrimp Farmer Respondents in Banyuwangi

No	Name	GPS Location	Education	Farming Area (Hectares)	Pond Size (m2)	Number of Pond (Units)	Productivity Per Annum (MT)	Certification (if any)
1	Gunawan	(-7.931881,114.419815)	Bachelor	9	3,500	25	550	
2	Mulyanto	(-7.935947,114.421322)	High School	4	3,500	8	230	
3	Budi Sururi	(-7.938813,114.421521)	Bachelor	3	3,000	8	140	
4	Sadewo	(-7.949417,114.421685)	Bachelor	7	2,700	27	375	
5	Sadewo	(-7.956129,114.419303)	Bachelor	13	2,500	48	600	
6	Suyanto	(-7.960946,114.421689)	Diploma	4	2,500	14	200	
7	Michael	(-7.963993,114.422536)	Bachelor	18	3,000	50	600	BAP
8	Siswoto	(-7.980734,114.422570)	Bachelor	5	2,700	18	300	
9	Ansori	(-7.985924,114.424495)	High School	4.5	3,000	14	275	
10	Aminoto	(-7.983367,114.423892)	Bachelor	3	2,700	8	130	
11	Rustam	(-7.996451,114.426929)	Bachelor	6	2,500	22	300	
12	Asiung	(-8.020445,114.423656)	Bachelor	2.5	2,700	9	150	
13	Harnoko	(-8.021953,114.426518)	Bachelor	4.5	3,000	14	250	
14	Parlan/Giosun	(-8.040462,114.428022)	Bachelor	5.5	3,200	14	325	BAP
15	Sonny	(-8.044274,114.427860)	Bachelor	2	3,000	6	125	
16	Puji	(-8.372398,114.346780)	Bachelor	8	2,500	22	210	BAP
17	Adi Wijaya	(-8.375932,114.348483)	Bachelor	5.5	2,700	14	180	
18	Kristian	(-8.380643,114.348015)	Bachelor	5	2,700	15	190	
19	Sigit	(-8.363611,114.350354)	Bachelor	2	4,000	5	110	
20	Agus Widi	(-8.370102,114.349175)	Bachelor	2.3	2,700	7	120	
21	Aan Yudhi	(-8.365482,114.350293)	Diploma	6	3,300	15	190	
22	Sugik	(-8.368393,114.349322)	Bachelor	3	3,000	10	140	
23	Darminto	7°58'41.4"S 114°25'23.6"E	High School	9	2,500	31	130	BAP
24	Sutrisno	7°59'20.6"S 114°25'23.7"E	High School	12	3,000	30	210	BAP on progress
25	David Wahyu	8°09'54.2"S 114°23'40.3"E	Bachelor	11	2,500	6	42	
26	H. Ahmad Muhtarom/Rustam Effendi	8°01'30.3"S 114°25'45.5"E	Bachelor	2,7	1,820	15	48	BAP on progress
27	Bangkit Tunggul Priyadi	8°00'37.9"S 114°25'33.3"E	Bachelor	1,8	3,000	6	60	
28	M. Rozakul Amin	8°00'50.1"S 114°25'27.3"E	Bachelor	4.75	3,100	15	160	

Appendix 2. Shrimp Farmer Respondents in Situbondo

No	Name	GPS Location	Education	Farming Area (Hectare)	Pond Size (m2)	Number of Pond (Units)	Productivity Per Annum (MT)	Certification (if any)
1	Ahmad Muhlasin	(-7.708611,114.109720)	Bachelor	1.5	2,500	6	120	
2	Tarmuji	(-7.712024,113.710883)	Bachelor	1.3	1,500	9	100	
3	Suhadak	(-7.735274,113.671836)	Bachelor	2.7	3,800	7	150	
4	Hadi Asmono	(-7.722242,113.695674)	Bachelor	2.3	3,600	6	90	
5	Samsul	(-7.698951,113.915744)	Bachelor	2.6	2,500	17	350	
6	Salman alFaris	(-7.687823,113.883522)	Bachelor	0.98	1,000	10	70	
7	Habib	(-7.646054,113.985782)	Bachelor	2.6	2,500	8	80	
8	Edi Istiono	(-7.715120,114.147522)	Bachelor	2.3	2,000	10	80	
9	Budi	(-7.655256,113.971000)	Bachelor	4.7	3,000	12	135	
10	Aming	(-7.619986,114.050291)	Bachelor	5.8	2,300	26	230	
11	Eko Sucipto	(-7.718384,114.158252)	Bachelor	3.5	3,000	11	150	
12	Puji	(-7.707409,114.107583)	Bachelor	0.8	2,500	3	40	
13	Winarso	(-7.624677,114.059391)	Bachelor	0.9	2,000	3	25	
14	Rofiq	(-7.748287,114.304514)	Bachelor	4.2	3,500	12	180	
15	Kusbianto	(-7.697656,113.913335)	Bachelor	1.8	2,700	5	60	
16	Ade	(-7.747619,114.287664)	Bachelor	1.9	2,000	8	65	
17	Andar	(-7.694273,114.096243)	Diploma	2.7	2,000	10	75	
18	Suki	(-7.692819,114.093567)	Diploma	3.7	3,500	14	120	
19	Adi	(-7.741945,114.285710)	Bachelor	7	3,000	26	270	
20	Eko	(-7.738200,113.758472)	Bachelor	1.3	2,500	4	50	
21	Gatot	(-7.734372,113.783990)	Bachelor	1.2	3,000	3	90	
22	Herman	(-7.711773,113.707119)	Bachelor	1.9	2,800	5	70	
23	Sugeng	(-7.650823,113.982697)	Bachelor	3.5	3,000	15	250	
24	Setyo Gunawan	(-7.669526,114.082828)	Bachelor	0.7	1,500	3	10	
25	Didik	(-7.710963,113.710263)	Bachelor	1.8	3,000	7	60	
26	Himawan Haryo Satrio	(-7.619214,114.019833)	Bachelor	0.1	200	5	12	
27	Ponadi	(-7.713537,113.705827)	Bachelor	1.7	2,500	6	60	
28	Ilham Farihan	(-7.627798,114.060746)	Bachelor	4.2	3,000	12	150	
29	Yahya	(-7.713485,113.707324)	Bachelor	0.7	2,000	3	30	
30	Sutrisno	(-7.624340,114.057886)	High School	3.8	3,500	12	140	
31	Nukman	(-7.699165,114.098329)	Bachelor	1.6	2,500	5	50	
32	Yuyung	(-7.622381,114.056012)	Bachelor	1.9	2,400	8	70	
33	Untung	(-7.656790,113.970379)	Bachelor	3.2	2,500	12	120	
34	Eko Irianto	(-7.622231,114.018426)	Bachelor	5.8	3,000	18	275	BAP
35	Marido Fandi Setiawan	(-7.619066,114.019991)	Bachelor	0.8	2,600	3	36	
36	Subianto	(-7.700842,113.918187)	Bachelor	2	2,500	8	80	
37	Soleh	(-7.715575,113.703182)	Diploma	0.8	1,800	4	30	
38	Anang	(-7.738333,113.759522)	Bachelor	1.9	2,700	7	80	
39	Agung	(-7.712213,114.129913)	Bachelor	4	3,000	10	120	
40	Wasis	(-7.691292,114.092124)	Bachelor	6	2,000	25	180	

Appendix 3. Input Supplier Respondents in Banyuwangi

No	Nama	Education	Company	Product	Total Sales per Annum
1	Ahmad Fauzi Rizal	Bachelor	CJ Feed	Feeds	7,000 MT
2	Habib Adi	Bachelor	Haida Indonesia	Feeds	900 MT
3	Nanang L	Bachelor	Suri Tani Pemuka	Feeds	6,000 MT
4	Yuka Kurnia	Bachelor	Grobest Indomakmur	Feeds	2,500 MT
5	Gilang L	Bachelor	Wonokoyo	Feeds	900 MT
6	Yulianto Sadewo	Bachelor	Sejahtera Usaha Bersama	Feed supplement	IDR 1.5 billion
7	Alfian A	Bachelor	Bakti Anugrah Kreasindo	Probiotic	8,000 Liters
8	Sugeng Haryadi	Bachelor	Suri Tani Pemuka	Shrimp PL	450 million PL
9	Sujono	High School	Hisenor Hatchery	Shrimp PL	550 million PL
10	M. Dindin	Bachelor	Prima Larva	Shrimp PL	750 million PL

Appendix 4. Input Supplier Respondents in Situbondo

No	Name	Education	Company	Product	Total Sales per Annum
1	Lutfi Anshori	Bachelor	CJ Feed	Feeds	9,000 MT
2	Annas	Diploma	Suri Tani Pemuka	Feeds	5,500 MT
3	Krisna Aji	Diploma	Matahari Sakti	Feeds	1,400 MT
4	Muhammad Yahya	Diploma	Evergreen	Feeds	900 MT
5	Benny	Bachelor	Benur MS	Shrimp PL	250 million PL
6	M. Lukman	Bachelor	Raja Benur	Shrimp PL	750 million PL
7	Rizky	Bachelor	Ndaru Laut	Shrimp PL	950 million PL
8	Sartoyo	Bachelor	CV Garuda Mas	Drug and feed supplement	IDR 2.5 billion
9	M. Mashuri	Bachelor	CV. Bahari Pradipta	Drug and feed supplement	IDR 1.5 billion
10	Yuanda Dwi P	Bachelor	Sejahtera Usaha Berjaya	Drug and feed supplement	IDR 2 billion