ADOPTION OF GOOD MANAGEMENT PRACTICE (GMP) IN SMALL AND MEDIUM SCALE VANNAMEI SHRIMP FARMS ON THE NORTHERN SHORE OF EAST JAVA

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ABSTRACT

The objectives of this research were to describe the value chain of Vannamei shrimp industry on the northern shore of East Java, to identify the current management practice that is being implemented by small to medium scale shrimp farmers, to analyze the level of adoption of Good Management Practice by small to medium scale shrimp farmers and to identify the challenges that prevent small to medium scale farmers from adopting Good Management Practice. This research utilized descriptive qualitative method using multiple-case study. Data collection was conducted through interviews with experts and various actors in shrimp industry and interviews and observations in shrimp farms. From this research it can be concluded that the farming activity gives the largest contribution in final product value, that the current management practice in observed intensive Vannamei shrimp farms is in line with recommendations of various institutions with the exception of waste management, that the observed intensive Vannamei shrimp farms have high adoption level of Good Management Practice (GMP) for various stages of shrimp farming activity with the exception of waste management, and that there is a tendency that farmers follow the good practices that have direct impact to the success of the production, and that the main challenges of GMP adoption are the lack of a comprehensive GMP manual, the lack of structured technology dissemination, and the lack of incentive for the farmers to adopt waste management practices.

Keywords: Litopenaeus Vannamei, Shrimp Farm, Good Management Practice, Value Chain, Multiple-Case Study

ABSTRAK

Tujuan penelitian ini adalah untuk menjabarkan rantai nilai industri udang Vannamei di pantai utara Pulau Jawa, mengidentifikasi bentuk management practice yang diterapkan oleh petambak skala kecil dan menengah saat ini, menganalisa tingkat adopsi Good Management Practice (GMP) oleh petambak skala kecil dan menengah, dan mengidentifikasi kendala-kendala yang menjadi hambatan bagi petambak untuk mengadopsi Good Management Practice. Penelitian dilakukan dengan pendekatan metode deskriptif kualitatif dengan studi kasus berganda. Pengumpulan data dilakukan melalui wawancara dengan pakar dan praktisi di industri udang, serta wawancara dan pengamatan lapangan di tambak udang. Pemilihan responden dilakukan dengan cara purposif. Kesimpulan dari penelitian ini adalah bahwa kegiatan tambak memberikan kontribusi paling besar terhadap nilai akhir produk, bahwa management practice saat ini pada tambak udang Vannamei yang sudah sejalan dengan rekomendasi berbagai institusi untuk berbagai tahapan budidaya kecuali manajemen limbah, bahwa tambak udang Vannamei yang diamati memiliki tingkat adopsi GMP yang tinggi untuk berbagai tahapan budidaya kecuali manajemen limbah serta adanya kecenderungan untuk hanya melakukan good practices yang mempunyai dampak langsung terhadap keberhasilan panen, dan bahwa kendala utama adopsi GMP adalah tidak tersedianya panduan komprehensif, tidak adanya kegiatan penyebaran teknologi yang terstruktur, dan tidak adanya insentif bagi petambak untuk melakukan pengolahan limbah.

Kata Kunci: Litopenaeus Vannamei, Tambak Udang, Good Management Practice, Rantai Nilai, Studi Kasus Berganda

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INTRODUCTION

Indonesia has great comparative advantages in aquaculture industry which can be built into nationwide competitiveness to increase sustainability. Aquaculture product comprises 2,47% of total GDP and shrimp export comprises 18,7% volume (or 43,2% value) of total aquaculture product. East java has a great potential for aquaculture production which contributes to national production.

In former researches value chain of shrimp industry in Indonesia was mapped and some of possible gaps were identified. The basic value chain of shrimp industry in Indonesia consists of six main functions/actors, which are broodstocking, hatchery, farming, processing, exporting and overseas distributor. Among all activities, farming activity has the greatest contribution in the final product value of shrimp industry (46,1% for Vannamei shrimp – Litopenaeus Vannamei). Out of the identified gaps, poor management practice at the farm resulting in low productivity was selected as the focus of this research.

Based on various former researches (FIAS, 2006 and IRA, 2005), some possible gaps in shrimp industry in Indonesia were identified:

1. Inability to comply with international health and safety standard.
2. Crucial environmental compliance with tighter and more stringent traceability standard.
3. Capital problem faced by small scale farmers.
4. Poor quality brood stock.
5. High cost shrimp feed.
6. Poor management practice at the farm resulting in low productivity.

Considering that farming activity has a great contribution in the final product value of shrimp industry and that there is a room for improvement on the productivity in small to medium scale farms, this research was focused to address the last gap in the list.

Several Good Management Practice manuals or guidelines have been issued by various institutions or government body, locally, nationwide, regionally and internationally. Those institutions are Ministry of Marine Affairs and Fisheries Republic of Indonesia (Kementerian Kelautan dan Perikanan Republik Indonesia or DKP), National Standardization Agency of Indonesia (Badan Standardisasi Nasional or BSN), Southeast Asian Fisheries Development Center – SEAFDEC, Network of Aquaculture Center in Asia-Pacific (NACA) and GlobalG.A.P. In this research a conjunction of the Good Management Practice manuals was used as a starting point to identify the adoption level with the emphasis on the production management aspects.

The objectives of this research were (1) to describe the value chain of Vannamei shrimp industry on the northern shore of East Java, (2) to identify the current management practice that is being implemented by small to medium scale shrimp farmers, (3) to analyze the level of adoption of Good Management Practice by small to medium scale shrimp farmers and (4) to identify the challenges that prevent small to medium scale farmers from adopting Good Management Practice.

This research was focused on small to medium scale shrimp farms with net operating area less than 10 hectares that cultivate Vannamei shrimp using intensive methods on the northern shore of East Java.

METHODOLOGY

Location and Time Frame

This research was conducted in various places in Indonesia. Literature study and interview with experts was conducted in Bogor, Jakarta, Surabaya and Situbondo. Interview and observation of small to medium scale shrimp farmers was conducted in northern shore of East Java, in the regencies of Probolinggo and Situbondo. The research was conducted from September to December 2010.

Research Method

This research utilized descriptive method with qualitative technique using multiple-case study. This research comprised literature study, interview with experts from shrimp industry, and interview and observation with small to medium scale farmers on the northern shore of East Java. Current and local shrimp value chain was re-mapped based on interviews with experts and various actors along the value chain.

Data Requirement and Data Source

Data collection involved both primary and secondary data. Primary data was acquired through individual depth interviews and observations.

The main sources of secondary data are the Library and website of the Ministry of Marine Affairs and Fisheries Republic of Indonesia (Kementerian Kelautan dan Perikanan Republik Indonesia or DKP) and websites of various national, regional and international institutions or organizations, such as GLOBALG.A.P., Southeast Asian Fisheries Development Center (SEAFDEC), and Network of Aquaculture Centres in Asia-Pacific (NACA), National Standardization Agency of Indonesia (BSN), Food and Agriculture Organization (FAO), and Government of East Java Province.

Data Collection Methods

Data collection was conducted through individual depth interviews with experts and various actors in shrimp industry in Indonesia and individual depth interviews along with observations for selected shrimp farmers.

Respondents Selection

Expert respondents were purposively selected based on their expertise. Representative of various actors of the value chain were also selected as expert panel. Small and medium scale farmers were selected based on the feasibility and perceived level of Good Management Practice adoption to cover various levels of adoption.

Data Analysis Methods

The general strategy to analyze case-study data was to develop a descriptive framework for organizing the case study. A conjunction of Pattern Matching, Explanation Building and Cross-Case Synthesis techniques was utilized to analyse collected data with the emphasis on the Cross-Case Synthesis technique. Framework for organizing the case study was based on the basic steps that are commonly found in the GMP documents. Those basic steps are:

1. Site Selection and Pond Construction.
2. Pond Preparation.
3. Postlarvae Selection and Stocking.
4. Water Management.
5. Feed and Feeding Management.
6. Health Management and Chemical Utilization.
7. Waste Management.
8. Handling and Harvest Management.

RESULTS AND DISCUSSIONS

Value Chain

Figure 1 depicts the typical value chain of Vannamei shrimp industry in East Java, especially for the regencies of Probolinggo and Situbondo. The actors involved in this industry are categorized into four parts:

1. Producers: broodstock/nauplii centres, hatcheries and farms.
2. Processors and distributors: "suppliers" (collectors), "cold storages" (processors) and local middlemen and exporters.
3. Consumers: foreign market and local market.
4. Supporting actors: manufactured feed, fresh feed, additive and vitamin, probiotics, equipment, electricity and fuel, chemical and laboratory services.

Each actor in the value chain has a unique contribution to the success of the Vannamei shrimp industry in general. Each actor also finds specific challenges in the activity.

Product value breakdown for exported frozen shrimp was calculated using primary data collected in this research as well as derivation of secondary data from Data Bank of East Java Province Government. As shown in Table 1, farming activity has the greatest contribution of the product value breakdown. As additional information this research discovered the fact that manufactured feed played a big role in this value chain. Approximately 43% of the value created in the farming activity comes from manufactured feed (hence 26% of the final product value).

Table 1. Product Value Breakdown for Exported Frozen Shrimp

Activity	Value Added	Cumulative Value
Broodstock	0.1%	0.1%
Hatchery	3.4%	3.4%
Farming	56.0%	59.4%
Cold Storage and Exporting	40.6%	100.0%

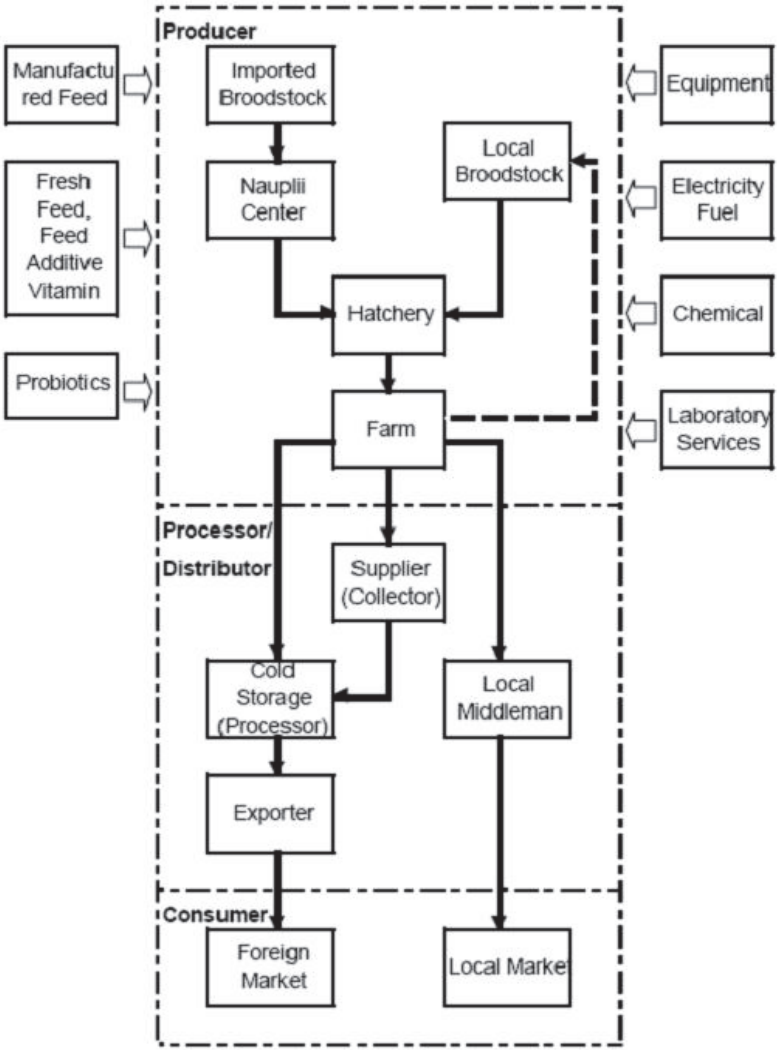

Figure 1. Value Chain of Vannamei Shrimp Industry in East Java

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Current Management Practice and GMP Adoption Level

Background Information of the Selected Farms

The cross-case analysis is based on data collected from five shrimp farms. As shown in Table 2, four intensive shrimp farms with stocking density 100 – 125 pcs/m^2 were selected for this study. Only one farm with stocking density 20 – 25 pcs/m^2 was selected to represent traditional shrimp farming. The traditional farm served as a comparison, while more attention had been given to intensive shrimp farms where Good Management Practice was considerably more applicable.

Out of four intensive farms, two selected farms already had acquired CBIB certificates (Cara Budidaya Ikan yang Baik, a translation of Good Aquaculture Practice). Two farms did not have or were in the process of obtaining CBIB certificates at the time of data collection. The purpose of this arrangement was to cover various GMP adoption levels. To ensure confidentiality, dual coding schemes were used in the data tables that appear in this report for intensive farms. The traditional farm is consistently designated as Farm A. For the intensive farms, the farm designated as Farm B in one table is not necessarily the same farm as the one designated as Farm B in another table.

Table 2. Composition of Farms Selection

Farm	Type of Culture	CBIB Certified	Nett Active Operating Area (Ha)
A	Traditional	No	0.3
B	Intensive	No	0.6
C	Intensive	No	2.0
D	Intensive	Yes	4.4
E	Intensive	Yes	5.9

Stages in farming activity are shown in Figure 2. Detailed discussion about the current management practice and GMP adoption level is broken down to separate sections.

Site Selection and Pond Construction

In the Site Selection and Pond Construction Stage, the overall GMP adoption level for the observed intensive farms is high and it is medium for the observed traditional farm.

The farms are all located in the aquacultural area along the north coast of Probolinggo and Situbondo. Mangrove existed naturally in some of the investigated area. Some farmers had attempted to plant mangrove on the coastal part of the farm. Soil structure is mostly sand soil type which is not suitable for embankments. This problem has been solved by cementing the embankments and pond bottoms, using plastic liners, or placing backfill soil.

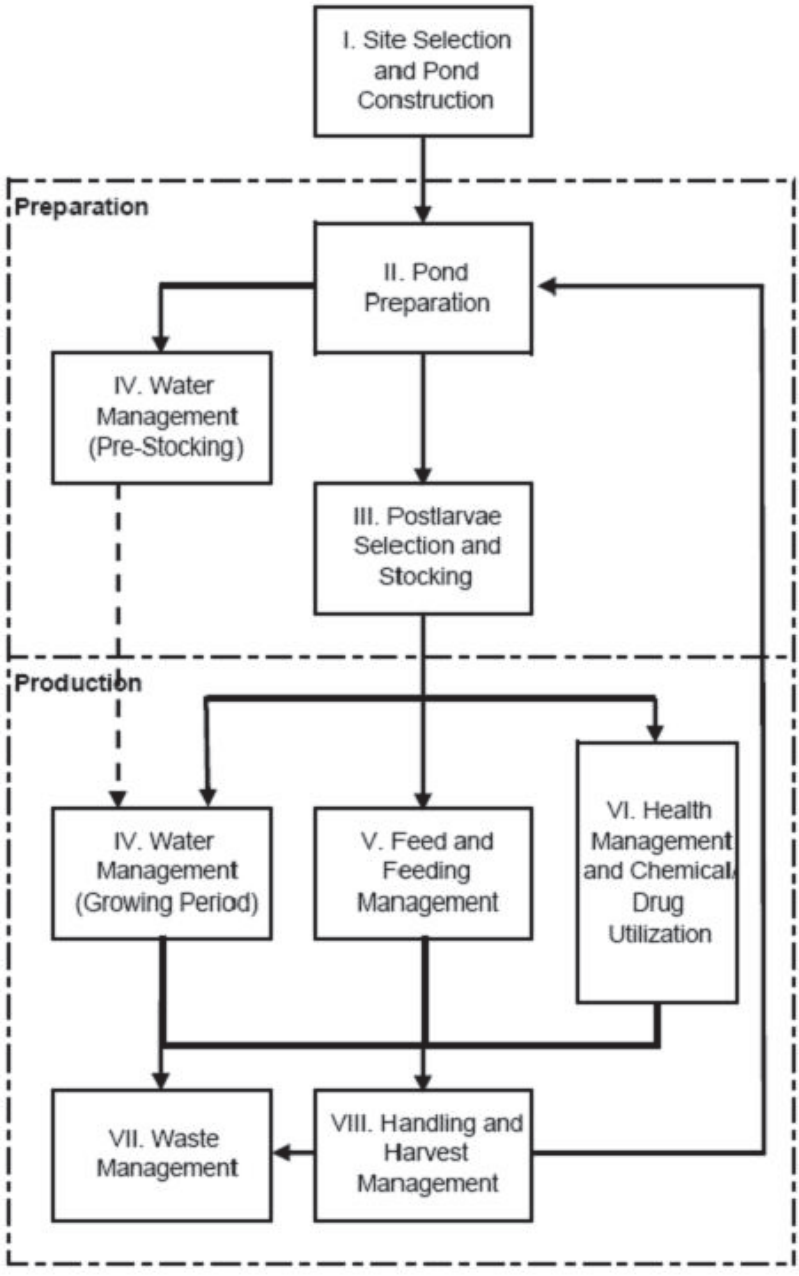

Figure 2. Shrimp Farming Stages

In four intensive farms, the growing ponds were constructed as recommended by GMP. All four farms built separate canals for intake and discharge water and had designated ponds to serve as reservoirs. None of the intensive farms had settling ponds. Most intensive farms were equipped with water gates and central drain.

The assessment of GMP adoption for traditional pond construction is not thoroughly applicable. The traditional farm had a single naturally existing pond. There was only one canal for water intake and water discharge. With the given condition, shrimp farming is still feasible with reduced stocking density.

All five farms have filters installed at required points. Observed intensive farms also placed fence and other means to prevent unwanted trespassing. This practice is to prevent shrimp loss and disease spread by predator. Most observed intensive farms have designated place to function as feed and chemical storage and proper sanitary facilities.

Pond Preparation

The overall GMP adoption level for pond preparation is high for the observed intensive farms and low for the observed traditional farm. Some aspects in this assessment are not applicable for intensive farms with plastic or cement pond bottom.

After harvesting period, all four intensive farms followed the recommended procedure of draining the growing ponds, removing the sediments and drying out pond bottoms. This is an opportunity for the intensive farmers to repair any leakage or damage of pond embankments before the next crop starts.

After the ponds had been dried completely, three intensive farms applied disinfectant to control pest and predator. Farmers also monitored the acidity of the soil, and applied agricultural lime to neutralize the pH if required. This is not applicable for the farm that used plastic liner on the pond bottoms.

The traditional farm, however, did not have the capability to do the procedures as described above. It is not possible to drain the pond completely with the existing construction and equipment. The farmer allowed some fallow period between the crops without doing any soil treatment.

Postlarvae Selection and Stocking

For the postlarvae selection and stocking stage, GMP adoption level is high for all observed farms. The traditional farm received good quality postlarvae and technical assistance from a nearby hatchery.

In line with GMP recommendation, all five farms obtained high quality SPF (Specific Pathogen Free) postlarvae from certified hatcheries, which had undergone physical inspection, PCR (Polymerase Chain Reaction) laboratory test, and salinity stress test before being delivered to the farms.

In all five farms the average postlarvae age for stocking was PL-10. The stocking density for all five farms was 25 pieces per square meter for the traditional farm and 100 – 150 pieces per square meter for intensive farms as recommended by GMP manuals.

All five farms allowed acclimatization period during stocking stage. The traditional farm had a special stocking section in the middle of the pond.

Water Management

The overall GMP adoption level on water management is high for the intensive farms and medium for the traditional farm.

Intensive farms utilized treated water from the reservoir to fill the growing ponds during the pre-stocking period as well as during growing period. This practice is not applicable for the traditional farm, which only had a single pond.

All observed intensive farms used closed system where the water exchange was kept to minimum. In the traditional farm, water intake and discharge, as well as water level depends on the current sea level and the natural tide and ebb of the sea.

The common aeration systems that used in intensive farms were paddlewheel and turbo jet. The traditional farm did not use aeration system. Natural level of dissolved oxygen was sufficient for the shrimp with low stocking density. In line with GMP manuals, all five farms filtered the water before entering the ponds. All farms applied disinfectant to treat the water, monitored and managed the plankton and applied probiotics as recommended by the manuals or

brochures. These practices were not adopted by the traditional farm due to capability limitation.

All observed intensive farms monitored the water parameter regularly as recommended in GMP manuals. The traditional farm conducted simple visual observation. When problems arise, the farm advisor will offer simple solution and recommendations.

Feed and Feeding Management

Feed and Feeding Management in all observed farms are in line with GMP manuals, despite the different type of feed used in intensive and traditional farms. Observed intensive farms utilized manufactured feed whereas the traditional farm utilized existing natural fresh feed.

Four observed intensive farms used high quality feed from approved feed manufacturer, followed feed schedule and adjusted feed quantity based on the result of the previous feeding, which can be determined by feed tray monitoring. Three intensive farms developed records and monitored the feeding progress.

The observed traditional farm has taken the advantage of sea worms that exist naturally in the pond in abundance. The low stocking density allowed this practice to be successful. The farmer used neither manufactured feed nor feed additives. Feed monitoring was done by conducting physical observation of the shrimp (for example examining the intestines). Adjustment to the feeding capacity of the farm has been conducted in crop level by postponing next crop or reducing stocking density.

Health Management and Chemical/Drug Utilization

The GMP adoption level for health management and chemical or drug utilization is high for the intensive farms and medium for the traditional farm.

Growth monitoring in four intensive farms was done by conducting sampling regularly. Information obtained includes Survival Rate (SR), Average Daily Gain (ADG), biomass and Feed Conversion Ration (FCR). Health monitoring in intensive farms was conducted regularly. Disease prevention in the observed intensive farms was conducted by giving the suitable treatment based on the result of water monitoring and health monitoring. Disease outbreak was prevented by localizing the disease using various means.

In the observed traditional farm, shrimp growth and health were monitored by regular simple visual inspection. There was no special treatment to prevent disease.

All observed farms claimed their full compliance to the restriction of antibiotics utilization. For the intensive farms this was also closely monitored by their collector or cold storage. Shrimps were tested before harvesting and had to be free of antibiotics residual in order to qualify for transaction.

Waste Management

Waste management is the only stage in this research where the GMP adoption level is low for traditional and intensive farms. None of the observed farms had facility to treat effluent. All observed intensive farms removed solid waste material after the pond had been drained. The traditional farmer did the best effort to remove solid waste from the pond despite unfeasibility of complete drainage.

Handling and Harvest Management

GMP adoption level for handling and harvest management is high for intensive farms and medium for the traditional farm. Collector (also called supplier) has a role in the way handling and harvest is managed. Target market also determines how harvest is handled. None of the farmers did regular pre-harvest treatment. All observed intensive farmers used proper equipment to harvest, such as harvest net and bag net or harvest basket. The buyers for intensive farms product have a high standard of handling the harvest in an efficient manner. Harvest from the pond were taken to a designated area where the shrimps got sorted, weighted and placed immediately in special container with ice and shrimps in layers.

The traditional farmer did partial harvest every few weeks, on average 50 kg per harvest. The harvest was usually sold to local middlemen, who brought the harvest to the local market.

Overall Adoption Level

Overall GMP adoption level is high for intensive farms and medium for traditional farm, as shown in Table 3.

Table 3. Adoption Level of Observed Farms

Stage	Farm				
	A	B	C	D	E
I. Site Selection and Pond Construction	med	high	high	high	high
II. Pond Preparation	low	high	high	high	high
III. Postlarvae Selection and Stocking	high	high	high	high	high
IV. Water Management	med	high	high	high	high
V. Feed and Feeding Management	high	high	high	high	high
VI. Health Management and Chemical/ Drug Utilization	med	high	high	high	high
VII. Waste Management	low	low	low	low	low
VIII. Handling and Harvest Management	med	high	high	high	high
Overall Adoption Level	med	high	high	high	high

The observed intensive farms consistently showed a high GMP adoption level for all stages except waste management. There is no significance difference between intensive farms with CBIB certificates and those without CBIB certificates.

The traditional farms showed mixed level of GMP adoption. It is high for postlarvae selection and stocking stage and for feed and feeding management stage. It is low for pond preparation and waste management. For other stages it showed a medium level of adoption.

This research shows a tendency that farmers follow the good practices that have direct impact to the success of the crop. The success has been a natural incentive to adopt certain steps or practice. Waste management that has long term impact has not received the same attention or priority.

Another factor that may contribute to the high GMP adoption level is the business consideration. It is possible that the farms that had not adopted GMP had to endure successive failure and therefore could not stay in the business.

GMP manuals used as a starting point were focused more on the technical aspects of the management practice. It did not give much attention to environmental, social, organizational and legislative aspects of the shrimp farming. Food safety, traceability and procedure documentation issues were not discussed in detail. Further research is required to cover those areas.

Challenges of GMP Adoption

The main focus of discussion in this section is the intensive farm. Despite the high adoption level, intensive farmer found challenges that prevent the adoption or that make it more difficult to adopt.

The first challenge was the unavailability of a comprehensive manual. The manuals that are available, if any, are not adequate to cover the intricate nature of the business. According to most farmers, shrimp farming is a highly complex and complicated activities, where the aspects are interrelated to one another. Therefore following the recommendation in the manuals alone do not guarantee the success of the production. Some of the existing manuals were also outdated, and there have not been a revision for many years. More information and technology update have to be searched from other sources.

There is no structured way of technology dissemination in shrimp farming. Some farmers were not aware of the existence of manuals from government or other formal institution. Information sharing has been done sporadically, counting more on semi-formal and informal farmer-to-farmer information exchange.

The semi-formal information sharing occurs in the form of associations, for example Indonesian Aquaculture Society (Masyarakat Akuakultur Indonesia or MAI), Indonesian Fishery Product Processing and Marketing Association (Asosiasi Pengusaha Pengolahan & Pemasaran Produk Perikanan Indonesia or AP5I) and Shrimp Club Indonesia (SCI). These associations conduct seminars, trainings and discussions regularly. Another source of information sharing and technology transfer is the technical service groups that are promoted by feed manufacturer.

Regarding the low GMP adoption level for waste management, it was concluded from the discussion that most farmers were reluctant to adopt the recommended practice, despite their awareness that it is important

for the society as well as for their own farms to preserve the environment. Waste management was considered to have negative impact on the profit and represented a loss opportunity. There was no financial incentive to encourage the farmers to do a proper waste management.

The capital issue had been predicted as a challenge for GMP adoption. Despite the difficulty to get financial aid from formal institution, this is not perceived as a major issue. In the investigated area it is common that the intensive farmers mostly do the farming activity as their secondary business and have other business with less degree of uncertainty as their primary source of income.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The actors involved in shrimp industry are producers (functioning in broodstock, hatchery and farming activities), processors and distributors (functioning in processing and exporting), consumers and supporting actors. Product value breakdown for exported shrimp was 0,1% for broodstock, 3,4% for hatchery, 56% for farming activity and 40,6% for cold storage (processing) and exporting.

From this research it can be concluded that the current management practice in observed intensive Vannamei shrimp farms on the northern shore of East Java is in line with recommendations of various institutions, with the exception of waste management.

It can also be concluded that the observed intensive Vannamei shrimp farms on the northern shore of East Java have a high adoption level of Good Management Practice (GMP) for various stages of shrimp farming activity, with the exception of waste management.

The main challenge is to create a comprehensive GMP manual that is applicable thoroughly despite the intricacy of the shrimp farming activity, and to ensure that the information sharing and technology dissemination can be done in all levels of farming activity. Another challenge is to create an incentive for the farmers to adopt recommended practices for waste management. Capital problem has been a minor challenge, and mitigation of this issue may encourage higher GMP adoption level among the shrimp farmers.

Recommendations

Considering the intricacy of the shrimp farming activity, it is recommended that more focus should be given to information sharing and technology dissemination. It is suggested that it should be a joint effort by various institution. Existing associations can function as the closest point to the farmers. Formal institution can give the contribution by updating the information on a regular basis.

Regarding the low GMP adoption in waste management, it is recommended that a form of incentive should be created to encourage farmer to adopt this practice.

This research has given attention to the technical and production management aspects. It is recommended that in the next research more attention be given to social, environmental, social, organizational and legislative aspects of the shrimp farming. Manufactured feed, which plays a big role in shrimp industry, may also be considered as an interesting topic for further research.

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