14. SHRIMP

14.1. Overview of Shrimp Production in South Sulawesi

Shrimp farming has been practised intensive in South Sulawesi since 1950’s. Shrimps were traditionally cultivated in in ponds (tambak) combined with fishes, without significantly altering the mangrove forest. Due to recent increase in market demand, the method has been changed into intensive and semi-intensive, with much less respect to local ecosystems and people. The introduction of modern technology started in 1971, when the Indonesian government built the first hatchery in South Sulawesi. With the support of the FAO and UNEP, the government set up The Brackishwater Aquaculture Development Center (BPPP) in Jepara (Central Java) in 1974. By 1989, more than one hundred hatchery units had been established in the country.

In 1984 the Indonesian government initiated a national program, known as INTAM (Intensify Tambak --shrimp pond), to intensify shrimp farming and at the same time to expand shrimp ponds in new locations. Between 1983 and 1984, the Asian Development Bank and the World Bank financially assisted several major shrimp farming projects. By the end of the 1980s, the Nucleus Estate Smallholders Scheme (NESS) was introduced into shrimp farming and very large scale shrimp farms started to be planned and developed. The area covered by ponds increased from 174,600 hectares in 1977 to 231,460 in 1989 and 305,500 in 1998.

World Rainforest Movement (WRM) had reported that in recent years, single shrimp farms covering up to 170,000 hectares have been planned and the government said that 860,000 hectares of mangrove forests (about 25% of Indonesian mangrove forest) are available to be converted into shrimp ponds. According to the government program Protekan 2003 (Program to Increase Fishery Export), the Agricultural Department intends to achieve an export volume of approximately 677,800 tonnes by 2003 against 97,228 tonnes in 1989 and 117,847 tonnes in 1998. One reason for such expansion is that shrimp exports earned precious foreign currency to Indonesia during the financial meltdown of 1997-98, so the government wants now to exploit as much as possible the foreign currency potential of shrimp farming, while ignoring the severe impacts on the local environment and people that are associated with industrial shrimp farming. Since 1992, shrimp production has been affected by virus attacks as in many other countries. Many ponds have been abandoned in Java and South Sulawesi, and shrimp investors are looking for new places to exploit. As a respond to virus attack, the government decided to import the species Penaeus Vannamei from South America, a controversial decision given that not enough studies have been conducted on the potential impacts of introducing a new species in the country.

Regarding social impacts, shrimp farming has generated severe tensions and conflicts between local people and outside workers, within communities, and between local people and investors/companies. One of the main reasons for conflict has been land grabbing and stealing. Supported by government agencies and police, companies force the local people to give up their land with inappropriate compensation or even with no compensation at all. In order to expand the farming operation to 170,000 hectares, during the year 2000 the company built water canals through local people's lands, creating further tensions and conflict. Some of the local people run traditional shrimp farming. The company moved in with the protection of the army and police.
In conclusion, the change from traditional to industrial shrimp farming that is rapidly taking place in Indonesia might in the short term benefit the government and the large-scale shrimp investors due to foreign currency generation, but the environmental and social costs associated with the industry by far outstrip the benefits.

14.2. Product Characteristics

The increased demand for Black Tiger Shrimp in world markets has encouraged many developing countries including Indonesia to enter into the practice of shrimp farming. In Indonesia, the South Sulawesi Province is one of the largest producers of Black Tiger Shrimp. In South Sulawesi Province, there are three regency (Pinrang, Bone and Wajo) that have potential area for Black Tiger Shrimp cultivation. Especially for Kabupaten Pinrang, they produce ± 2233.95 tons / yr of Black Tiger Shrimp (source : Fisheries and Marine Kabupaten Pinrang, 2007). The largest export markets for Thai Black Tiger Shrimp are the United States and Japan and the demand is increasing yearly. In Kabupaten Pinrang, the Shrimp yields in ponds have already increased by application of modern farming techniques such as intensification of culture operation by regularization of pond size, increasing stocking rate, employment of aeration, application of formulated feed, etc. Its mean a considerable increase of financial and technological inputs, which most small farmers in many place of shrimp aquaculture including Kabupaten Pinrang may be able to afford.

Several research studies has been conducted and results showed that the natural food produced in a shrimp pond through fertilization is not fully consumed in the first two months at a stocking rate of 5,000 post larvae per hectare. Research studies have demonstrated that the natural food produced by organic and inorganic fertilization using the traditional practice can sustain an optimal growth of shrimp at a density of 20,000 post larvae per hectare for a period of 60 days. Supplementary feeding is needed to sustain the growth of the shrimps after 60 days by feeding with formulated pellet feeds or trash fish. Research has further proven that excessive stocking over 20,000 post larvae per hectare in such traditional shrimp farm affects growth resulting in reduced rate of returns to investments.

Because of the volumes of shrimp harvested and amounts of water utilized, it is the grow-out phase that generates most of the profits, and problems, in shrimp aquaculture. Grow-out or farming systems for shrimp are classified into four categories--traditional, extensive, semi-intensive and intensive-- characterized by increasing stocking rates supported by corresponding feed and water management inputs.

Traditional culture with stocking rates below 10,000 fry/ha (<1/sq m) often in polyculture with fish, and average production not exceeding 500 kg/ha/yr depends completely on natural food and tidal flushing. Supplemental wet or dry feeds and
pumping are used only occasionally in extensive culture and more regularly in semi-intensive farming as densities increase to 10,000-30,000/ha (1-3/sq m) and 30,000-100,000/ha (3-10/sq m), respectively.

In intensive ponds where fry are stocked at 10-30/sq m or more, feeding and water management are completely dependent on formulated pellets, pumps and aerators. Average yearly production is 0.6-1.5 mt, 2-6 mt and 7-15 mt, respectively for extensive, semi-intensive and intensive culture.

Intensive farming is characterized on a per kilogram basis by low fixed cost because of high productivity per area, but high variable cost mainly for feeds and water quality maintenance. Profitability depends on market price and production costs. If market prices are favorable, intensive farming remains profitable from the sheer volume of production; once prices drop, so does profitability.

Unfortunately, in Kabupaten Pinrang, there are not supporting industries for Black Tiger Shrimp production. The shrimp farmer only cultivated the shrimp and after harvested, they sell it direct to the traders who are coming from KIMA (Kawasan Industri Makassar). The characteristics of the products produced by farmers in Pinrang as follows:

a. Farmers level

Shrimp harvested (after reared in ponds 2 months) have been placed in Styrofoam with ice in it.

b. KIMA

Shrimp that come from Kab. Pinrang then processed in KIMA. In general, KIMA only treated the shrimp in the form of freezing shrimp (Frozen Shrimp). Frozen shrimp divided three forms i.e.:

1. *Head On*, is the completely frozen shrimp without carapax or cut his head. This is the highest demand frozen shrimp product in international market with a good value. The frozen Tiger Shrimp Head On (HO) is packaging in a consecutive paper folding (primary packaging), plastic High Density Polyethylene (secondary packaging), and cardboard (tertiary packaging). The number of production about 1.5 tons per day.

2. *Head Less (HL)*, is frozen shrimp that have already separated with his head, but not skinned. The frozen Tiger Shrimp Head Less (HL) is packaging in consecutive plastic is High Density Polyethylene (primary packaging), paper folding (secondary packaging), and cardboard (tertiary packaging). Number of production about 1 ton per day.
3. **Peeled**, is the frozen shrimp after the skin peeled and the head separated. The product of peeled is divided into three types:

   a. **Peeled Undevined (PUD)**: the carapax and tail remove without cut a slit.

   b. **Peeled and Devined (PND)**: the carapax and tail removed and cut a slit and the back of the shrimp using knife, skewer and even toothpicks

   c. **Peeled Tile On (PTO)**: similar with PND treatment without tail removal

The frozen Peeled Pink is packaging with High Density Polyethylene (primary packaging), paper folding (secondary packaging), and cardboard (tertiary packaging). Number of production per about 500 kg per day. All above products have kept at a temperature below -17°C and can hold up to 6 months.

**14.3. Procurement of raw material**

PT. SITTOLESTARI JAYASAKTI has gotten the raw materials through the collector that each collector has an agent on each Centre for shrimp production in South Sulawesi Province. Furthermore, the agent will purchase the shrimp from the collectors in each district. After collecting the shrimp, they kept it in container with ice to maintained the temperature before bring it to the PT. SITTOLESTARI JAYASAKTI in KIMA. The shrimp are taken directly from the farmer pond need two days treatment before sent to the PT. SITTOLESTARI JAYASAKTI in KIMA.

The shrimp production is coming from the shrimp pond at Bone Regency, Maros Regency, Regency of Pangkep, Pinrang Regency, Palopo and Makassar. Especially in Pinrang, the largest producer of shrimp is coming from Suppa, Mattiro Sompe, Duampaua and Cempa Districts. The average production of frozen shrimp in the PT. Sittolestari Jayasakti is 962 tons/year

**14.4. Distribution and Trading**

Farmers usually sell shrimp to the collector in the form of fresh shrimp or directing sells it to the local market. The collectors sell it to the agent and the agent will sell it to the exporters including PT. SITTOLESTARI JAYASAKTI in KIMA. In some cases, the farmer especially who has a large area of shrimp pond; sell the shrimp directly to the exporters. Almost the shrimp productions of Pinrang send to JAPAN. For more details, distribution and trading of shrimp in Pinrang can be seen in the picture below:
PT. Sitolestari Jayasakti have sent the frozen shrimp 3-4 times per month to Japan, Taiwan, France, Belgium and Germany.

### 14.5. Buyer Position and Role

In general, marketing chain of shrimp in Pinrang as follow:

According to the data from agency of fisheries of Kabupaten Pinrang, the numbers of traditional and semi-intensive shrimp farmers are 92% and 8%, respectively. As explained in picture above that several collector and trader based in Pinrang. The collector will send the shrimp to the agent who next sends it to the cold storage in KIMA Makassar. The agent will do sorting of quality of shrimp based on the weight and standard quality from the cold storage. The shrimp have not matching with requirement will sell to the local market. It interesting to note that, the transaction from farmers to the cold storage has not using a legal contract. The agent playing important role to bridging between farmer and collector with the cold storage. They will sell the shrimp to the cold storage that will buy with higher price.

#### 14.6. Processing /value addition

In Kabupaten Pinrang, there are not special industries that treated the shrimp to the others form except the raw materials. They just cultivated in Pond and the harvest sent direct to the cold storage in KIMA Makassar.
14.7. Processing technology, recent innovation

a. In farmer level

Implementation of Aquaculture technology in Kabupaten Pinrang as follow:

1. Traditional System (Policuture) (Cultivation of Shrimp, Milkfish, Seaweed Gracilaria): 15.732 Ha
2. Semi intensive System (shrimp) : 56 Ha
3. Intensive System (Shrimp) : 26 Ha

b. In KIMA

The processing of raw materials into frozen shrimp through several important stages:

1. Processing

Shortage must be made at the beginning of processing. The goal of shortage is to separate the shrimp based on the categories that already set by the cold storage. It also to separate the good and poor quality of the shrimp. It also believed that the shortage would increase the price. The next stage is the weighing the shrimp after the shortage.

Furthermore, washing is done to remove the dirt objects that coming from the previous processing. The next processed are cutting head for the type of shrimp Tiger Head Less (HL) and removing the skin for type of shrimp Peeled Pink. Sizing and grading is done to anticipate the possibility of errors in the initial shortage and at the same time weighing the code size for determining of the size. Final washing step is done to remove all the leftover dirt.

Preparation of shrimp to the pan in a stage where the important skills needed to preparing the appropriate size. Every type of shrimp has a different pan.

For Tiger Shrimp Head On (HO) using a plastic pan. It is used only at the time of freezing to easy release from the pan. While for the type of shrimp Tiger Shrimp Peeled using a stainless steel that has been coated with plastic polietilen type of High Density. It will be used also as primary packaging at the time of the process of packaging (packaging). Furthermore, quick freezing is done using the Contact Plate Freezer with a temperature reaches 42°C during 2 hours.

2. Packaging of frozen shrimp

a. Tiger Shrimp Head On (HO)

Packaging the product in the frozen shrimp is depending on the type of product. The type of shrimp Shrimp Tiger Head On (HO) using cardboard that coated with a plastic laminating. Each package contains 1 kg for all types of shrimp that have been adjusted in each size. Frozen shrimp products that have been previously packed put in a master carton packaging. It made from cardboard that allow 12 packages with 12 kg of frozen shrimp. This master package consists of several layers, including Kraft paper.
b. Tiger Shrimp Head Less (HL)

The other product of frozen shrimp is Tiger Shrimp Head Less (HL). It use plastic polietilen high density (HDPE) as a packaging primer with the net weight around 1.8 kg every package. This is intended to facilitate the process of the shrimp frozen after considering a number of shrimp compared to the amount of frozen shrimp products Tiger Shrimp Head On (HO). The packages also keep it water-resistant and moisture. In addition, polietilen used in the process of freezing food is good especially at a low temperature.

The next packaging using the folding carton packaging (inner carton) with a layer of wax. It is used to prevent water and moisture so that it can prevent the occurrence of water evaporation products during frozen storage. The frozen shrimp that have already packaged with carton inner wax then put it in the master cartons made from usual thick paper without a wax layer.

The master cartons are used to accommodate the inner carton. It can hold six inner cartons with 10.8 kg of net weight. Packaging ended with a master carton with the closure paper and it tied with rope rust-resistant plastic with a metal plate. Each carton can hold 6 or 12 inner carton based on size and type. It is ready to be saved in Cold Storage.

c. Peeled Pink

The frozen shrimp packaging for Peeled Pink type is the same as the packaging on frozen shrimp Shrimp Tiger Head Less (HL). It also is using polietilen High Density plastic as packaging primer. It is intended to facilitate preparation of the number of shrimp that quite a lot compared to the number of shrimp Head On (HO and Head Less (HL). In addition, the use of plastic to resemble polietilen good frozen product with high resistance against a very low temperature reach -42°C. Generally, the processing technology of frozen shrimp could be seen in below chart:

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**Diagram:**

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Raw material

Processing

Head on (HO)

Head Less (HL)

Peeled Pink
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14.8. Further processing opportunities and challenges

a. In farmer Level
   1. low quality of shrimp fry
   2. Limited working capital
   3. Limited skill of farmers

b. In KIMA
   Freezing process on the machine sometimes unsuccessfully due to the adhering
   the pan or media for the frozen shrimp with the machine

14.9. Existing / potential markets, competition of processed products

Shrimp production of Kabupaten Pinrang can reach 2148.50 tons or 30.31% of the total
shrimp production in South Sulawesi (7087, 7 tons). Almost of the production exporting to
the United States, the European Union, Asia (Japan and Korea) and Australia.

The list bellow shows several companies of cold storage in South Sulawesi.
<table>
<thead>
<tr>
<th>No</th>
<th>Company Name</th>
<th>Address</th>
<th>Product type</th>
<th>Director Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PT. Sitto Mas Mulia Sakti</td>
<td>Jln. Kima 7 Ka J.2</td>
<td>Frozen Shrimp</td>
<td>Adriadi</td>
</tr>
<tr>
<td>3</td>
<td>Pt. Mitra Kartika Sejati</td>
<td>Jln. Kima Raya Kav D-1b</td>
<td>Frozen Shrimp, Frozen cooked shrimp</td>
<td>Susam Tangkuna</td>
</tr>
<tr>
<td>4</td>
<td>CV. Bone Mina Persada</td>
<td>Jln. Wiyata Mandala Kel. Lonrae</td>
<td>Frozen Shrimp, Frozen fish</td>
<td>Tanardi</td>
</tr>
<tr>
<td>6</td>
<td>PT. South Suco</td>
<td>Jln. Kima VI Blok G.4</td>
<td>Frozen Shrimp, Frozen fish</td>
<td>Hengki Tansil</td>
</tr>
<tr>
<td>7</td>
<td>PT. wahyu Perdana BM</td>
<td>Jln. Kima Raya I Blok D No.2c</td>
<td>Frozen Shrimp, Frozen cooked Shrimp, Frozen Cephalopod, Frozen fish, Dried flaying fish roe</td>
<td>Herman Sentosa</td>
</tr>
<tr>
<td>8</td>
<td>CV. Anugrah Semesta Bahari</td>
<td>Jln. Lantebung No. 9</td>
<td>Frozen Shrimp, Frozen fish</td>
<td>Susanto</td>
</tr>
</tbody>
</table>

**14.10. Linkage with Supporting institutions**

a. In farmer level

Linkage with supporting institutions doing through farmers' groups. They get a briefing from the agency of fisheries and marine of Kabupaten Pinrang and from BP4K (Board of Management of Agriculture Extension, Fisheries and Forestry) although it is infrequently

b. In KIMA

PT. Sitto Lestari JayaSakti often associated with the agency of Fisheries and marine due to the approval certificate that must be obtained before send the product to the buyer in abroad.
14.11. Training of Human Resources

a. In farmer level

As mentioned before that the farmer’s group is infrequently get a briefing from the agency of fisheries and marine of Kabupaten Pinrang and from BP4K (Board of Management of Agriculture Extension, Fisheries and Forestry). It is interesting to note that most of the farmers only graduated from elementary and junior high school. The number of shrimp farmer in Kabupaten Pinrang is 12.102 farmers according to the BPS of Kabupaten Pinrang.

b. In KIMA

The numbers of employees in PT. Sitto lestari jayasakti are 174 employees, as follow:

1. Permanent employee : 155
   Man : 67
   Woman : 88
2. Monthly employee : 13
   Man : 3
   Woman : 10
3. Part time employee : 3
   Man : 3
4. Trainer : 3
   Man : 2
   Woman : 1

Most of the Employees had trained in the Department of Employment (workplace safety), Fisheries (HCCP materials) and PT. Brands (about the use of chemicals)

14.12. SWOT Analysis

A Strengths-Weaknesses-Opportunities-Threats analysis of the shrimp industry in Kabupaten Pinrang believes that in addition to the crucial issue of the industry’s need for a sustained and focussed R&D effort, two major issues stand out for a joint consideration by Government and industry together. They are scale and marketing, and environment and sustainability. Each is briefly discussed below.

Strength

- Strong export shrimp markets developed
- Land (Tambak) and water resources
- Science and Technology base
- Clean waters, minimal pollution.

Weaknesses

- Fragmentation
- Low investment
- Lack of specific aquaculture and harvesting knowledge
- Lack of site knowledge.
- Lack of industry skill related to shrimp health and disease
- Scale
**Opportunities**

- Industry vision
- National planning and integrated approach to marine resource management - obtain funding to this end from Ministry of Marine and Fisheries in Jakarta.
- Strategic R&D direction setting and priorities.
- Reduce dependence on one market. Integrate harvesting/processing activities to cover different products/markets.
- Luxury seafood demand
- Use of inland saline groundwater

**Threats**

- Pollution and environmental backlash
- Feed costs and shortfall of supply
- Foreign shrimp diseases and lack of registered treatment agents
- Lack of research and innovation especially in harvesting and packaging technology.
- Weakening overseas markets; foreign competition

### 14.13. Recommendations

The following recommendations are based on the above discussion and the principle of maximizing strengths, minimizing weaknesses/threats and exploiting opportunities as identified in the SWOT analysis above.

**Recommendation 1: Strengthen local activities.**

That the multiple aquaculture especially shrimp industry stakeholders with initial administrative and financial assistance from Government strengthen local aquaculture to form collective views and actions relating to a sustainable development and conduct of the Kabupaten Pinrang shrimp industry. It would related to:

- efficient communication and promotion;
- risk management;
- adoption of best practice, and consistency
- uptake and implementation of measures to enhance shrimp health;
- a national plan for aquatic health including import and quarantine issues;
- formulation of national aquaculture R&D priorities
- attracting sound investment to the industry; and
- Export promotion through label integrity programs and brand building similar to that seen for other successful export commodities.

**Recommendation 2: An industry levy and Government contribution.**

It is recommended that, following development of industry R&D priorities and actions as drivers, for each and all sectors of the industry are introduced. The Local Government in KAbupaten Pinrang should maintain its current commitments and extend these to the newly emerging aquaculture sectors.

- attracting the best, most durable and most appropriate R&D provision for an industry in its formative stages;
• reducing dependence on fishmeal production for shrimp;
• developing environmentally sustainable production systems;
• decreasing dependence on wild stock through application of aquaculture and post harvest developments;
• monitoring international developments; and
• Collecting statistical information and associated research that facilitate market access.