MILKFISH (Chanos chanos) FRY PRODUCTION IN GEROKGAK DISTRICT, NORTH OF BALI INDONESIA: A GEOGRAPHY-ECONOMIC ASPECT

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ABSTRACT

Fry production of milkfish (Chanos chanos), which is called “Milkfish Backyard Hatchery” or MBH in Gerokgak District, North of Bali had been famous since 1995. The coastal area of the district is the largest place for backyard hatcheries. The research was conducted in Gerokgak District in the year of 2004. A "Purposive Sampling" Technique was used to collect the samples, which is combined among perception technique, document analysis, and interview. The primary data was obtained from the interview with the farmers of Incomplete Hatcheries (IH) as the respondents, covered the number milkfish (Chanos chanos) larvae tanks (unit), total fry production, and the fry price. The references study and observation results were conducted and used as secondary data.

The objectives of this research was to describe a geography-economic aspect of MBH in Gerokgak District covered the geographic condition of Gerokgak District, which was used for backyard hatcheries (coastal area), the production process, the contribution of MBH to the development of Buleleng Regency, the issues which were faced by the farmers and also the development strategy from the government. The data and document analysis presented qualitatively descriptive.

MBH is an economic effort which is combined between nature power in a geographic area and production factor to get fry with a proper number. Gerokgak District, the central place of MBH in Bali Island has 12 coastal villages which border directly with Sea of Bali. It made those coastal areas is suitable for MBH location. It has dry climate type, with the average of rainfall in the driest month < 3.94–r/25; whereas r is the average of annual rainfall month (in inch).

The milkfish fry production during 1994 – 1999 was very profitable effort, with the price of each fry was Rp. 40.00- Rp. 90.00. However, since the year of 2000, it has been declining year by year. Later on, in the year of 2004, the fry price range was only between Rp. 3.00-10.00. The main issues were: there was no fry price controlling association, and the market was monopolized by the whole seller assembler to East Java.

Many advantages from the backyard hatcheries, i.e.: coastal area development, aquaculture technique development, fry supplying, increasing income for fishermen and farmers, an alternative job for fishermen, create new business (fish culture tools, fish feed supplier, fish transportation, and workshops) and increasing the number of investors (foreign and domestic).

Although the farmers of MBH encountered fry price fluctuation, the number of IH units and fry production has been increasing year by year. There were approximately 2700 IH units with total fry production was 2,423,882,468 fries in Gerokgak District in the year of 2004. It showed that the MBH is an enthusiastic effort for the coastal community of Gerokgak District. Thereby, the government should pay more attention to over come the marketing and make a development strategy.

Learning from the milkfish (Chanos chanos) fry price deterioration, the marketing of fish fries needed to be arranged. Involving the producer and fish fries marketing perpetrators needed to identify the issues and publish the policy of “intelligent market” as a first strategy that should be done.

Key words: milkfish, fry production, geography-economic aspect

INTRODUCTION

The hatchery system in coastal area is basically classified in two categories, i.e.: Complete Hatchery (CH) and of Incomplete Hatchery (IH). CH provides the matured brood stocks, eggs, post larvae in various stages, natural food, and fingerling size of cultured fish. Whilst the IH only produce fish fry and its’ activity began from fertilized egg or growth the larvae which was derived from CH. The milkfish backyard hatchery (MBH) is an example of IH. The development of MBH in a coastal area can be as a growth point for the economic activity in order to develop
the coastal area and labor involving which was purposed to build the area with environmental view (Research and Developing Centre of Fisheries. 1993).

As the declining of the prawn demand from Bali Island in the beginning of the year of 1990s, the investor did not interest anymore to conduct prawn hatchery. They rather chose to conduct MBH than the prawn because of the cost of milkfish production is by far cheaper than the cost for prawn production. The production technique of milkfish (Chanos chanos) is relatively easier than the production of prawn. The milkfish production could be done in various scales.

The management technique of milkfish represented an effort to produce milkfish fry, which was recognized with “nener” in Indonesian. This effort showed various attainments, i.e.: provide an alternative field working in a coastal village, especially for people around coastal area, and improved the income of fisherman which was directed to cope with the poorness. The largest impact is that MBH is an easy operational effort and can be done over the year because the eggs from CH can be stocked every day.

Alexander in Muliahati (1996) expressed that geography-economics is a science which focused on the studying various area and its’ economic activity related to the production, consumption, and distribution. C.F. Jones and G. Darkenwald in Muliahati, (1996) described definition of the geography-economics that is science about relationship between environmental factors and economic condition to the production efforts and distribution of its result. The Geography-economics connected between the economic elements and the geo-science. Therefore, MBH represented an example of the economic productivity of human being by giving more attention to the existing factors to obtain the persistent product in a certain geographical area.

This paper describes the aspect of geography-economics of the milkfish (Chanos chanos) production in Gerokgak District, North of Bali, Indonesia.

**METHOD**

A study case method was used, which combined among perception technique, document analysis, and interview. The data was collected with a Purposive Sampling technique, whereas the samples were determined pursuant to a certain criterion (Sugiyono, 2002).

The primary data was obtained directly from the interview result with the IH owners as respondents, covering the number of larvae tanks, fry production, and fry price. The secondary data was needed to strengthen the primary data by observed from literatures and location. The respondents were all owners of the Incomplete Hatcheries (IH) in 8 villages in Gerokgak District in the year of 2004.

The geography-economics aspect in this paper covered the geographical condition of Gerokgak District, where was the basis for MBH, fry production of milkfish, the contribution of MBH to the development of Buleleng Regency, the issues which is faced by the farmers, and the development strategy from the government. The data and document analysis presented qualitatively descriptive.

**RESULT AND DISCUSSION**

**Geographical condition of Gerokgak District**

Astronomically, Gerokgak District is located at: South latitude (SLatd) between: 8° 5' 29" and 8° 15’ 31”;
East longitude (ELotd): 114° 25’ 53" and 114° 52’ 59” (The government of Buleleng Regency, 2004)

The boundaries of the district as follows:
1. West side: Jembrana Regency
2. South: Jembrana Regency
3. East: Seririt Regency
4. North: Java Sea

Gerokgak District is one of 9 (nine) districts in Buleleng Regency, Bali Island. It consists of 12 coastal villages and 2 rural villages; 56 cluster, and 13 custom villages. Gerokgak District is passed by the main road of Singaraja-Gilimanuk. The total area is 356.57 km² or 1/5 of total area of Buleleng Regency. It extends from East to the West side with the coastal length of 72 km (50 % of total coastal length of Buleleng Regency) and the total main road is 60 km. There are 9 capes and 12 bays. One of the bays is Sumberkima Bay, which is a suitable area for marine aquaculture. According to its’ height from sea water level, Gerokgak District is divided to 3 area, i.e.: a. 298.79 km² is located between 0-499.9 m; b. 5.543 km² is located between 500-999.9 m; c. 235 km² is located above 1000 m from sea water level. 12 (twelve) coastal villages in Gerokgak District are located between 50-100 m from sea water level. The map of Gerokgak District and the distribution pattern of backyard hatcheries covered 8 villages in the year of 2004 can be seen in fig 1. and fig 2.
The name of villages and their tanks number:

1. Sumber Klampon : -
2. Pejarakan : -
3. Sumberkima : -
4. Pemuteran : 106 tanks
5. Banyupoh : 708 tanks
6. Penyabangan : 1,463 tanks
7. Musi : 822 tanks
8. Sanggalangit : 694 tanks
9. Gerokgak : 1,115 tanks
10. Patas : 170 tanks
11. Pengulon : -
12. Tinga tinga : -
13. Celukan Bawang : 301 tanks
14. Tukad Sumaga : -
Total : 5,379 tanks

The climate in Gerokgak District

There are two rainfall stations in Gerokgak District. There are in Sumber Klampon, and Tetelan villages. To obtain the climate in Gerokgak District, the rainfall data and its temperature had to be known.

The criterion of Mohr was used to determine the wet month (WM), namely: a. Wet month (WM), which accepting rainfall more than 100 mm; b. Humid month (HM), which accepted rainfall between 60-100 mm; c. Dry month (DM), which accepted rainfall less than 60 mm (Kartasapoetra, 1986). The average of the total annual rainfall of Gerokgak District in the year of 1996-2005 was 1075.75 mm. The highest rainfall was on January (289.75 mm) and the driest was on August (1.3 mm). The average of rainfall for the WM was 4.0; HM was 0.9; and DM was 7.4.
Pursuant to the average number of WM and DM, the value level of Q in Gerokgak District can be determined, according to Schemid-Fergusson, as the equation below:

\[ Q = \left( \frac{\text{DM}}{\text{WM}} \right) \times 100 \% \]

(Eq.1)

Whereas: \( \text{DM} \) = the average number of DM
\( \text{WM} \) = the average number of WM

From the (Eq.1), the value of Q in Gerokgak District can be determined as follows:

\[ Q = (7.4: 4.0) \times 100 = 185 \% \]

\[ Q = 1.85 \]

Schemit-Fergusson classified the climate in the world pursuant to the value of “Q” as follows:

1. \( 0 < Q < 0.143 \)   A = Very wet
2. \( 0.143 < Q < 0.333 \)   B = Wet
3. \( 0.333 < Q < 0.600 \)   C = Rather wet
4. \( 0.600 < Q < 1.000 \)   D = Mid wet
5. \( 1.000 < Q < 1.670 \)   E = Rather dry
6. \( 1.670 < Q < 3.000 \)   F = Dry
7. \( 3.000 < Q < 7.000 \)   G = Very dry
8. \( Q > 7.000 \)   H = Extraordinary dry

According to Schemidt-Fergusson, Gerokgak District has F (dry climate) type, as shown in fig.3.

To determine the climate type in a region, the annual rainfall and temperature data have to be known. To determine the temperature of an area, according to Kartasapoetra (1986), the following formula is used:

\[ T = (26.3 - 0.6 \times \frac{h}{100}) \, ^{\circ}C \]

(Eq.2)

Whereas:

\( T \) = the average temperature of a determined area
\( h \) = the height of an area from seawater level (height/100)
26.3 = the average temperature in the tropical coast
0.6 = tropical constantan, every going up 100 m, temperature is going down 0.6 \(^{\circ}C\)

Hendayani (2002) expressed according to a research result, the temperature in a coastal area is equal to 27.6 \(^{\circ}C\), hence the temperature of MBH location in Gerokgak district, with the height of 5 m from sea water level can be calculated as follows:

\[ T = (26.3 - 0.6 \times \frac{5}{100}) \, ^{\circ}C = 26.27 \, ^{\circ}C \]

According to W. Koppen, Gerokgak District has an “A” or tropical rainy climate type. Whereas in this type, the temperature of the driest month > 64.4\(^{\circ}\)F or >18 \(^{\circ}\)C. Pursuant to the average rainfall in the driest month, W. Koppen divided the “A” type into 3 (three) types, i.e.: a. Af (tropical rainy forest) type, if the average > 60 mm; b. Am (monsoon climate) type, if the average < 60 mm but > 3.94-r/25; c. Aw (savanna climate) type, if the average < 3.94-r/25, whereas r is the average of annual rainfall in inch (Kartasapoetra, 1986).

As it mentioned above, the average of the total annual rainfall of Gerokgak District for 1996-2005 was 1075.75 mm with the average rainfall in August as the driest month was 1.3 mm. According to W. Koppen, Gerokgak District has “Aw” climate type, as it shown in fig 4. and the data of annual rainfall (mm) in Gerokgak District for 1996-2005 can be seen in appendix 1.
Fig. 4. The Climate Type in Gerokgak District according to W. Koppen

According to Schmit-Fergusson and W. Koppen climate analysis showed that Gerokgak District has dry climate type.

**Land Usage of Gerokgak District:**

The total area of the district was 356.57 km². General farming was over than 50% from the total areas (including fisheries, agriculture, and animal husbandry). The government land was 38% from total area. The rest was for: non irrigated dry farming, plantation, home yard, fishpond, rice field, etc. The composition of land usage in Gerokgak District can be seen in fig. 5.

Fig 5. showed that the largest land usage is for general farming (50.12%) and the tightest is for rice field (0.46%). It can be said that the dominancy of land usage is dry land, because Gerokgak District has dry climate type.

Fig 5. The percentage of land usage in Gerokgak District in the year of 2004

The quantity and quality of water resources as the technical requirement occupied the first sequence in choosing the location for the hatcheries. Other aspects are needed as the non technical requirement to attest the larval rearing. The water quality parameter which is required in milkfish (*Chanos chanos*) fry production can be seen in table I. below:

**Table I. The requirement of water quality in milkfish (*Chanos chanos*) larval rearing in MBH**

<table>
<thead>
<tr>
<th>No</th>
<th>parameters</th>
<th>suitable range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Temperature</td>
<td>26.50-31.00 °C</td>
</tr>
<tr>
<td>2</td>
<td>Salinity</td>
<td>10-35 ppt</td>
</tr>
<tr>
<td>3</td>
<td>pH</td>
<td>6.50-8.50</td>
</tr>
<tr>
<td>4</td>
<td>(Dissolved Oxygen) DO</td>
<td>4.00-8.500 ppm</td>
</tr>
<tr>
<td>5</td>
<td>Ammoniac (NH₃)</td>
<td>&lt; 0.02 ppm</td>
</tr>
<tr>
<td>6</td>
<td>Nitrit (NO₂)</td>
<td>&lt; 0.5 ppm</td>
</tr>
<tr>
<td>7</td>
<td>Total Organic Matter (TOM)</td>
<td>&lt; 95.00 ppm</td>
</tr>
</tbody>
</table>

(Source: Brachishwater Institute of Jepara, 1995)
The coastal villages of Gerokgak District are suitable for MBH location and its' border directly with Sea of Bali. It gave an amenity to get the suitable in quality and quantity sea water for larval rearing of milkfish (*Chanos chanos*). The range of sea water quality according to some measurement in Gerokgak District in the year of 2005, i.e.: salinity: 34±1 ppt; temperature: 29.40±2.30 °C; pH: 7.50 ± 1.00; DO: 7.35±1.10 ppm; NH₃: 0.0034±0.002; NO₂: 0.005±0.001 and TOM: 21.43±2.16. The main road of Singaraja-Gilimanuk gave an amenity in fry transportation to local market in Java Island.

Thereby, it can be said that the Geographic condition of Gerokgak District attest the existence of MBH.

**Production process of milkfish (*Chanos chanos*) fry**

The production process can be seen in appendix 2.

A. Eggs stocking

The farmers got the eggs from CH around the district. The eggs were sold in one sack packing. Each sack contained of 75,000-100,000 eggs. The price was around Rp. 1-2 each egg or was equal from Rp. 75,000.00 – 200,000.00 per-sack.

B. Larvae rearing

There are some requisitions for rearing the milkfish larvae, i.e.: the range of water salinity must be between 33-34 ppt; *Nannochloropsis* sp. and *Brachionus plicatilis* supply were the main lived food in the early stages of larvae; good aeration; orange wall tank color; yolk eggs and rice powder for the fry;

For the successfulness of harvest, hence the monitoring of water quality and larva growth is exactly required to be done. If the farmers encounter the mass death of larvae, hence they have to be thrown out the dead larvae from the tank immediately. They have to clean of the bottom of tank continuously.

All MBH farmers conducted the appropriate rearing technique. They can produce fries in satisfied numbers.

C. Harvesting and marketing

The 21-25 day (D21-D25) larvae were strong enough to be harvested. One Household scale of hatchery can produce 3-10 reans of milkfish fries. One rean is equal to 5000 milkfish fries.

Marketing means the human activity related to the market. Market facilities cooperated with market to create the exchanging to fulfill the demand. The exchanging involved working process, the effort of seller to find the proper buyer, identified what buyer needed, posting the proper product, promote the product, saving and accommodate, negotiate the price, etc. The main activities of marketing are: developing product, communication research, distribution, price decision, and services (Kottler, 1999). In a distribution process, the marketing sequences had to be known, covered: producer, whole seller assembler, whole distributor, retailer, peddler, and consumer.

The marketing process of milkfish fry began from the whole seller assembler. The activity started from packaging until releasing the fries to the buyer, so that farmers didn’t pay anything which related to marketing and they did not have any risk of death of larvae.

The milkfish fries distributed trough Gilimanuk harbor, to the local market in East Java (Lamongan, Gresik, and Situbondo), Central Java, and West Java. While for the export, the fries distributed trough Ngurah Rai Airport.

The issue in marketing is the fry fluctuation price, which described furthermore in another part of this paper below.

**The issues**

The possibility competition had been anticipated by inviting all owners of MBH to merge into a business enterprise in the year of 1995, but it did not work as well. The marketing system was directly conducted by each hatchery that was act both as a producer and a whole seller. An association forum for the coastal fisheries farmers in Penyabangan village that was formed in the year of 2002 got failure because the farmers couldn’t coalescent each other and it caused the whole seller assembler monopolized the fry price.

The marketing is a complicated problem and became a famous topic in every scientific and business meeting. The fry selling price deteriorated the household farmers of MBH. During the year of 1994-1998, the average selling price could reach Rp. 40.00-90.00 per-fry. Later on since the end of 2000 until present, the average selling price was getting worse until Rp. 3.00 per-fry. The comparison chart of milkfish fry price fluctuation for 2001-2004 and 1994-1998 can be seen in fig. 6 and 7 below.
Various negative impacts started to arise as the effect of the milkfish (Chanos chanos) fry price deterioration, i.e.: the activity of milkfish (Chanos chanos) fry drowned and caused many MBH bankrupted; many empty hatcheries intruded the coastal area site plan of Gerokgak District; the income of Buleleng Regency from milkfish fry production decreased. The farmers of MBH progressively deteriorated to the bad corner. The bigger scale farmers were luckier than the smaller scale farmers. They changed over their businesses into other commodities, i.e.: sea weeds, ornamental fish, and the groupers. For others, who have not enough capital, changed their attitude, i.e.: working in their previous job in other sector (farming, rice field or fishing).

MBH development in Gerokgak District

The Incomplete Hatchery (IH) of MBH in Gerokgak District is known as the household scale MBH. It started in the year 1992 with the number of hatchery only 5 units. One unit of IH is assumed consists of 2 larval tanks. In the year of 1994 it became 94 units, and in the year of 1996 it flourished until 250 units (Kartikaningsih, 1996). The simple technology was used and became expand year by year. Later on, Gerokgak District definitely had represented as the biggest production place of milkfish fries in Indonesia for 1994-1998.

The fry production number has been increasing in Gerokgak District year by year. It was attested by the developing technology in marine finfish production.

An important benefit that was directly felt though MBH developing in Gerokgak District was financial return. Even all capital could return in only second production cycle. The management pattern of MBH effort should be conducted with good cooperation with CH for eggs distribution and price stabilization (Research and Developing Centre of Fisheries. 1993).
Fig. 8. The change number of CH and IH in Gerokgak District for 1999-2004

Fig 2 and 8. showed that although the farmers faced the fry price fluctuation, the number of MBH units and fry production progressively increased. These circumstances indicated that milkfish (Chanos chanos) fry production is an enthusiastic effort for the society of Gerokgak District.

Therefore, the government have to pay more attention to overcome the marketing and the research about marketing of milkfish (Chanos chanos) should be conducted.

The contribution of MBH to the development of Buleleng Regency

The MBH license was given from the local government of Buleleng for some reasons, i.e.:

1. To create the good situation,
2. To guarantee the certainty of fisheries business
3. To control the optimum fisheries resources with pay more attention to the sustainability of resources and environment as the impact of fisheries activity
4. To arrange the fisheries business
5. To improve the farmers and fisheries businessmen conscious in giving their contribution to support the development of Buleleng Regency.

According to the Regent of Buleleng decision letter no. 283/2003 related to “other income and regency’s income from fisheries sector, there are some rules for the farmers, i.e.:

1. The annual contribution from Complete Hatchery (CH) owner is equal to Rp. 100,000.00 for each brood stock tank and Rp. 15,000.00 for each larvae tank.
2. The annual contribution from Incomplete Hatchery (IH) owner is equal to Rp. 10,000.00 to each tank. In the year of 2004, it was equal to Rp. 53,790,000.00
3. The annual contribution from the whole seller assembler is equal to Rp. 100,000.00.

Another important rule is the explanation letter of fry providing area, which explained where the fries derived from, which was known as Surat Keterangan Asal or SKA in Indonesian. The rule was based on the decision letter of Ministry of Marine and Fisheries Affairs Republic of Indonesia no. Kep.04/MEN/2003 dated on March 20, 2003 which described the requisition of milkfish exported from Republic of Indonesia. The rule of SKA for the whole seller assembler according to the destination as follow:

1. Export, SKA was equal to Rp. 0.5.00 per-fry
2. Domestic, SKA was equal to Rp. 0.3.00 per-fry

Those rules above give a hint about the contribution of MBH in Gerokgak District to the economic growth of Buleleng Regency. If 10 % of total milkfish fry production was assumed to export market, so that the incomes from SKA in the year of 2004 as follow:

1. From the export market : Rp. 1,211,941,234.00
2. From the domestic market : Rp. 6,544,482,664.00

Total income from SKA in 2004 : Rp. 7,756,423,898.00
Development strategy of MBH

Gerokgak District is a part of Buleleng Regency, which represented as the centre of milkfish fry production in the era of 1994-2000. Based on the Planning of Marine Site Location of Buleleng Regency and the Pattern of Developing Area, Gerokgak District is divided into:

1. The industrial area I : Tukadsumaga, Tinga tinga, Celukan Bawang, and Pengulon.
2. The capital of district: Patas, Gerokgak, and Sanggalangit.
3. The industrial area II : General agriculture: Musi, Penyabangan, and Banyupoh.
5. The forest supporter area : Sumberklampok

The local government of Buleleng Regency tried to expand the area, namely:

1. Cooperative developing with Research Institute for Mariculture Gondol, Bali.
2. Formed an association forum for the coastal fisheries farmers in Penyabangan village in the year of 2002.
3. Conducted some businesses meetings and open forums among farmers, investors, buyers, and stakeholders.
5. Built an oceanic laboratory in Celukan Bawang Village.

All owners of household scale MBH have to coalesce and cooperate with the relevant institutions so that they can improve their management; produce fry with high quality; predict the fry number which is produced and get the competitive fry price.

The duty of Fish Quarantine Institute of Bali Province has to be improved so that the quality of milkfish fry from Gerokgak District can be justified. The implementation of a good integration among institutions which related to household scale finfish fries production needed to strengthen the position of Indonesia in a global market.

According to a survey which was conducted by Ahmad et. al. in the year of 2005, that in Gerokgak District there were some policies that were expected from the government to overcome the debility of fries production, especially the milkfish fry, i.e.: develop of segmented market area; empower the smaller farmer with “step father” system and develop the domestic market. The first strategy could be done is the “market intelligent”, whereas the production target had determined to each effort segment (Ahmad, et.al, 2005).

CONCLUSION

1. Geographically, the coastal area of Gerokgak District is suitable for marine fish culture.
2. The Milkfish Backyard Hatchery (MBH) is an enthusiastic effort for the society of Gerokgak District.
3. The main issue was the price fry fluctuation.
4. The government should pay more attention to overcome the marketing.
5. The good cooperation among government, stakeholders, and farmers is the keyword for the successness for the milkfish and other finfish fries production.

REFERENCES


Kartasapoetra, Ance Gunarsih,1986, Climatology; The effect of climate to the land and plantation, Published by Bina Aksara. Jakarta, 134p, pp-25-26 In Indonesian

Kartikaningsih. Dyah Lily, 1996, The economic and technical evaluation aspects of milkfish (Chanos chanos forscal) household scale in Gondol, Bali. Fisheries Institute, Jakarta, 61p, In Indonesian


## Appendix 1. The annual rainfall (mm) in Gerokgak District for 1996 – 2005

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<td>278</td>
<td>113</td>
<td>192</td>
<td>314</td>
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<td>395</td>
<td>287</td>
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Remarks:

WM = Wet month
HM = Humid month
DM = Dry month

(Source: Agricultural Institute of “Palawija” Seed of Banyupoh, 2005)
Appendix 2. Milkfish (*Chanos chanos*) fry production process

(Source: Research Institute for Mariculture Gondol, Bali documentation, 1999)