

An Economic Situation of Artisanal Fishery in East Java and Madura Island*

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Introduction

The role of fisheries and its economic importance in Indonesia had been changed to a great extent since the latter of the '70's, when fisheries had made rapid progress. Fishery's progress had enforced fisheries management from artisanal way to commercialized one through motorization of fishing boat, improvement and modernization of fishing gear and method, and advancement of fish culture method. But, such progress have not been uniformly achieved in all provinces and in all types of fishery, but achieved having a large difference between the respective provinces and each section of fisheries. Undoubtedly some districts and also some fisheries have developed and pulled up the level of Indonesian fisheries as a whole. On the other hand, the other parts still remain traditional in accordance with natural, social, and historical background. At present, it seems that the conflicts between modern and traditional fisheries are growing more severe than before.

This document is aimed to clear the structure of artisanal fisheries in relatively underdeveloped districts, namely, Madura Island in comparison with the whole of East Java Province. The characteristics of fisheries in Madura Island and East Java are dealt in the following section, following fisheries activities, fish marketing and fisheries co-operative, and economic situation of artisanal fishing household is presented in the last section.

East Java Province is constituted of 7 prefectures, including Madura Prefecture. In this paper, Madura and East Java mean Madura Prefecture and the whole of East Java, respectively.

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Section 1. Fisheries characteristics in East Java and Madura Island

The fisheries characteristics found in East Java and Madura are described as follows: The total fish production in East Java amounts to around 10% of the whole production of Indonesia in yield and in value in 1979²⁾. Comparing East Java with the other provinces in Java, the composition of fisheries varies in the respective provinces. As a whole, the production from inland fishery is poor and fish culture is more popular in East Java. While brackishwater pond culture, so-called *TAMBAK* culture, is main fish culture followed by paddy field fish culture and freshwater pond culture is very poor in East Java. Freshwater pond culture is the most important fish culture in the other provinces in Java⁹⁾. These variations depend on the topography of the respective provinces. In marine fishery, captured fish species and fishing method vary from district to district in East Java according to natural conditions. At the south coast of East Java facing the Indian Ocean, where the sea bed goes deep sharply and hence only pelagic fishery is possible. All kinds of fishery can not be carried out in some areas as there is no adequate fishing port and rough sea condition prevents fishing trip. In contrast, in the north coast of East Java including Madura, the water is shallow and the bottom is muddy and sandy, and fish resources both demersal and pelagic fishes are rich, in Madura Strait and Bali Strait. The sea condition in these areas is relatively better than in the south coast of East Java. Consequently, demersal and pelagic fisheries and *TAMBAK* culture are densely concentrated along the north coast of East Java.

Section 2. Fisheries in East Java and Madura Island

A large number of fishing households and fishermen/fish farmers are engaged in the following fisheries, namely, inland fishery, *TAMBAK*, freshwater pond, and paddy field fish culture in East Java. Inland fishery, freshwater pond culture and paddy field fish culture realize an extremely low productivities so that total production both in quantity and in value of these fisheries shifts to lower stage than the correspondence of these fishing managements. Marine fishery and *TAMBAK* culture are major fisheries in East Java in production (Table 1). In contrast, marine fishery exists exceptionally in Madura and the other fisheries still underdeveloped so that the productivities of Madura fisheries are always regarded as less than that of East Java.

Table 1. A summary of fisheries in East Java and Madura Island in 1979

Types of fishery	No. of fishermen/ fish farmers	No. of fishing households	No. of fishing boats	No. of fishing gear	Culture area ha	Production		
						ton	x10 ⁶ Rp	
East Java	Total	232,377	108,980	36,445	85,797	59,629	178,108	49,238
	Marine fishery	142,003	33,561	32,261	39,665	-	132,254	23,084
	Inland fishery	25,125	20,579	4,184	46,132	-	8,127	1,977
	Brackishwater pond culture	13,574	11,532	-	-	44,648	25,524	20,075
	Freshwater pond culture	32,814	26,811	-	-	1,739	2,263	671
	Paddy field fish culture	16,945	16,102	-	-	13,239	9,928	3,424
Madura Is.	Total	?	18,121	14,978	20,617	4,548	34,396	6,793
	Marine fishery	51,104	15,221	14,857	20,064	-	33,572	6,475
	Inland fishery	?	527	121	553	-	85	15
	Brackishwater pond culture	2,669	1,787	-	-	4,483	687	295
	Freshwater pond culture	314	535	-	-	43	37	8
	Paddy field fish culture	9	51	-	-	22	6	1

Source: Laporan Statistik Perikanan Jawa Timur 1979
Laporan Tahunan 1979

1. Marine fisheries

Precedence of productivities found in marine fisheries mentioned above reflects typically upon the proportion of fishing households with powered boat to the whole and/or size of fishing gear¹⁴⁾. Actually powered boat, especially out-board motor, has become widespread since the latter of the '70's, and has reached 5% of the households in East Java and 3% in Madura. Half of the fishing gear in number in East Java are concentrated in Madura, but the production in Madura is only 5% of the total catch in East Java¹⁾. It is characteristic that fisheries in Madura still use small and traditional fishing gear, non-powered boat, and inefficient fishing methods are popular.

PAYANG seine, purse seine, gill net fisheries, and fish seed collection are very common and important fisheries in East Java and Madura (Table 2). The author describes these fishing in Madura in comparison with the whole of East Java.

Table 2. Main marine fisheries in East Java and Madura Island in 1979

Types of fishery	East Java		Madura Is.		Main species of captured fish
	Fishing units	ton	Fishing units	ton	
<i>PAYANG</i> seine	5,408	23,895	3,549	11,672	scad, mackerel, anchovy, little tuna
Purse seine	735	24,640	69	2,968	sardine, mackerel, scad, little tuna
Drift gill net	8,902	19,667	4,281	8,010	sardine, halibat, mackerel, shark, little tuna
Shrimp gill net	3,596	2,311	2,357	1,018	trevallie, shrimp
Set gill net	2,571	3,516	1,158	1,069	sardine

Source: Laporan Statistik Perikanan Jawa Timur 1979

1) *PAYANG* seine fishery: A bulk of catch is caught with *PAYANG* seine and purse seine. *PAYANG* seine has been modified in various ways to meet local conditions and improved more efficient than before through motorization and change of netting materials⁵⁾. Sardine occur densely in Bali Strait, so Muncar, Banyuwangi Prefecture, is the biggest fishing base where large quantity of the fish and other fishes are landed and sold in the auction market. This fishery in Madura is carried out as follows: one fishing unit is composed of a boat of 3 to 4 gross tons equipped with a 8 to 12 H.P. engine, and 10 to 16 crew who, half of them, are hired out as full-time crew and the half as part-time, and is operated for 10 months except during the rough sea period in January and February, in and around the fishing ground 40km far from Madura Is.. The catch is marketed through, if exists, fisheries co-operative's auction in Madura Is. or to other prefectures in East Java. When there were 16 crew on board, the total catch in value after deduction of operational cost is divided into 20, and then 8 shares is offered to the owner, 8 shares to the 8 full-time crew, and 4 to the 8 part-time crew. Average share per capita of a full-time crew amounts to around 800 Rp. per day.

2) Purse seine fishery: Purse seine fishery was introduced in Madura in 1976, and in Muncar in 1974, by the government in order to promote fishing efficiency and spread by turns of *PAYANG* seine fishery since 1978. A fishing unit is composed of a boat of 5 to 6 gross tons equipped with a 25 to 50 H.P. engine, which costs three times that of the *PAYANG* seine. A purse seine is operated by 10 to 14 crew for 10 months a year in the sea 50km far from shore. Catch is landed in East Java except for Madura since fish marketing and fuel supply are more convenient in East Java than in Madura. The total catch in value is divided into 4 shares: the owner gets three shares and bears all fishing expenses. Average income per capita amounts to 1,000 Rp. per day. Thus this fishery is characterized by a high productivity and big scale in comparison with *PAYANG* seine

fishery.

3) Gill net fishery: Artisanal fishermen especially in Madura used to operate gill nets around the Island. While, this fishery is classified into three types from the view point of technology; drift, shrimp, and set gill nets, these can be dealt mixed economically. Three to five persons who are friends and/or relatives to each other board on an outrigger boat sometimes equipped with a 5 to 7 H.P. engine and is operated for 10 months a year. The catch is marketed through an auction of their fisheries co-operative. Sharing way of the catch in value is that, when there were 4 crew, the total catch is divided into 9, and one of them is shared to the owner of the boat, two to the net, two to the engine, four to the crew. Daily earning varies to a large extent.

4) Fish seed collection: With the expansion of fish culture such as milkfish and shrimp, seed price of these species has increased and seed-supply business has become more demanding¹³. It is well known that East Java is one of the main seed collection areas³. According to the statistics in 1979, 195 million fish seed were supplied from East Java, 105 millions from Sumenep District in Madura. This means that Madura annually supplies a large number of fish seed to the other districts¹⁴; East Java and the other provinces. Actually in Central Java 80% of milkfish fry are transported from East Java through Surabaya city. Shrimp larvae are collected with push nets by adult people almost throughout the year in Madura. If fortune, a collector can catch 50 to 100 larvae in a day, the price of one larva is 50 to 100 Rp. Milkfish fry are also collected with push nets that are smaller in size than that for shrimp larvae. Collection is made twice a day, in the morning and in the evening during two periods: from April to June and from September to December. This fishing gear is so small that even women or children are able to operate and can catch daily 100 to 150 fry. The price of a fry is 10 Rp. and rises to 18 to 20 Rp., when the fry are sold to fish farmer through brokers. The earning from this fishing makes a significant contribution to the income of artisanal fishing household. These fishermen are hired out as laborers of gill net or *PAYANG* seine fishery during off-season of milkfish fry.

Referring to the management of fishery, it is a natural tendency that total cost for an operation increases in proportion to the enlargement of fishing management and also to total labor cost. The number of crew per fishing unit has increased because mechanization was achieved not to fishing itself but to navigation. Then, total labor cost even for the powered-boat occupies about the half of the total cost for an operation. The way of share payment is dominant in Madura and East Java and daily wage or fixed monthly salary are very rare⁷. Even if a crew in a bigger fishing, he can not always get more income. The average share per crew ranges from 400 to 1,000 Rp. per day

throughout a year. On the other hand, the owner usually takes remarkable benefit after the deduction of the operational and maintenance cost, despite the instability in total catch.

Most of marine products are utilized for food. Disposition of marine fishes are classified into three: fresh fish, artisanal processed fish (such as dried, salted, boiled, fermented, and smoked), and frozen, canning, and fish meal which need remarkable capital investment. Most of the catches are consumed fresh and also as artisanal processed fish. An exception exists in Muncar where some part of the total landing is processed for canning or fish meal, but the majority is consumed as artisanal processed fish. Besides this, in East Java some laborers get a fixed monthly salary of 25,000 Rp. with meals from a *PINDANG* factory which produces *PINDANG*, boiled fish. Such a commercialized factory is very few in Madura; an exception is Bluto Fisheries Co-operative's factory that was established in 1970 by an aid from Australia. This factory processes dried and salted fish during the rainy season when catch is good despite bad weather condition. In Madura, however, home-made processing is commonly found, the productions are *PINDANG*, shrimp paste, salted and dried fish which are important ingredient in the daily diet. The reason for the consumption of relatively high percent of fresh fish in Madura is due to inavailability of facilities such as ice-making machine. The use of ice is hardly sufficient for small-scale fisheries in Madura since they can not afford to buy ice which is expensive and often not available in local fishing villages⁷⁾.

2. Inland fisheries

While there are a lot of inland fishing households in East Java, they seldom have fishing boat. The boat, if they have, is not powered nor large, and of a dugout with outriggers. Fishing gear, i.e., gill net, cast net, line, and trap are also small in scale and primitive so that both productivity and total catch are very low. Moreover inland fishery is very poor in Madura.

3. Brackishwater pond culture

In East Java, one of the very important areas of *TAMBAK* culture is that it produces the same value as marine fishery does. According to the statistics, the productivity of this fishery in East Java is to some extent higher than the average of Indonesia^{2,10)}. However, Madura is characterized by extremely low productivity and cheap fish price (Table 3). The reason for the cheap fish price is caused mainly by the difference in fish species cultured. Madura people usually rely on the seed which usually come into the ponds, and which are quite abundant around Madura, and they choose cheaper seed to buy. The low productivity is due to extensive culture method. *TAMBAK* culture in Madura is carried out traditionally; rare use of fertilizer and pesticide, poor physical pond structure and water management, reliance on natural seed to come into the ponds together with

predators that leads to high predation of cultured fishes¹⁰. Moreover, it is common to alternately use the field for salt making in dry season and for fish culture in rainy season in Madura. Production per ha of salt amounts to 40 tons and fish to 200kg which consists of 80% milkfish and 20% mullet and banana prawn. In this case, fish seed and 100 to 200kg of fertilizer per ha are used for fish culture. On the other hand, pond rearing of fish for whole a year using cow dung produces 200kg of milkfish from 2,500 fry and 100kg of banana prawn from natural larvae. The majority of the ponds are directly managed by owners. To harvest cultured fishes the pond owner, *IPUKAN*, hires 5 to 10 workers, *PENDEGA*. He pays 500 to 750Rp. and two meals to a worker. However, in some ponds which belong to wealthy owner the work is carried out or supervised by a hired watchman. Usually the harvests from leased ponds are shared between the tenants and the owner. In some ponds the tenants are paid a fixed rental charge. The average area per fish farmer is usually 2ha in Indonesia, although in East Java it is classified in a range of 2 to 5ha, and less than 2ha in Madura. As a result, the status of Madura to the whole of East Java is that 15% in number of fish farmers, 10% in area under culture, and 1.5% in production in quantity and in value^{1,2}. *TAMBAK* culture has rapidly progressed since the latter of the 70's due to rising price of cultured fishes, especially shrimp and milkfish. Then, fish farmers have strengthened their effort on fish culture. This advance brought about the improvement of farming methods such as better pond construction, proper utilization of fertilizer, pesticide, and artificial food, and better management of water and stock. Furthermore, the seed collection became intensive.

Table 3. Brackishwater pond culture in East Java and Madura Island in 1979

Items	Unit	East Java	Madura Is.
Gross area under culture	ha	44,648	4,483
Production	ton	25,524	697
Productivity	kg/ha	572	155
Production	1,000 Rp.	20,075,087	294,653
Fish price	Rp./kg	787	423
Species cultured		Milkfish Tilapia Banana prawn Tiger prawn	Banana prawn Tilapia Mullet Milkfish

Source: Laporan Statistik Perikanan Jawa Timur 1979

4. Freshwater pond culture

A lot of households used to culture freshwater fish in East Java. The culture method adopted by each fish farmer is such that they have a small pond of simple structure in

their premises and buy fish seed mainly from the public hatchery *B.B.I.* or *K.P.I.*, feed wasted matters from livelihood or dung of human and domestic animals, use very little artificial fertilizer or pesticide, and rear twice a year. In 1980, there were 34 public hatcheries in East Java, 4 in Madura and fish seed of puntius, common carp, and tilapia were supplied to the fish farmers^{3,11}).

In Madura, such kind of aquaculture, even though very primitive, is still underdeveloped. In some intensive culture ponds, since 1978, fish farmer use 133kg of artificial fertilizer instead of food, about 5% of the all ponds depend on such way at present, and harvest 1,200kg/ha in rainy season and 400 kg/ha in dry season. The reason why milkfish is not dominant species nevertheless its highest price to sell is that its seed is also expensive in comparison with other fish seed. On the contrary, in majority of the ponds without the use of fertilizer, fish production amounts to 500kg/ha.

Thus extensive culture method results in low production and hence low income, however, this fishery is important for each household as a side-job.

5. Paddy field fish culture

In East Java, fish culture in paddy field is prosperous due to the existence of vast paddy fields and to that fish culture is much beneficial than paddy rice monoculture particularly in places of undeveloped irrigation system. There are three ways of culture, that is, fish are not separated from rice (this is most popular), fish are separated from paddy rice within a field, and an alternative use of a field for fish and rice by seasons. In each case a farmer looks on cultured fish as the main crop. At present, paddy field fish culture faces a problem because of more pesticides to paddy field than before, which are harmful to fish. The cultured fish species are milkfish, puntius, and common carp. The price of a species is not affected by different culture methods. In this case fish seed are provided by *B.B.I.* or *K.P.I.* In Madura, in contrast with the whole of East Java, paddy field fish culture is underdeveloped, so, if exists, productivity and fish price are lowest in East Java. Some paddy fields in Madura wherein a farmer uses 400kg of fertilizer per ha produce 600kg of fish, 700Rp./kg, and 2,500kg of unhulled rice, 120Rp./kg, amounting to 720,000Rp./ha. However, if he cultures paddy rice alone throughout a year, he gets 5,000kg of paddy rice, 600,000Rp. in total value.

Section 3. Fish marketing and fisheries co-operative

There are three channels which fish is sold, *i.e.*, fish auction market, fish dealer, and consumer⁸).

1. Fish auction market

Fish auction market has been rapidly promoted since the latter of the '70's by the government's subsidy and has been set at 24 places in East Java, 5 in Madura in 1979 and a number of auction markets have risen annually together with their activities which were managed by fisheries co-operative so-called *K.U.D.* and fish auction market, *T.P.I.*. According to statistics in 1979, half of the total catch and one third of fishing households/fish farmers depend on this channel in East Java, but, vary largely from district to district. For instance, Muncar *K.U.D.*, the largest one, deals with 96% of the total catch, 12,700 tons per year¹⁹. In Madura, on the other hand, handling volume per market amounts to less than 100 tons and a few percent of fishermen utilize the market and a small part of fish production is sold through the market, even in recent years, because the activity of the market was just started. This means that fish auction market is still underdeveloping in Madura and also that ratio of the use of fish market increases in proportion to fishing scale. In the area where *K.U.D.* was organized, majority of fishermen became members and fish price is decided by many middle wholesalers/fish retailers. After the auction, the highest fish price among the three channels is usually realized.

Money is paid to the fishing operator within the same day or next day after deduction of 5% brokerage. *K.U.D.* not only gives the auction place but also supplies fuel, oil, ice, and credit to the fishermen.

2. Fish dealer

A private fish dealer also plays very important role in marketing at present. It is probably due to the underdevelopment of fish auction system and a lack of fishing running capital. The fish dealers are active in the landing places wherein existing fish marketing network is not functioning. They usually supply a loan for fishing materials and fish culture ponds to fishermen. The interest of this loan is very high in compensation for the payment after the capture and/or the harvest.

3. Consumer

The majority of artisanal fishing households carry their catch to the local market or to the town streets to sell in Madura. This sale is carried out mainly by wives of fishing community. A wife brings the small amount of fish that her husband or her family earned either from capture or the share of fishing to the local market on foot or by bicycle with fare. She sells fresh fishes without ice, home-made processed fish to the inhabitants by mutual negotiation. As a result, fish price becomes very low. At that time she buys some foodstuffs or daily commodities from the women of agricultural households. Therefore, this seems to be a mutual exchange of local products among inhabitants.

Section 4. Economic situation of artisanal fishing households

While some fishing households find work in farming, trade, commerce and wage work other than fishery, a great majority in East Java depends mainly on fishing for their livelihood. Therefore, this causes not a sufficient income from fishery but a less opportunity of employment, and in consequence their major income comes from fishery. But they increase their income by combining different kinds of fishery by seasons. A family size of fishing household is quite big in comparison with other kinds of family, and then likewise the leader, activity of women and children is to sell their products, to help the fishing and miscellaneous business to supplement their household economy.

With reference to the annual income of fishing household, the author points out some characteristics as follows:

- 1) The annual income of a fishing household in East Java is less than that in other provinces in Java, and extremely low in Madura as well as in comparison with that of another business in and around the district. This seems to be caused probably by the consequence of their low fishing productivity, the poor use of fish market wherein they can get higher price, and overpopulation in fishing villages.
- 2) The annual income of a fishing household differs widely from section to section of fisheries, *i.e.*, in East Java the most beneficial one is in *TAMBAK* culture and followed by marine fishery, paddy field fish culture, feshwater pond culture, and inland fishery. In Madura, however, marine fishery results much more earning than that of *TAMBAK* culture since this fish culture is undergoing on extensive way.
- 3) The income increases in proportion to the enlargement of fishing management within each section of fishery.
- 4) The income of fishing laborer's household is remarkably lower than that of a fishing operator, and its daily wage is almost the same as that of farming or salt making, *i.e.*, 500 to 750Rp. with meals.

Living condition of fishing household seems poorer than that of another business owing to low income. Otherwise, significant differences exist among fishing households by size of fishing, by their status, either being operator or not, and by districts. Living condition is improved in proportion to the enlargement of fishing management; upper class includes operators of big fishing such as purse seiners, *PAYANG* seiners, trawlers, and *TAMBAK* farmers, the middle class includes gill netters, fixed lift netters, and the lowest one does scoop net, angling and guiding barrier as well as fishing laborer. Residence of artisanal fishing household is usually narrow in spits of comparatively large family. Besides they possess few facilities such as waterworks, toilet, and electric lamp,

and few durable consuming goods. Such tendency is more clearer in rural area than the town. This implies that most of their earning is used for foodstuff of local products and daily commodity at the bazaar held in and around their villages⁷⁾.

Summary

Fisheries in Madura generally remain still more undeveloped in comparison with East Java. Any fishing and fish farming are adhere to the traditional ways as shown in typical poor fishing facilities and equipment resulting in low productivity and low fish price and low income, however, these situations are going to be rapidly changed. Fishing households depend mainly on artisanal fisheries due to less employment opportunities. Their family members are much more than the family in the town, and their activities play an important role to supplement their livelihood economy. Such situation found in fishing households causes an overcrowded use of coastal fishing ground and a strain between their artisanal fisheries and more effective ones. Large part of the catch from small scale fisheries is sold directly in the rural market through negotiation by women of fishing household to rural inhabitants at remarkable low price. The amount of expenditure is very low due to low income, and they spend majority of their income for foodstuff and daily commodity, in consequence, they have a few life facility and few durable consuming goods.

Since the latter of the '70's, the rapid fisheries progress have achieved being supported mainly by the government and by fish price more steeply risen than in general prices.

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Fig. 1. A shipyard, Madura, June 30
Fig. 2. Children who are repairing gill net, the north coast of Bali, July 27
Fig. 3. A public hatchery, Madura, July 3
Fig. 4. Out-board motor, Madura, July 27



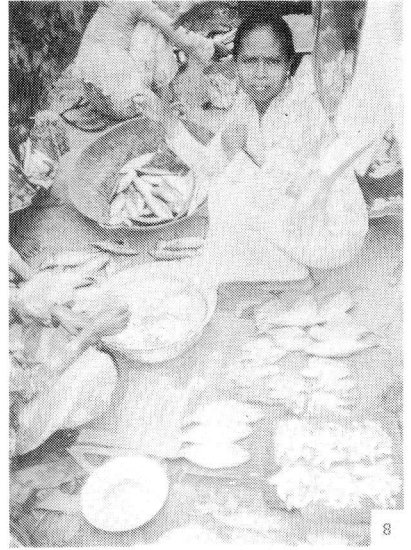
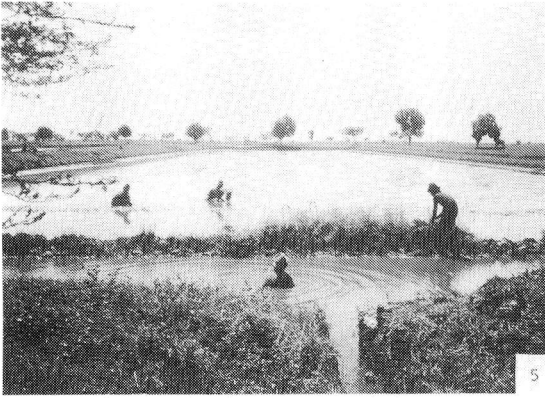


Fig. 5. Mud snail collection after fish and prawn harvest at *TAMBAK*, Lamongan, East Java, July 15

Fig. 6. Fish auction at Jepara Fisheries Co-operative, Central Java, August 4

Fig. 7. A typical kitchen in rural area, the north coast of Bali, July 25

Fig. 8. Fish retailer at rural market, Madura, June 26

