APPENDIX-2

PERCOBAAN OPERASI PENANGKAPAN DIDALAM DAN DILUAR TELUK WAWORADA

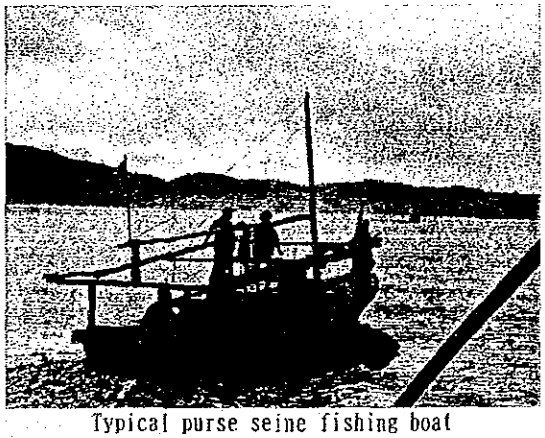
APPENDIX - 2. *Experimental fishing operations inside and outside of Waworada Bay*

1. Outline of the experiment

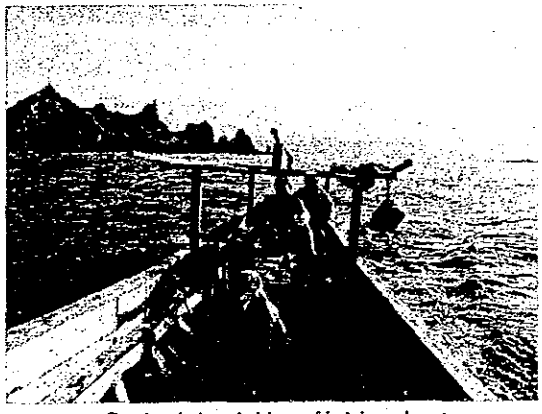
(1) Objective	:	To compare fishing operations inside and outside of the bay technically and economically.
(2) Fishing methods	:	Purse seine fishing and hand-line fishing
(3) Area of experiment	:	Waworada
(4) Period	:	Five fishing days in a period from April 2nd to 18th, 2002
(5) Way of experiment	:	

The experiment was conducted with the existing fishing boats in Waworada. Two purse seine fishing boats and two hand-line fishing boats participated in the experimental fishing operations. One of each kind of fishing boats undertook the fishing operations out of the Bay for five (5) fishing days and the other one of each kind of fishing boats conducted its fishing inside of the Bay for five (5) fishing days. The boats' owners or captains were required to record their fishing operations including quantity of catches by species, sales and expenses in every fishing day, according to recording form prepared.

The border between the inside and the outside of the Bay was set along a line from the lighthouse (Toro Jampang) to the tip of the peninsula, south of the Bay (Toro Langudu). Since severe sea condition was expected in the outside of the Bay in this season (south-east monsoon), the captains were instructed to give the highest priority to the safety-first operation and entrusted to decide when to go out of the Bay and where to fish, watching sea conditions. Main particulars of the fishing boats participated in this experiment are shown in the attached table.



Typical purse seine fishing boat



Typical hand-lien fishing boat

2. Results of fishing operations

A. Purse seine fishing:

(1) Outline of the fishing operations

Both of the purse seine fishing boats were almost same in scale, equipped with fishing net of same size and operated, based on Rompo, Waworada.

On April 2nd, the first day, the fishing boat undertaking fishing outside of the Bay (hereinafter called the "Outside Boat") went out the Bay, about 3 ~ 4 miles from the border line (mouth of the Bay) for fishing. The fishing boat undertaking fishing inside of the Bay (hereinafter called the "Inside Boat") also proceeded near to the mouth of the Bay, together with other purse seine fishing boats and in consequence, there was not much difference in distance between the two boats on the first day.

The "Outside Boat" could not go fishing due to engine trouble on April 4th, and the fishing net was damaged on 6th. As a result, the "Outside Boat" could conduct the fishing outside only three (3) days in the period of the experiment.

(2) Results of fishing operation

The records of fishing are shown in the attached tables A-1, A-2.

The fishing operations of the two boats were compared in daily average base because the numbers of their fishing days were different ("Outside Boat" = 3 days, "Inside Boat"= 5 days). (See Table A-3)

a) Direct operation cost:

There is no substantial difference between the two boats, though the expense of the Inside Boat is larger than the Outside Boat's one, due to expenses for crew and engine oil, which they renew once a month. The Outside Boat's accidental expenses for repairing the engine and the fishing net were excluded, because it is easier to compare just several times of the fishing operations.

b) Quantity of catches:

The Outside Boat landed 220kg of catches in average, 1.8 times as much as the Boat Inside landed.

On April 2nd, the Outside Boat caught 200kg of Tongkol (Frigate Mackerel), while the Inside Boat had no catch. Most of the purse seining fishing boats, which operated inside

of the Bay, had no catch on the same day.

On April 4th, the Inside Boat landed 65 pieces of Cakalang (Skipjack), 260kg, but the Outside Boat did not go out fishing due to engine trouble.

Catches of the Outside Boat and the Inside Boat

Species	Fishing, Outside of the Bay		Fishing, Inside of the Bay	
	Total in 3 days	Average/day	Total in 5 days	Average/day
Tongkol (Frigate mackerel)	1,500 pcs. 668 kg 1,125,000 Rp	500 pcs. 223 kg 375,000 Rp	700 pcs. 160 kg 420,000 Rp	140 pcs. 32 kg 84,000 Rp
Cakalang (Skipjack)	0 pcs.	0 pcs	65 pcs. 260 kg 552,500 Rp	13 pcs. 52 kg 110,500 Rp
Total quantity	668 kg	223 kg	420kg	84 kg
Total amount	1,125,000 Rp	375,000 Rp	972,500 Rp	194,500 Rp

c) Sale of catches:

The sales amount of catches of the Outside Boat was 370,000Rp, which was 1.9 times of the Inside Boat's sales, 190,000Rp. The difference in sales amount was made mainly from the difference in quantity of catches. The Outside Boat earned 248,000Rp of gross profit; while the Inside Boat's gross profit was 49,000Rp.

After dividing the gross profit[1] between the boat owner and crew, the boat owner bears maintenance/repairing expense and depreciation cost of the boats, engines and fishing gears, which were estimated as indicated in the attached table.

In case of the Outside Boat, the owner earned net profit 66,000Rp after deducting the maintenance/repairing expense and depreciation cost from the owner's share of the gross profit, while the Inside Boat owner got a loss. With the catches and sales in the experiment, the Inside Boat's owner would not be able to bear the maintenance/ repairing expense and depreciation cost.

[1] In many cases in Waworada, the gross profit, which is the balance after deducting direct operation expenses from sales amount, are shared by boat owner 50% and crew 50%, though the sharing rates slightly vary by boats.

Purse seine fishing operation
(outside of Bay)

Catch from purse seine fishing
(outside of Bay)

B. Hand-line fishing

(1) Outline of the fishing operations

A hand-line fishing boat of Rompo, Waworada carried out the fishing operation in the Bay. But, because all of the hand-line fishing boats in Rompo, Waworada are small boats of canoe type, which are operated only inside of the Bay and not practical to go out from the Bay, the fishing operation outside of the Bay was undertaken by a fishing boat based on Sido, a small village near the mouth of the Bay.

The fishing ground of the boat fishing in the Bay (hereinafter called the Inside Boat) was the inner part of the Bay, west of Rompo. The fishing boat undertaking the fishing operation outside of the Bay (hereinafter called the Outside Boat) operated in southern coastal area of the peninsula tip, about one hour running from the village. The Inside Boat did fishing from evening to next morning. The Outside Boat went out fishing early morning and retuned afternoon.

(2) Results of fishing

Results of the fishing operations were shown in the attached Table.

a) Quantity of catches:

The Inside Boat landed 86kg and the Outside Boat landed 51kg, mainly groupers and snappers, in five (5) fishing days. The Inside Boat exceeded the Outside Boat in both quantity and size of fish.

Catches by the Outside Boat and the Inside Boat

Species	Fishing, Outside of the Bay			Fishing, Inside of the Bay		
	No. of catch	Total weight (kg)	Av. (kg/pc.)	No. of catch	Total weight (kg)	Av. (kg/pc.)
Kerapu Bintik (Grouper)	5	3.2	0.64			
Kerapu Biasa (Grouper)	38	27.4	0.72	37	55.3	1.49
Ketamba (Emperor)	28	18.4	0.66			
Lentam	3	1.2	0.40			
Kerisi Bali	1	0.7	0.70			
K.P				3	7.1	2.37
.B 1				2	1.1	0.55
T.A				1	2.0	2.00
K. Lokal				6	6.0	1.00
T.U				2	5.0	2.50
Bangkolong (Caranx sp.)				1	10.0	10.00
Total in 5 days	75	50.9	0.68	52	86.5	1.66
Average per day	15pcs	10.2kg		10pcs	17.3kg	

b) Sale of catches

There was a large difference in sales amount between the two boats, owing to disparity of price by marketing place in addition to the abovementioned difference in quantity. The Inside Boat sold its catches to fish-buyers at Rompo, a fish-marketing center in Waworada area. On the other hand, the Outside Boat landed its catches at Side, where marketing fish is unfavorable due to distance, taking two hours by boat from Rompo.

Hand-line fishing operation
(outside of Bay)

Catch from hand-line fishing
(outside of Bay)

3. Observation on the results

A. Purse seine fishing:

In three to five fishing days in the experiment, the Outside Boat largely surpassed the Inside Boat at both catch quantity and sales amount. Only based on the data obtained in this small experiment, it cannot be concluded that fishing outside of the Bay is more advantageous than fishing inside of the Bay, but it suggests a possibility to expand the purse seine fishing out of the Bay.

B. Hand-line fishing:

The results indicate considerably good productivity and profitability of the hand-line fishing inside of the Bay, though it cannot be said that demersal fish resources are more abundant in the Bay than outside of the Bay, with the data obtained by this experiment only.

The quantity of catches could be largely related to fishermen's knowledge, experience on their fishing grounds and their fishing skill. The fishermen of the Inside boat did fishing in their well-known fishing grounds in the Bay as usual, while the fishing outside of the Bay was conducted in less experienced areas for the fishermen of the Outside Boat. Finding good fishing points in new areas is difficult in several times of fishing and the Inside Boat fishermen were, therefore, more advantageous than the Outside Boat fishermen. This also suggest that it would be possible to increase catches in outside of the Bay by obtaining knowledge and experience on new fishing grounds.

In marketing of the catch, there are also a difference in selling prices between the marketing places, Rompo as the center of marketing of fish in the area and Sido a small village as far as two-hour drive by boat from Rompo. In case that the Outside Boat goes to Rompo to sell their catches, the operation is estimated as shown in the Table B-4. According to this estimation, the income falls down due to increase of fuel expense when they land 10kg only, even if their selling price at Rompo could be 1.2 times as much as one at Sido. In this case, however, the income would be increased if they landed more than 13kg.

It can be, therefore, suggested that the hand-line fishing outside of the Bay is possible by developing fishing grounds and marketing channels at Rompo.

TABLE A-1 PURSE SEINE FISHING , OUTSIDE of the Bay

Fishing, Outside of the bay	1st	2nd	3rd	4th	5th	Total	Average per day
Date of Fishing	02/4	04/4	06/4	17/4	18/4	3 days	
Number of crew	7			6	6		
Departing time	07:00	(Engine trouble)	(Net trouble)	05:00	04:30		
Arrival time at fishing ground	09:30			08:00	07:30		
Position of fishing ground				Langgudu	Langgudu Selatan		
Wether	Fine			Fine	Fine		
Wind direction	East			East	East		
Wind force	Gentle			Gentle	Gentle		
Waves	small			small	small		
Number of shooting net	3 times			3 times	3 times		
Arrival time at port	18:20			16:30	17:00		
Hours from departure to return	11:20 hrs			11:30 hrs	12:30 hrs	35:20 hrs	11:40 hrs
Roning hours	6 hrs			6 hrs	7 hrs	19 hrs	6:20 hrs
Catches							
Tongkol Q'nty (pcs)	450 pcs	0 pcs	0 pcs	750 pcs	300 pcs	1,500 pcs	500 pcs
Q'nty (kg)	210 kg	0 kg	0 kg	308 kg	150 kg	668 kg	223 kg
Sales (Rp)	337,500 Rp	0 Rp	0 Rp	562,500 Rp	225,000 Rp	1,125,000 Rp	375,000 Rp
Total quantity of catches	210 kg			308 kg	150 kg	668 kg	223 kg
Sales amount o catches (A)	337,500 Rp			562,500 Rp	225,000 Rp	1,125,000 Rp	375,000 Rp
Expenses for fishing							
Fuel oil for engine (diesel)							
Quantity (liter)	30			30	30	90 liter	30 liter
Unit price (Rp/liter)	1,750			1,750	1,750	1,750 Rp/l	1,750 Rp/l
Amount (Rp)	52,500			52,500	52,500	157,500 Rp	52,500 Rp
Lub. Oil for engine						0	0
Quantity (liter)	0			0	0	0 liter	0 liter
Unit price (Rp/liter)						0 Rp/l	0 Rp/l
Amount (Rp)						0 Rp	0 Rp
Ice	0			0	0	0	0
Water	1,000			1,000	1,000	3,000	1,000
Food for crew	20,000			20,000	20,000	60,000	20,000
Cigarette	16,000			16,000	16,000	48,000	16,000
others	0						0
(Sub-total)	89,500			89,500	89,500	268,500 Rp	89,500 Rp
Expense for repairing							
Fishing gears							
Boat							
Engine							
Total expense for fishing (B)	89,500 Rp			89,500 Rp	89,500 Rp	268,500 Rp	89,500 Rp
Gross profit (A) - (B)	248,000 Rp			473,000 Rp	135,500 Rp	856,500 Rp	285,500 Rp
Share for boat owner							
Share for crew							

Catch Details	1	2	3	4	5	Total	Average per day
Tongkol						Tongkol	Tongkol
Length				22 cm	22 cm	22 cm	22 cm
Weight				200 g/pc	200 g/pc	g/pc	200 g/pc
Q'nty (pcs)				400 pcs	300 pcs	1,150 pcs	383 pcs
Price				750 Rp/pc	750 Rp/pc	Rp/pc	750 Rp/pc
Quantity (kg)				150 kg	150 kg	300 kg	100 kg
Sales (Rp)				300,000 Rp	225,000 Rp	862,500 Rp	287,500 Rp
Tongkol						Tongkol	Tongkol
				24 cm		24 cm	24 cm
				210 g/pc		210 g/pc	210 g/pc
				350 pcs		350 pcs	117 pcs
				750 Rp/pc		Rp/pc	750 Rp/pc
				158 kg		158 kg	53 kg
				262,500 Rp		262,500 Rp	87,500 Rp
Tongkol						Tongkol	Tongkol
	26 cm					26 cm	26 cm
	280 g/pc					280 g/pc	280 g/pc
	450 pcs					450 pcs	150 pcs
	750 Rp/pc					750 Rp/pc	750 Rp/pc
	210 kg					210 kg	70 kg
	337,500 Rp					337,500 Rp	112,500 Rp
Cakalang						Cakalang	Cakalang
						cm	cm
						g/pc	g/pc
						0 pcs	0 pcs
						Rp/pc	Rp/pc
						0 kg	0 kg
						0 Rp	0 Rp
Total quantity of catches (kg)	210 kg			308 kg	150 kg	668 kg	223 kg
Sales amount o catches (Rp)	337,500 Rp			562,500 Rp	225,000 Rp	1,125,000 Rp	375,000 Rp

TABLE A-2 PURSE SEINE FISHING , INSIDE of the Bay

Fishing, Inside of the bay	1st	2nd	3rd	4th	5th	Total	Average per day
Date of Fishing	02/4	03/4	04/4	05/4	06/4	5 days	
Number of crew	8	7	7	7	7		
Departing time	07:00	07:00	08:00	08:00	10:35		
Arrival time at fishing ground	09:20	09:30	11:00	11:00	11:20		
Position of fishing ground							
Wether	Fine	Fine	Fine	Fine	Fine		
Wind direction	East	East	East	South	South		
Wind force	Gentle	Gentle	Gentle	Gentle	Gentle		
Waves	small	small	small	small	small		
Number of shooting net	*3 times*	*2 times*	*3 times*	*2 times*	*1 time*		
Arrival time at port	19:00	19:00	19:00	18:00	17:30		
Hours from departure to return	12:00 hrs	12:00 hrs	11:00 hrs	10:00 hrs	7:00 hrs	52:00 hrs	10:24 hrs
Runing hours	6 hrs	7 hrs	7 hrs	7 hrs	6 hrs	33 hrs	7 hrs
Catches							
Tongkol Q'nty (pcs)	0 pcs	200 pcs	0 pcs	0 pcs	500 pcs	700 pcs	140 pcs
Q'nty (kg)	*0 kg*	*60 kg*	*0 kg*	*0 kg*	*100 kg*	*160 kg*	*32 kg*
Sales (Rp)	0 Rp	160,000 Rp	0 Rp	0 Rp	260,000 Rp	420,000 Rp	84,000 Rp
Cakalang Q'nty (pcs)		0 pcs	65 pcs			65 pcs	13 pcs
Q'nty (kg)		0 kg	260 kg			260 kg	52 kg
Sales (Rp)		0 Rp	552,500 Rp			552,500 Rp	110,500 Rp
Total quantity of catches	0 kg	60 kg	260 kg	0 kg	100 kg	420 kg	84 kg
Sales amount o catches (A)	0 Rp	160,000 Rp	552,500 Rp	0 Rp	260,000 Rp	972,500 Rp	194,500 Rp
Expenses for fishing							
Fuel oil for engine (diesel)							
Quantity (liter)	35 liter	35 liter	35 liter	35 liter	35 liter	175 liter	35 liter
Unit price (Rp/liter)	1,500 Rp/l	1,500 Rp/l	1,750 Rp/l	1,750 Rp/l	1,750 Rp/l	1,650 Rp/l	1,650 Rp/l
Amount (Rp)	52,500 Rp	52,500 Rp	61,250 Rp	61,250 Rp	61,250 Rp	288,750 Rp	57,750 Rp
Lub. Oil for engine						0	0
Quantity (liter)	5 liter	2 liter	0 liter	5 liter	0 liter	12 liter	2 liter
Unit price (Rp/liter)	12,000 Rp/l	12,000 Rp/l	Rp/l	12,000 Rp/l	Rp/l	36,000 Rp/l	7,200 Rp/l
Amount (Rp)	60,000 Rp	24,000 Rp	0 Rp	60,000 Rp	0 Rp	144,000 Rp	28,800 Rp
Ice	0	0	0	0	0	0	0
Water	1,000	1,000	25,000	0	0	27,000	5,400
Food for crew	25,000	25,000	30,000	25,000	25,000	130,000	26,000
Cigarette	32,000	30,000	4,000	30,000	30,000	126,000	25,200
others	0	0	4,000	4,000		8,000	1,600
(Sub-total)	170,500 Rp	132,500 Rp	124,250 Rp	180,250 Rp	116,250 Rp	723,750 Rp	144,750 Rp
Expense for repairing							
Fishing gears							
Boat							
Engine							
Total expense for fishing (B)	170,500 Rp	132,500 Rp	124,250 Rp	180,250 Rp	116,250 Rp	723,750 Rp	144,750 Rp
Gross profit (A) - (B)	(170,500) Rp	27,500 Rp	428,250 Rp	(180,250) Rp	143,750 Rp	248,750 Rp	49,750 Rp
Share for boat owner							
Share for crew							

Catch Details	1	2	3	4	5	Total (5days)	Average per day
Tongkol						Tongkol	Tongkol
Length	cm		cm	cm	22 cm	22 cm	22 cm
Weight	g/pc		g/pc	g/pc	200 g/pc	g/pc	g/pc
Q'nty (pcs)	0 pcs		0 pcs	0 pcs	500 pcs	500 pcs	100 pcs
Price	0 Rp/pc		0 Rp/pc	0 Rp/pc	520 Rp/pc	520 Rp/pc	520 Rp/pc
Quantity (kg)	0 kg		0 kg	0 kg	100 kg	100 kg	20 kg
Sales (Rp)	0 Rp		0 Rp	0 Rp	260,000 Rp	260,000 Rp	52,000 Rp
						Tongkol	Tongkol
		28 cm		cm		28 cm	28 cm
		300 g/pc		g/pc		300 g/pc	300 g/pc
		200 pcs		0 pcs		200 pcs	40 pcs
		800 Rp/pc		0 Rp/pc		800 Rp/pc	800 Rp/pc
		60 kg		0 kg		60 kg	12 kg
		160,000 Rp		0 Rp		160,000 Rp	32,000 Rp
Cakalang						Cakalang	Cakalang
Length		cm	65 cm			65 cm	65 cm
Weight		kg/pc	4 kg/pc			4 kg/pc	4 kg/pc
Q'nty (pcs)		pcs	65 pcs			65 pcs	13 pcs
Price		Rp/pc	8,500 Rp/pc			8,500 Rp/pc	8,500 Rp/pc
Quantity (kg)		0 kg	260 kg			260 kg	52 kg
Sales (Rp)		0 Rp	552,500 Rp			552,500 Rp	110,500 Rp
Total quantity of catches (kg)	0 kg	60 kg	260 kg	0 kg	100 kg	420 kg	84 kg
Sales amount o catches (Rp)	0 Rp	160,000 Rp	552,500 Rp	0 Rp	260,000 Rp	972,500 Rp	194,500 Rp

Table B-1 **HAND LINE FISHING , OUTSIDE of the Bay**

	1st	2nd	3rd	4th	5th	Total	Average per day
Date of Fishing	07/4	08/4	09/4	10/4	11/4	5 days	
Number of crew	2	2	2	2	2		
Departing time	07:15	05:00	05:00	04:00	04:00		
Start fishing	08:20	07:40	08:10	07:00	06:00		
Position of fishing ground							
Wether	Fine						
Wind direction	East	South	South		South		
Wind force		Gentle	Gentle		Gentle		
Waves		Little	Little		Little		
Finish fishing	13:30	12:00					
Arriving at port	14:00	12:30	1300	12:00	12:00		
Hours from departure to return	7:15 hrs	7:30 hrs	8:00 hrs	8:00 hrs	8:00 hrs	38:45 hrs	15:24 hrs
Runing hours	2.0 hrs	1.0 hrs	2.0 hrs	2.0 hrs	2.0 hrs	9.0 hrs	2 hrs
Catches							
Number of catch (pcs)	6 pcs	8 pcs	21 pcs	18 pcs	22 pcs	75 pcs	15 pcs
Total quantity of catches	3.00 kg	5.40 kg	15.45 kg	12.36 kg	14.68 kg	50.89 kg	10.18 kg
Sales amount of catches (A)	21,000 Rp	24,000 Rp	58,500 Rp	56,000 Rp	99,000 Rp	258,500 Rp	51,700 Rp
Expenses for fishing							
Fuel oil for engine (diesel)							
Quantity (liter)	10 liter	10 liter	10 liter	10 liter	10 liter	50 liter	10 liter
Unit price (Rp/liter)	1,750 Rp/l	1,750 Rp/l	1,750 Rp/l	1,750 Rp/l	1,750 Rp/l	1,750 Rp/l	1,750 Rp/l
Amount (Rp)	17,500 Rp	17,500 Rp	17,500 Rp	17,500 Rp	17,500 Rp	87,500 Rp	17,500 Rp
Lub. Oil for engine							
Quantity (liter)	0 liter	0 liter	0 liter	0 liter	0 liter	0 liter	0 liter
Unit price (Rp/liter)	Rp/l	Rp/l	Rp/l	Rp/l	Rp/l	Rp/l	0 Rp/l
Amount (Rp)	0 Rp	0 Rp	0 Rp	0 Rp	0 Rp	0 Rp	0 Rp
Bait	1,500	2,000	2,000	2,000	2,000	9,500	1,900
Ice	0	0	0	0	0	0	0
Water	0	0	0	0	0	0	0
Food foe crew	6,000	4,000	4,000	4,000	4,000	22,000	4,400
Cigarette	0	6,000	6,000	6,000	6,000	24,000	4,800
others	0	0	0	0			0
(Sub-total)	25,000 Rp	29,500 Rp	29,500 Rp	29,500 Rp	29,500 Rp	143,000 Rp	28,600 Rp
Expense for repairing							
Fishing gears							
Boat							
Engine							
Total expense for fishing (B)	25,000 Rp	29,500 Rp	29,500 Rp	29,500 Rp	29,500 Rp	143,000 Rp	28,600 Rp
Gross profit (A) - (B)	(4,000) Rp	(5,500) Rp	29,000 Rp	26,500 Rp	69,500 Rp	115,500 Rp	23,100 Rp
Share for boat owner							
Share for crew							

CATCH DETAILS

		Length (cm)	Weight (kg)	No. of catch (pcs)	Price (Rp/pc)	Quantity (kg)	Sales (Rp)
1st	Lentam	23	0.40	3	1,500	1.20	4,500
	Kerapu Bintik (Grouper)	30	0.60	1	8,000	0.60	8,000
	Kerapu Biasa (Grouper)	25	0.50	1	7,000	0.50	7,000
	Gurisi Bali	26	0.70	1	1,500	0.70	1,500
	(Total of the day)			6 pcs		3.00 kg	21,000 Rp
2nd	Kerapu Biasa (Grouper)	32	0.75	2	4,500	1.50	9,000
	"	30	0.75	2	4,500	1.50	9,000
	Ketamba (Emperor)	30	0.60	4	1,500	2.40	6,000
	(Total of the day)			8 pcs		5.40 kg	24,000 Rp
3rd	Ketamba (Emperor)	32	1.10	2	2,000	2.20	4,000
	"	20	0.50	6	1,000	3.00	6,000
	"	26	0.70	3	1,500	2.10	4,500
	"	35	1.40	1	3500	1.40	3,500
	Kerapu Biasa (Grouper)	28	0.75	9	4500	6.75	40,500
	(Total of the day)			21 pcs		15.45 kg	58,500 Rp
4th	Kerapu Biasa (Grouper)	28	0.75	8	4,000	6.00	32,000
	"	26	0.75	2	4,000	1.50	8,000
	Ketamba (Emperor)	26	0.60	5	2,000	3.00	10,000
	"	28	0.62	3	2,000	1.86	6,000
							0
	(Total of the day)			18 pcs		12.36 kg	56,000 Rp
5th	Kerapu Biasa (Grouper)	25	0.55	8	3,750	4.40	30,000
	"	32	2.70	1	14,000	2.70	14,000
	"	24	0.50	5	3,000	2.50	15,000
	Ketamba (Emperor)	30	0.62	4	2,000	2.48	8,000
	Kerapu Bintik (Grouper)	30	0.65	4	8,000	2.60	32,000
	(Total of the day)			22 pcs		14.68 kg	99,000 Rp
	Total in 5 days			75 pcs		50.9 kg	258,500 Rp

Average weight per pc. = 0.679 kg/pc

Average price = 5,080 Rp/kg

Table B-2 **HAND LINE FISHING , INSIDE of the Bay**

	1st	2nd	3rd	4th	5th	Total	Average per day
Date of Fishing	09/4	10/4	11/4	12/4	13/4	5 days	
Number of crew	1	1	1	1	1		
Departing time	15:00	15:00	16:00	16:00	16:00		
Start fishing	19:00	19:00	18:00	18:00	18:00		
Position of fishing ground	Nisa Genda	Nisa Nggenda	Nisa Lampa Dana	Tonggo Laju	Nisa Sura		
Weither							
Wind direction	East	East	East	South	East		
Wind force	Normal	Normal	Strong		Strong		
Waves	Normal	Normal	Big		Big		
Finish fishing	06:00 +1	06:00 +1	06:00 +1	06:00 +1	06:00 +1		
Arriving at port		08:00 +1	08:00 +1				
Hours from departure to return	17:00 hrs	17:00 hrs	16:00 hrs	16:00 hrs	16:00 hrs	82:00 hrs	16:24 hrs
Runing hours	6 hrs	6 hrs	4 hrs	4 hrs	3 hrs	23 hrs (Sailing	5 hrs (Sailing
Catches							
• @ Number of catch (pcs)	21 pcs	16 pcs	8 pcs	4 pcs	3 pcs	52 pcs	10 pcs
Total quantity of catches	18.6 kg	26.3 kg	15.5 kg	16.6 kg	9.5 kg	86.5 kg	17.3 kg
Sales amount of catches (A)	265,000 Rp	152,750 Rp	220,000 Rp	100,000 Rp	60,000 Rp	797,750 Rp	159,550 Rp
Expenses for fishing							
Fuel oil for engine (diesel)							
Quantity (liter)	0 liter	0 liter	0 liter	0 liter	0 liter	0 liter	0 liter
Unit price (Rp/liter)	Rp/l	Rp/l	Rp/l	Rp/l	Rp/l	Rp/l	0 Rp/l
Amount (Rp)	0 Rp	0 Rp	0 Rp	0 Rp	0 Rp	0 Rp	0 Rp
Lub. Oil for engine							0
Quantity (liter)	0 liter	0 liter	0 liter	0 liter	0 liter	0 liter	0 liter
Unit price (Rp/liter)	Rp/l	Rp/l	Rp/l	Rp/l	Rp/l	Rp/l	0 Rp/l
Amount (Rp)	0 Rp	0 Rp	0 Rp	0 Rp	0 Rp	0 Rp	0 Rp
Bait	20,000	15,000	20,000	25,000	18,000	98,000	19,600
Ice	0	0	0	50,000	15,000	65,000	13,000
Water	0	0	0	0	0	0	0
Food foe crew	0	0	0	0	0	0	0
Cigarette	0	9,000	9,000	9,000	9,000	36,000	7,200
others	0	0	0	0			0
(Sub-total)	20,000 Rp	24,000 Rp	29,000 Rp	84,000 Rp	42,000 Rp	199,000 Rp	39,800 Rp
Expense for repairing						0	0
Fishing gears			10,000			10,000	2,000
Boat						0	0
Engine						0	0
Total expense for fishing (B)	20,000 Rp	24,000 Rp	39,000 Rp	84,000 Rp	42,000 Rp	209,000 Rp	41,800 Rp
Gross profit (A) - (B)	245,000 Rp	128,750 Rp	181,000 Rp	16,000 Rp	18,000 Rp	588,750 Rp	117,750 Rp
Share for boat owner							
Share for crew							

CATCH DETAILS

		Length (cm)	Weight (kg)	No. of catch (pcs)	Price (Rp/pc)	Quantity (kg)	Sales (Rp)
1st	K.B (Grouper)	30	1.5	4	20,000	6.0	80,000
	"	28	1.0	5	20,000	5.0	100,000
	"	16	0.3	10	2,500	3.0	25,000
	K.P	33	2.3	2	30,000	4.6	60,000
	(Total of the day)			21 pcs		18.6 kg	265,000 Rp
2nd	K.B 4 (Grouper)		2.5	4	15,000	10.0	60,000
	K.B 4 (Grouper)		2.3	4	15,000	9.2	60,000
	K.B 3 (Grouper)		1.0	6	5,000	6.0	30,000
	• @ 1		0.6	1	1,500	0.6	1,500
	• @ 1		0.5	1	1,250	0.5	1,250
	(Total of the day)			16 pcs		26.3 kg	152,750 Rp
3rd	K.B (Grouper)	60	7.5	1	150,000	7.5	150,000
	T.A	30	2.0	1	40,000	2.0	40,000
	K.Lokal		1.0	6	5,000	6.0	30,000
							0
							0
	(Total of the day)			8 pcs		15.5 kg	220,000 Rp
4th	T.U	52	2.5	2	20,000	5.0	40,000
	Bangkolong	68	10.0	1	40,000	10.0	40,000
	K.B (Grouper)	30	1.6	1	20,000	1.6	20,000
							0
							0
	(Total of the day)			4 pcs		16.6 kg	100,000 Rp
5th	K.B (Grouper)	41	3.5	2	15,000	7.0	30,000
	K.P	33	2.5	1	30,000	2.5	30,000
							0
							0
							0
	(Total of the day)			3 pcs		9.5 kg	60,000 Rp
	Total in 5 days			52 pcs		86.5 kg	797,750 Rp

Average weight pc 1.663 kg/pc

Average price 9,223 Rp/kg

17.3 kg/day

GILL NET FISHING

Fishing, * Inside of the bay	1st	2nd	3rd	4th	5th	Total	Average per day
Date of Fishing	02/4	03/4	04/4	05/4	06/4	5 days	
Number of crew	2	2	2	2	2		
Departing time	17:00	17:00	17:00	18:00	17:00		
Start fishing	18:30	18:30	18:30	19:00	18:30		
Position of fishing ground	Toko Pangkajarat	Karampi			Toko Neenggo		
Wether	Fine	Fine	Fine	Fine	Fine		
Wind direction	East	East	East	East	East		
Wind force	Gentle						
Waves							
Times of setting net	1 time	2 times	2 times	2 times	2 times		
Finish fishing	23:30	01:30 +1	02:30 +1	04:30 +1	03:30 +1		
Arriving at port	01:30 +1	03:30 +1	04:30 +1	06:30 +1	05:00 +1		
Hours from departure to return	8:30 hrs	10:30 hrs	11:30 hrs	12:30 hrs	12:30 hrs	55:30 hrs	11:06 hrs
Running hours	3.5 hrs	3.5 hrs	3.5 hrs	3.0 hrs	3.0 hrs	16.5 hrs	3.3 hrs
Catches							
* 8 Number of catch (pcs)	24 pcs	9 pcs	25 pcs	23 pcs	10 pcs	91 pcs	18 pcs
Total quantity of catches	9.35 kg	9.50 kg	11.80 kg	17.10 kg	48.00 kg	95.75 kg	19.15 kg
Sales amount o catches (A)	34,500 Rp	31,000 Rp	40,000 Rp	67,500 Rp	35,000 Rp	208,000 Rp	41,600 Rp
Expenses for fishing							
Fuel oil for engine (diesel)							
Quantity (liter)	10 liter	10 liter	5 liter	5 liter	5 liter	35 liter	7 liter
Unit price (Rp/liter)	1,500 Rp/l	1,500 Rp/l	1,500 Rp/l	1,500 Rp/l	1,500 Rp/l	1,500 Rp/l	1,500 Rp/l
Amount (Rp)	15,000 Rp	15,000 Rp	7,500 Rp	7,500 Rp	7,500 Rp	52,500 Rp	10,500 Rp
Lub. Oil for engine							0
Quantity (liter)	4 liter	0 liter	0 liter	0 liter	0 liter	0 liter	0 liter
Unit price (Rp/liter)	12,500 Rp/l	Rp/l	Rp/l	Rp/l	Rp/l	Rp/l	0 Rp/l
Amount (Rp)	50,000 Rp	0 Rp	0 Rp	0 Rp	0 Rp	0 Rp	0 Rp
Bait	0	0	0	0	0	0	
Ice	0	0	0	0	0	0	0
Water	500	0	500	500	500	2,000	400
Food for crew	15,000	0	0	2,000	5,000	22,000	4,400
Cigarette	8,000	8,000	8,000	8,000	8,000	40,000	8,000
others	5,000	1,500	500	500	500	8,000	1,600
(Sub-total)	93,500 Rp	24,500 Rp	16,500 Rp	18,500 Rp	21,500 Rp	174,500 Rp	34,900 Rp
Expense for repairing							
Fishing gears							
Boat							
Engine							
Total expense for fishing (B)	93,500 Rp	24,500 Rp	16,500 Rp	18,500 Rp	21,500 Rp	174,500 Rp	34,900 Rp
Gross profit (A) - (B)	-59,000 Rp	6,500 Rp	23,500 Rp	49,000 Rp	13,500 Rp	33,500 Rp	6,700 Rp
Share for boat owner							
Share for crew							

GILL NET FISHING , INSIDE

Catches		Length (cm)	Weight (kg)	No. of catch (pcs)	Price (Rp/pc)	Quantity (kg)	Sales (Rp)
1st	Kembung (Mackerel)	30	0.35	5	2,000	1.75	10,000
	Gazipi (Caranx sp.)	30	0.70	3	2,500	2.10	7,500
		20	0.50	3	1,500	1.50	4,500
	Peta 2 (Black Pomfret)	25	0.50	3	2,500	1.50	7,500
	Roo Rufe (Leiognathidae)	25	0.25	10	500	2.50	5,000
	(Total)			24 pcs		9.35 kg	34,500 Rp
2nd	Peta 2 (Black Pomfret)	50	3.00	1	10,000	3.00	10,000
		25	0.50	4	2,500	2.00	10,000
	Kembung (Mackerel)	25	0.25	2	1,500	0.50	3,000
	Tongkol (Frigate Mackerel)	35	2.00	2	4,000	4.00	8,000
	(Total)			9 pcs		9.50 kg	31,000 Rp
3rd	Kembung (Mackerel)	25	0.30	5	1,500	1.50	7,500
	Gazipi (Caranx sp.)	25	0.50	5	2,000	2.50	10,000
	Peta 2 (Black Pomfret)	30	0.70	4	2,500	2.80	10,000
	Ngodu ilu (???)	55	3.00	1	7,500	3.00	7,500
	Roo Rufe (Leiognathidae)	20	0.20	10	500	2.00	5,000
	(Total)			25 pcs		11.80 kg	40,000 Rp
4th	Peta 2 (Black Pomfret)	35	1.00	10	4,000	10.00	40,000
	Tongkol (Frigate Mackerel)	30	0.70	8	2,500	5.60	20,000
	Como 2 (???)	25	0.30	5	1,500	1.50	7,500
	(Total)			23 pcs		17.10 kg	67,500 Rp
5th	Tenggiri (Spanish Makarel)	90	6.00	6	3,500	36.00	21,000
	Kiu (Baby shark)	50	3.00	4	3,500	12.00	14,000
	(Total)			10 pcs		48.00 kg	35,000 Rp

HAND-LINE FISHING, OUTSIDE

CATCH DETAILS

		Length (cm)	Weight (kg)	No. of catch (pcs)	Price (Rp/pc)	Quantity (kg)	Sales (Rp)
1st	Lentam	23	0.40	3	1,500	1.20	4,500
	Kerapu Bintik (Grouper)	30	0.60	1	8,000	0.60	8,000
	Kerapu Biasa (Grouper)	25	0.50	1	7,000	0.50	7,000
	Gurisi Bali	26	0.70	1	1,500	0.70	1,500
	(Total of the day)			6 pcs		3.00 kg	21,000 Rp
2nd	Kerapu Biasa (Grouper)	32	0.75	2	4,500	1.50	9,000
	"	30	0.75	2	4,500	1.50	9,000
	Ketamba (Emperor)	30	0.60	4	1,500	2.40	6,000
	(Total of the day)			8 pcs		5.40 kg	24,000 Rp
3rd	Ketamba (Emperor)	32	1.10	2	2,000	2.20	4,000
	"	20	0.50	6	1,000	3.00	6,000
	"	26	0.70	3	1,500	2.10	4,500
	"	35	1.40	1	3500	1.40	3,500
	Kerapu Biasa (Grouper)	28	0.75	9	4500	6.75	40,500
	(Total of the day)			21 pcs		15.45 kg	58,500 Rp
4th	Kerapu Biasa (Grouper)	28	0.75	8	4,000	6.00	32,000
	"	26	0.75	2	4,000	1.50	8,000
	Ketamba (Emperor)	26	0.60	5	2,000	3.00	10,000
	"	28	0.62	3	2,000	1.86	6,000
							0
	(Total of the day)			18 pcs		12.36 kg	56,000 Rp
5th	Kerapu Biasa (Grouper)	25	0.55	8	3,750	4.40	30,000
	"	32	2.70	1	14,000	2.70	14,000
	"	24	0.50	5	3,000	2.50	15,000
	Ketamba (Emperor)	30	0.62	4	2,000	2.48	8,000
	Kerapu Bintik (Grouper)	30	0.65	4	8,000	2.60	32,000
	(Total of the day)			22 pcs		14.68 kg	99,000 Rp
	Total in 5 days			75 pcs		50.89 kg	258,500 Rp

Average weight = 0.679 kg/pc

Average price = 5,080 Rp/kg

HAND-LINE FISHING, INSIDE

CATCH DETAILS

		Length (cm)	Weight (kg)	No. of catch (pcs)	Price (Rp/pc)	Quantity (kg)	Sales (Rp)
1st	K.B (Grouper)	30	1.5	4	20,000	6.0	80,000
	"	28	1.0	5	20,000	5.0	100,000
	"	16	0.3	10	2,500	3.0	25,000
	K.P	33	2.3	2	30,000	4.6	60,000
	(Total of the day)			21 pcs		18.6 kg	265,000 Rp
2nd	K.B 4 (Grouper)		2.5	4	15,000	10.0	60,000
	K.B 4 (Grouper)		2.3	4	15,000	9.2	60,000
	K.B 3 (Grouper)		1.0	6	5,000	6.0	30,000
	" ÕB 1		0.6	1	1,500	0.6	1,500
	" ÕB 1		0.5	1	1,250	0.5	1,250
	(Total of the day)			16 pcs		26.3 kg	152,750 Rp
3rd	K.B (Grouper)	60	7.5	1	150,000	7.5	150,000
	T.A	30	2.0	1	40,000	2.0	40,000
	K.Lokal		1.0	6	5,000	6.0	30,000
							0
							0
	(Total of the day)			8 pcs		15.5 kg	220,000 Rp
4th	T.U	52	2.5	2	20,000	5.0	40,000
	Bangkolong	68	10.0	1	40,000	10.0	40,000
	K.B (Grouper)	30	1.6	1	20,000	1.6	20,000
							0
							0
	(Total of the day)			4 pcs		16.6 kg	100,000 Rp
5th	K.B (Grouper)	41	3.5	2	15,000	7.0	30,000
	K.P	33	2.5	1	30,000	2.5	30,000
							0
							0
							0
	(Total of the day)			3 pcs		9.5 kg	60,000 Rp
	Total in 5 days			52 pcs		86.5 kg	797,750 Rp

Average weight 1.663 kg/pc

Average price 9.223 Rp/kg

17.3 kg/day

Catches of the hand-line fishing boats

	HAND-LINE FISHING					
	OUTSIDE of the Bay			INSIDE of the Bay		
Species	No.of catch (pcs)	Total weight (kg)	Av. Weight (kg/ps.)	No.of catch (pcs)	Total weight (kg)	Av. Weight (kg/ps.)
Kerapu Bintik (Grouper)	5	3.2	0.64			
Kerapu Biasa (Grouper)	38	27.4	0.72	37	55.3	1.49
Ketamba (Emperor)	28	18.4	0.66			
Lentam	3	1.2	0.40			
Gurisi Bali	1	0.7	0.70			
K.P				3	7.1	2.37
• ŒB 1				2	1.1	0.55
T.A				1	2.0	2.00
K.Lokal				6	6.0	1.00
T.U				2	5.0	2.50
Bangkolong (Caranx sp.)				1	10.0	10.00
Total in 5 days	75	50.9	0.68	52	86.5	1.66
Average per day	15	10.2		10.4	17.3	

Table A-3

Result of Purse seine fishing, OUTSIDE and INSIDE

	OUTSIDE Total	OUTSIDE Average per day	INSIDE Total	INSIDE Average per day
Number of Fishing days	3 days		5 days	
Number of crew	7		7	
Hours from departure to return	35:20 hrs	11:40 hrs	52:00 hrs	10:24 hrs
Runing hours	19 hrs	6:20 hrs	33 hrs	7 hrs
Catches				
Tongkol Q'nty (pcs)	1,500 pcs	500 pcs	700 pcs	140 pcs
Q'nty (kg)	668 kg	223 kg	160 kg	32 kg
Sales (Rp)	1,125,000 Rp	375,000 Rp	420,000 Rp	84,000 Rp
Cakalang Q'nty (pcs)			65 pcs	13 pcs
Q'nty (kg)			260 kg	52 kg
Sales (Rp)			552,500 Rp	110,500 Rp
Total quantity of catches	668 kg	223 kg	420 kg	84 kg
Sales amount o catches (A)	1,125,000 Rp	375,000 Rp	972,500 Rp	194,500 Rp
Expenses for fishing				
Fuel oil for engine (diesel)				
Quantity (liter)	90 liter	30 liter	175 liter	35 liter
Unit price (Rp/liter)	1,750 Rp/l	1,750 Rp/l	1,650 Rp/l	1,650 Rp/l
Amount (Rp)	157,500 Rp	52,500 Rp	288,750 Rp	57,750 Rp
Lub. Oil for engine	0	0	0	0
Quantity (liter)	0 liter	0 liter	36,000 liter	7,200 liter
Unit price (Rp/liter)	0 Rp/l	0 Rp/l	144,000 Rp/l	28,800 Rp/l
Amount (Rp)	0 Rp	0 Rp	0 Rp	0 Rp
Ice	0	0	27,000	5,400
Water	3,000	1,000	130,000	26,000
Food foe crew	60,000	20,000	126,000	25,200
Cigarette	48,000	16,000	8,000	1,600
others		0	0	0
(Sub-total)	268,500 Rp	89,500 Rp	723,750 Rp	144,750 Rp
Expense for repairing				
Total expense for fishing (B)	268,500 Rp	89,500 Rp	723,750 Rp	144,750 Rp
Gross profit (A) - (B)	856,500 Rp	285,500 Rp	248,750 Rp	49,750 Rp
Share for boat owner 50%	428,250 Rp	142,750 Rp	124,375 Rp	24,875 Rp
Share for crew 50% (including Captain (Captain=2, crew=1 per person)	428,250 Rp	142,750 Rp	124,375 Rp	24,875 Rp

	Per year	per fishing day	Per year	per fishing day
Repairing cost for boat, engine, fishing gears	7,100,000 Rp	29,583 Rp	8,250,000 Rp	34,375 Rp
Balance		113,167 Rp		(9,500) Rp
Depreciation of boat, engine, fishing gears	11,183,333 Rp	46,597 Rp	11,441,65[illegible] Rp	47,674 Rp
Net Profit after depreciation		66,569 Rp		(57,174) Rp

CATCH DETAILS	Total (3days)	Average per day	Total (5days)	Average per day
Tongkol	Tongkol	Tongkol	Tongkol	Tongkol
Length	22 cm	22 cm	22 cm	22 cm
Weight	g/pc	200 g/pc	g/pc	g/pc
Q'nty (pcs)	1,150 pcs	383 pcs	500 pcs	100 pcs
Price	Rp/pc	750 Rp/pc	520 Rp/pc	520 Rp/pc
Quantity (kg)	300 kg	100 kg	100 kg	20 kg
Sales (Rp)	862,500 Rp	287,500 Rp	260,000 Rp	52,000 Rp
	Tongkol	Tongkol	Tongkol	Tongkol
	24 cm	24 cm	28 cm	22 cm
	g/pc	210 g/pc	300 g/pc	g/pc
	350 pcs	117 pcs	200 pcs	40 pcs
	Rp/pc	Rp/pc	800 Rp/pc	800 Rp/pc
	158 kg	53 kg	60 kg	12 kg
	262,500 Rp	87,500 Rp	160,000 Rp	32,000 Rp
	Tongkol	Tongkol		
	26 cm	26 cm		
	280 g/pc	280 g/pc		
	450 pcs	150 pcs		
	Rp/pc	750 Rp/pc		
	210 kg	70 kg		
	337,500 Rp	112,500 Rp		
Cakalang	Cakalang	Cakalang	Cakalang	Cakalang
	cm	cm	65 cm	65 cm
	g/pc	g/pc	4 kg/pc	4 kg/pc
	0 pcs	0 pcs	65 pcs	13 pcs
	Rp/pc	Rp/pc	8,500 Rp/pc	8,500 Rp/pc
	0 kg	0 kg	260 kg	52 kg
	0 Rp	0 Rp	552,500 Rp	110,500 Rp
Total quantity of catches (kg)	668 kg	223 kg	420 kg	84 kg
Sales amount o catches (Rp)	1,125,000 Rp	375,000 Rp	972,500 Rp	194,500 Rp

Table B-3 Result of Hand-line fishing, OUTSIDE and INSIDE of the Bay

	HAND LINE FISHING Fishing, * OUTSIDE of the bay		HAND LINE FISHING Fishing, * INSIDE of the bay	
	Total 5 days	Average per day	Total 5 days	Average per day
Number of crew	2	2	1	1
Departing time		Early morning		Evening
Arriving at port		Afternoon		Next morning
Hours from departure to return	38:45 hrs	7:45 hrs	82:00 hrs	16:24 hrs
Runing hours	9.0 hrs	1.8 hrs	23 hrs (Sailing)	4.6 hrs (Sailing)
Catches				
* Number of catch (pcs)	75 pcs	15 pcs	52 pcs	10 pcs
Total quantity of catches	50.89 kg	10 kg	86.5 kg	17 kg
Sales amount o catches (A)	258,500 Rp	51,700 Rp	797,750 Rp	159,550 Rp
Expenses for fishing				
Fuel oil for engine (diesel)				
Quantity (liter)	50 liter	10 liter	0 liter	0 liter
Unit price (Rp/liter)	1,750 Rp/l	1,750 Rp/l	Rp/l	0 Rp/l
Amount (Rp)	87,500 Rp	17,500 Rp	0 Rp	0 Rp
Lub. Oil for engine				0
Quantity (liter)	0 liter	0 liter	0 liter	0 liter
Unit price (Rp/liter)	Rp/l	0 Rp/l	Rp/l	0 Rp/l
Amount (Rp)	0 Rp	0 Rp	0 Rp	0 Rp
Bait	9,500	1,900	98,000	19,600
Ice	0	0	65,000	13,000
Water	0	0	0	0
Food for crew	22,000	4,400	0	0
Cigarette	24,000	4,800	36,000	7,200
others		0	0	0
(Sub-total)	143,000 Rp	28,600 Rp	199,000 Rp	39,800 Rp
Expense for repairing			0	0
Fishing gears			10,000	2,000
Boat			0	0
Engine			0	0
Total expense for fishing (B)	143,000 Rp	28,600 Rp	209,000 Rp	41,800 Rp
Gross profit (A) - (B)	115,500 Rp	23,100 Rp	588,750 Rp	117,750 Rp
Share for boat owner	57,750 Rp	11,550 Rp	588,750 Rp	117,750 Rp
Share for crew	57,750 Rp	11,550 Rp	- Rp	- Rp

	Per year	per fishing day	Per year	per fishing day
Repairing cost for boat, engine, fishing gears	2,060,000 Rp	8,583 Rp	150,000 Rp	625 Rp
Balance		2,967 Rp		117,125 Rp
Depreciation of boat, engine, fishing gears	690,000 Rp	2,875 Rp	150,000 Rp	625 Rp
Net Profit after depreciation		92 Rp		116,500 Rp

Table B-4

(*) Estimates, in case that the Outside hand-line fishing boat land its catches and sell them at Rompo.

	HAND LINE FISHING Fishing, * OUTSIDE of the bay		
	Total 5 days	Average per day	
Number of crew	2	2	
Departing time		Early morning	
Arriving at port		Afternoon	
Hours from departure to return	38:45 hrs	7:45 hrs	
Runing hours	9.0 hrs	1.8 hrs	
Catches			
* @ Number of catch (pcs)	75 pcs	15 pcs	6, 096
Total quantity of catches	50.89 kg	10 kg	13
Sales amount o catches (A)	310,200 Rp	62,040 Rp	79, 242
Expenses for fishing			
Fuel oil for engine (diesel)			
Quantity (liter)	125 liter	25 liter	
Unit price (Rp/liter)	1,750 Rp/l	1,750 Rp/l	
Amount (Rp)	218,750 Rp	43,750 Rp	
Lub. Oil for engine			
Quantity (liter)	0 liter	0 liter	
Unit price (Rp/liter)	Rp/l	0 Rp/l	
Amount (Rp)	0 Rp	0 Rp	
Bait	9,500	1,900	
Ice	0	0	
Water	0	0	
Food foe crew	22,000	4,400	
Cigarette	24,000	4,800	
others		0	
(Sub-total)	274,250 Rp	54,850 Rp	* @
Expense for repairing			* @
Fishing gears			* @
Boat			
Engine			
Total expense for fishing (B)	274,250 Rp	54,850 Rp	
Gross profit (A) - (B)	35,950 Rp	7,190 Rp	24,392
Share for boat owner	17,975 Rp	3,595 Rp	12,196
Share for crew	17,975 Rp	3,595 Rp	

	Per year	per fishing day	
Repairing cost for boat, engine, fishing gear	2,060,000 Rp	8,583 Rp	
Balance		(4,988) Rp	3, 612
Depreciation of boat, engine, fishing gears	690,000 Rp	2,875 Rp	
Net Profit after depreciation		(7,863) Rp	737

Table B-5

(*) Estimates, in case that the Outside hand-line fishing boat land its catches and sell them at Rempo.

1.2

Catch Details		Length (cm)	Weight (kg)	No. of catch (pcs)	Price (Rp/pc)	Expected price (Rp/pc) at Rempo	Quantity (kg)	Sales (Rp)
1st	Lentam	23	0.40	3	1,500	1,800	1.20	5,400
	Kerapu Bintik (Grouper)	30	0.60	1	8,000	9,600	0.60	9,600
	Kerapu Biasa (Grouper)	25	0.50	1	7,000	8,400 * θ	0.50	8,400
	Gurisi Bali	26	0.70	1	1,500	1,800	0.70	1,800
	(Total of the day)			6 pcs			3.00 kg	25,200 Rp
2nd	Kerapu Biasa (Grouper)	32	0.75	2	4,500	5,400	1.50	10,800
	"	30	0.75	2	4,500	5,400	1.50	10,800
	Ketamba (Emperor)	30	0.60	4	1,500	1,800	2.40	7,200
	(Total of the day)			8 pcs			5.40 kg	28,800 Rp
3rd	Ketamba (Emperor)	32	1.10	2	2,000	2,400	2.20	4,800
	"	20	0.50	6	1,000	1,200	3.00	7,200
	"	26	0.70	3	1,500	1,800	2.10	5,400
	"	35	1.40	1	3500	4,200	1.40	4,200
	Kerapu Biasa (Grouper)	28	0.75	9	4500	5,400	6.75	48,600
	(Total of the day)			21 pcs			15.45 kg	70,200 Rp
4th	Kerapu Biasa (Grouper)	28	0.75	8	4,000	4,800	6.00	38,400
	"	26	0.75	2	4,000	4,800	1.50	9,600
	Ketamba (Emperor)	26	0.60	5	2,000	2,400	3.00	12,000
	"	28	0.62	3	2,000	2,400	1.86	7,200
								0
	(Total of the day)			18 pcs			12.36 kg	67,200 Rp
5th	Kerapu Biasa (Grouper)	25	0.55	8	3,750	4,500	4.40	36,000
	"	32	2.70	1	14,000	16,800	2.70	16,800
	"	24	0.50	5	3,000	3,600	2.50	18,000
	Ketamba (Emperor)	30	0.62	4	2,000	2,400	2.48	9,600
	Kerapu Bintik (Grouper)	30	0.65	4	8,000	9,600	2.60	38,400
	(Total of the day)			22 pcs			14.68 kg	118,800 Rp
Total in 5 days				75 pcs			50.9 kg	310,200 Rp

Average weight: 0.679 kg/pc

Average price 6,096 Rp/kg

DEPRECIATION

PURSE SEINE FISHING BOAT, oprating OUTSIDE

	Depreciation cost									
	Initial cost		Period		Depreciation per year		fishing days /month	Dprction per fising day	
Boat hull	7,000,000	Rp	12	years	583,333	Rp	20 times	2,431	Rp
Engine	3,000,000	Rp	5	years	600,000	Rp		2,500	Rp
Fishing gear	20,000,000	Rp	2	years	10,000,000	Rp		41,667	Rp
Total	30,000,000	Rp			11,183,333	Rp		46,597	Rp
			Reparing Expenses						
			Estimate % on initial cost		Expense per year		fishing /month	Expense per fishing day	
Boat hull			10	%	700,000	Rp	20 times	2,917	Rp
Engine			80	%	2,400,000	Rp		10,000	Rp
Fishing gear			20	%	4,000,000	Rp		16,667	Rp
					7,100,000	Rp		29,583	Rp

PURSE SEINE FISHING BOAT, oprating INSIDE

	Depreciation cost									
	Initial cost		Period		Depreciation per year		fishing days /month	Dprction per fising day	
Boat hull	6,500,000	Rp	12	years	541,667	Rp	20 times	2,257	Rp
Engine	4,500,000	Rp	5	years	900,000	Rp		3,750	Rp
Fishing gear	20,000,000	Rp	2	years	10,000,000	Rp		41,667	Rp
Total	31,000,000	Rp			11,441,667	Rp		47,674	Rp
			Reparing Expenses						
			Estimate % on initial cost		Expense per year		fishing /month	Expense per fishing day	
Boat hull	7,000,000	Rp	10	%	650,000	Rp	20 times	2,708	Rp
Engine	4,500,000	Rp	80	%	3,600,000	Rp		15,000	Rp
Fishing gear	20,000,000	Rp	20	%	4,000,000	Rp		16,667	Rp
	31,500,000	Rp			8,250,000	Rp		34,375	Rp

HAND-LINE FISHING BOAT, oprating OUTSIDE

	Depreciation cost									
	Initial cost		Period		Depreciation per year		fishing days /month	Dprction per fising day	
Boat hull	3,000,000	Rp	12	years	250,000	Rp	20 times	1,042	Rp
Engine	2,200,000	Rp	5	years	440,000	Rp		1,833	Rp
Total	5,200,000	Rp			690,000	Rp		2,875	Rp
			Reparing Expenses						
			Estimate % on initial cost		Expense per year		fishing /month	Expense per fishing day	
Boat hull			10	%	300,000	Rp	20 times	1,250	Rp
Engine			80	%	1,760,000	Rp		7,333	Rp
Repairing expense Total					2,060,000	Rp		8,583	Rp

HAND-LINE FISHING BOAT, oprating INSIDE

	Depreciation cost									
	Initial cost		Period		Depreciation per year		fishing days /month	Dprction per fising day	
Boat hull	1,500,000	Rp	10	years	150,000	Rp	20 times	625	Rp
Engine	0	Rp	5	years	0	Rp		0	Rp
Total	*1,500,000*	*Rp*			*150,000*	*Rp*		*625*	*Rp*
			Reparing Expenses						
			Estimate % on initial cost		Expense per year		fishing /month	Expense per fishing day	
Boat hull			10	%	150,000	Rp	20 times	625	Rp
Engine			80	%	0	Rp		0	Rp
Repairing expense Total					*150,000*	*Rp*		*625*	*Rp*

EPERIMENTAL FISHING OPERATION

MAIN PARTICULARS OF MODEL FISHING BOATS

	PURSE SEINE FISHING		HAND-LINE FISHING		GILL NET FISHING	
	Outside	Inside	Outside	Inside	Outside	Inside
Name of Boat	-	DOA IBU	-	-	SAHABAT PUTIH	GITAR TUA
Regisitration No.	-		-	-		
When and Where was it built?	Rompo, 1992	Rompo, 2000	Sido, 1998	Rompo, 1997	Tanjune Mas, 1998	? (Second hand boat)
Main Dimensions						
Length over all	11.6m	12m	12m	9m		10m
Breadth	2.5m	2.5m	1.5m	1.5m		2m
Depth	0.86m (mould)	0.9m	0.8m (mould)			1.25m
Engine	Iboard diesel engine	Inboard diesel engine	Inboard diesel engine		Inboard diesel engine	Inboard diesel engine
Type of engine	JIANGOON				Dong Feng	Dong Feng
Horse power	20hp	23hp	22hp		23hp	18hp
Kind of Fishing, engaged.	Purse seine finsing	Purse seine	Hand-line fishinng	Hand-line fising	Gill ne & Bottom longline	Gill net
Nomber of crew (including captain)	7	7	2	1	3	2
Name of the captain/masterfishermen	H. Sato	Hasim (Owner's sun)	Sam	Mustamin	Sarjan	Umar
Name of Boat Owner	H. Sato	H.M. Said	Suryadin	Mustamin	Sarjan	Umar
Where does the Owner live?	Rompo, Desa Waworada	Rompo, Desa Waworada	Sido, Desa Waworada	Rompo, Desa Waworada	Rompo, Desa Waworada	Rompo, Desa Waworada
What is his main job/buisiness?	Fishing	Fishing	Fishing	Fishing	Fishing	Fishing
When did the Owner obtain the boat?	1992, (Newly built)	2000, (Newly built)	1998	1997	1998, (newly built)	1996, (Second hand boat)
How much did it cost?						
Boat	6,500,000Rp	7,000,000Rp	3,000,000Rp	1,500,000Rp	5,500,000Rp	2,500,000Rp
Engine	3,000,000Rp (2 years ago)	4,500,000Rp	2,200,000Rp		2,500,000Rp	2,000,000Rp
Fishing gears	20,000,000Rp	20,000,000Rp	40,000Rp		4,000,000Rp (10sets)	4,500,000RP
Fund to obtain the boat						
Own money	Own money	Own money	Own money		Own money	Own money
Loan	no loan	no loan			no loan	no loan
Who/which bank gave the loan?						
How much paid?						
How much is the balance?						
Number of own fishing boats	One, mentioned above	One, mentioned above			One, mentioned above	One, mentioned above
What boats are they?						

APPENDIX-3

PERCOBAAN TENTANG PENGAWETAN DAN PENGOLAHAN IKAN SEGAR

APPENDIX- 3. EXPERIMENTS ON FRESH FISH PRESERVATION AND PROCESSING

3-1. Fish Freshness Test by Different Ice Ratio and Types of Boxes

3-1-1. Methods and Procedure

(1) Objectives : To estimate the appropriate rate of ice and the type of container for keeping freshness depending on the time required for marketing of fresh fish.

(2) Place : Fish Quality Laboratory of NTB Provincial Fishery Office, Mataram – Lombok

(3) Period : From Feb. 21, 8 am to Feb. 23, 2002, 5 pm.

(4) Target Species: Sardine (Tembang) and Indo-pacific mackerel (Kembung)

(5) Methods :

1) Basic Theory

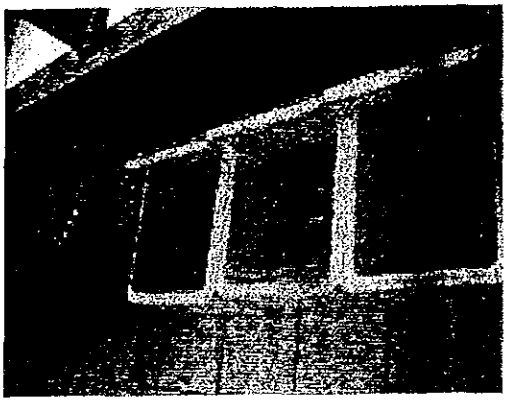
The oxidation-reduction potential (ORP) value of fish body changes reflecting the freshness from the stage of rigor mortis after dead to the stage of self-digestion until perishing. The speed of perishing largely differs depending on temperature and fish species.

2) Testing cases

Case	Container	Fresh Fish		Ice
		Tembang	Kembung	(Ice ratio)
1	Plastic container (30L)	3 kg (30g x 100pcs.)	0.75kg (25g x 30pcs.)	No (0%)
2		3 kg (30g x 100pcs.)	0.75kg (25g x 30pcs.)	2kg (50%)
3	Cool box (30L)	3 kg (30g x 100pcs.)	0.75kg (25g x 30pcs.)	2kg (50%)
4		3 kg (30g x 100pcs.)	0.75kg (25g x 30pcs.)	4kg (100%)
5		3 kg (30g x 100pcs.)	0.75kg (25g x 30pcs.)	7.5kg(200%)

Place of purchase of sample fish: Ampenan Utara - Lombok (2-4 hours after catch)
Time of purchase of sample fish: Feb. 21, 2002, 7 am.
Time of ice input: Feb. 21, 2002, 7:30 am.

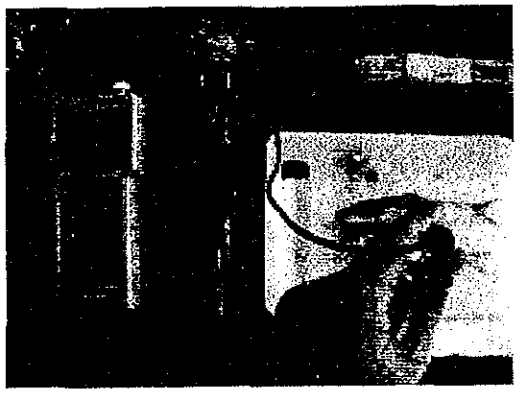
Procurement of Sample Fish at Ampenan Utara



Types of Preservation (5 Cases)

3) Procedure

Temperature and ORP of fish body by species were measured for each case at every 2-3 hours (until the fish is perished but max. for 48 hours). Organoleptic inspection (checking the stiffness of fish body, color of gill, etc.) was also conducted at same time. The maximum duration for keeping of fish freshness at each case was estimated at each case.



Measurement of ORP value

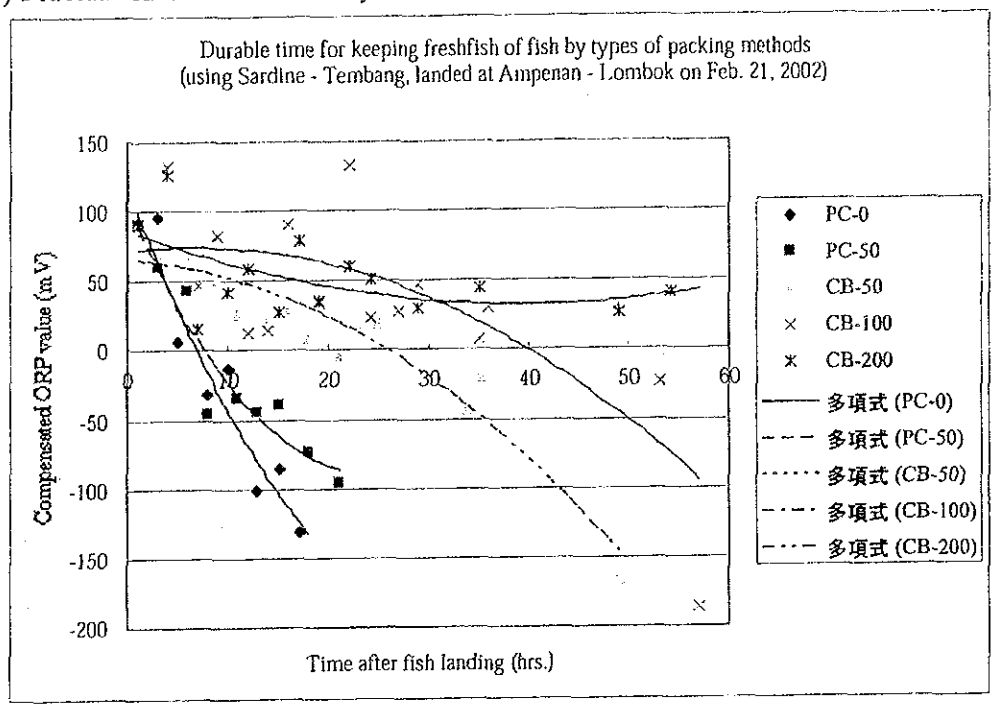
Place for Experiment

4) Equipment

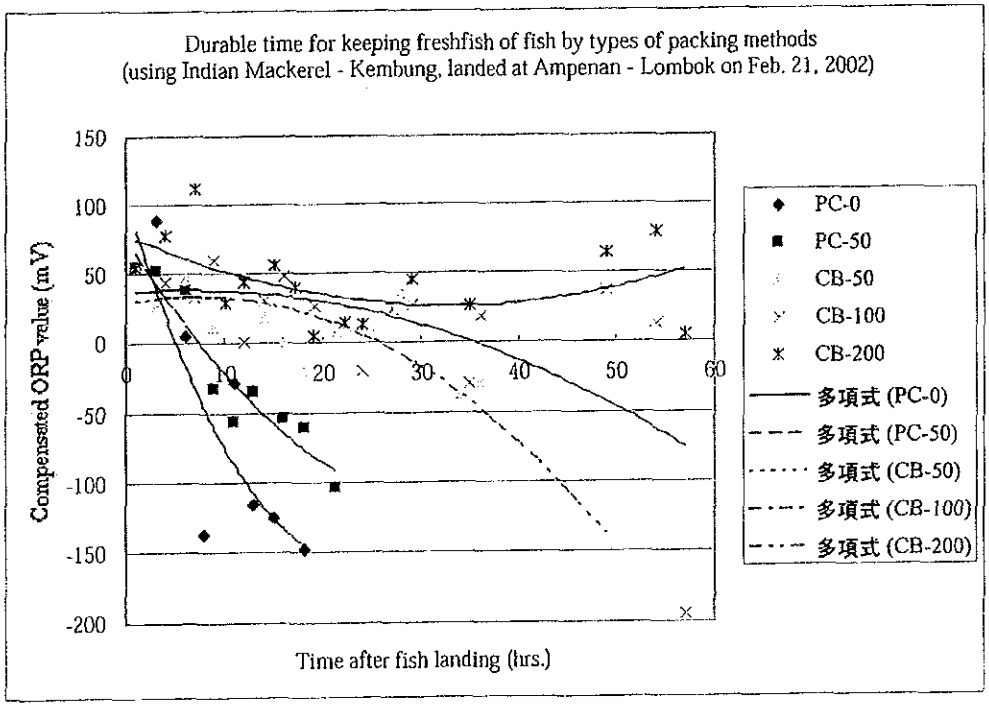
pH meter (portable, for food analysis use)	1 unit
ORP meter (with a thermometer)	1 unit
Cool box (30L)	3 boxes
Plastic container (30L)	2 pcs.
Top-pan scale (0-5 kg)	1 unit

3-1-2. Results of Experiments

(1) Fluctuation of ORP Value by Time

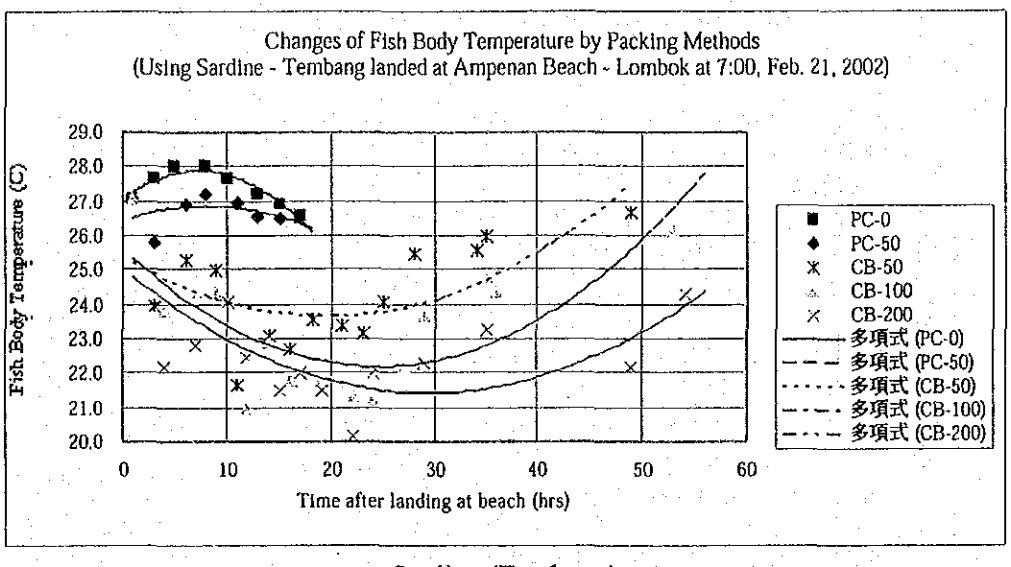


Sardine (Tembang)

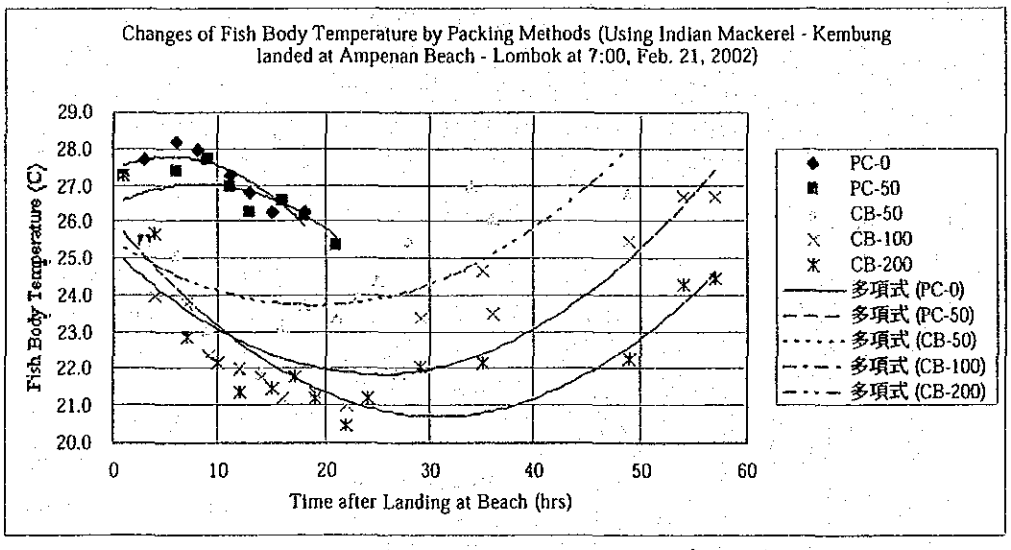


Indo-pacific mackerel (Kembung)

(2) Fluctuation of Fish Body Temperature by Time



Sardine (Tembang)



Indo-pacific mackerel (Kembung)

Detailed test results including organoleptic analysis are as shown on the attached Table 3-1-1.

3-1-3. Considerations

Container	Ice Ratio	Durable Time of Ice	Min. Temp. of Fish Body (degree C.)	Theoretical duration for keeping freshness (ORP value more than 0)	Recommended duration for preservation
Plastic container (30L)	0%	-	26.3	6 hrs.	<4 hrs.
	50%	4 hrs.	25.3	8 hrs.	<6 hrs.
Cool Box (30L)	50%	12 hrs.	21.7	24 hrs.	12-18 hrs.
	100%	24 hrs.	21.0	36 hrs.	24-30 hrs.
	200%	48 hrs.	21.2	60 hrs.<	48-60 hrs.

(1) Theoretical duration for keeping freshness seems to be longer than the recommended one based on the ORP value only. ORP values differ by each sample as some of sample fish shows the ORP value lower than 0. This is because of that sample fishes are mixed between one caught at the early time after departure and those caught just before going back to the landing site.

(2) Under the present method of fresh fish preservation made by village women (putting ice into the plastic container with fish), ice would be completely melt within 4 hours even the ice ratio of 50%. In this case, the duration for keeping freshness is not much different from the case without ice, and the fish would start to be perished in 6-7 hours after fish landing.

(3) In case of the use of cool box, with the ice ratio of 50%, ice would be melt in about 12 hours, but it is capable of keeping freshness for another 6 hours after disappearance of ice (about 18 hours after fish landing) because of the cooling effects. (With the ice ratio of 100%, ice would be melt in about 24 hours but cooling effects continues for another 12 hours.)

(4) Several samples causing the organoleptic abnormality on gills and eyes more than 15 hours passed after preservation were observed, although there was no problem on the ORP value. Since the consumers generally judge freshness by organoleptic method, it is anticipated that fishes would be targeted for discount if they are preserved with ice longer than 24 hours.

From the above, it is indispensable to use cool box in case of the application of ice. The cooling effects are the highest in the iced water after some ice are melt so that the ideal ice ratio would be 100% as all fishes can be soaked in the iced water, but the transportation cost per 1kg of fish would be increased as more ice are applied.

On the contrary, it is not appropriate to obtain cooling effects with the ice ratio

of less than 50%, as fish volume is too much against ice volume. It is therefore recommended as the most economical method to set up a standard ice ratio of 50% in initial periods and to add ice within 12 hours.

As for fishes landed at early morning and being sold within a few hours, although it is not indispensable to use ice as long as looking from the test results. Since the freshness would be going down during several hours after putting ice, however, it is recommended to apply ice soonest after fish landing even though it seems to be sold out within a few hours.

3-1-4. Conclusion

The optimum ratio of ice application (using cool box) under the Project would be set forth as follows, taking into account the above results and considerations.

(1) For 1-day sales: Ice ratio 25% (to be sold within 6 hours after fish landing)

(2) For overnight keeping: Ice ratio 75% (50% seems to be sufficient for keeping overnight only, but 75% would be recommended considering the time necessary for sales in next day)

(3) For long-distance transportation: Ice ratio 75% (Although 50% seems to be sufficient for transport within 12 hours, it is better to add more ice considering ice necessary for retailing at destination markets. It can be adjusted between 50-100% depending on the actual duration for transportation.)

(4) For fish processing: Ice ratio 25% (within 6 hours after landing during day-time or 9 hours during night-time)

Table 3-1-1. Results of Freshness Test

PC-0-1 (Tembang)

Date	Time	Body temp.	pH	Measured ORP (mV)	Temp. compensate ORP (mV)	Organoleptic observation	Ice
21.Feb	8:00	27.1	6.5	-108	91	Good	-
	9:55	27.7	6.4	-103	96	Good	-
	12:31	28.0	5.8	-192	7	Good	-
	15:05	28.0	5.9	-230	-31	Partly white-color gill	-
	17:36	27.7	5.9	-212	-13	Soft body, black-color gill	-
	20:05	27.2	6.0	-299	-100	Soft body, black-color gill, blood eye	-
	22:10	26.9	6.0	-284	-85	ditto + yellow-color body	-
22.Feb	0:31	26.6	6.0	-330	-130	ditto + yellow-color body	-

PC-50-1 (Tembang)

Date	Time	Body temp.	pH	Measured ORP (mV)	Temp. compensate ORP (mV)	Organoleptic observation	Ice
21.Feb	10:15	25.8	6.0	-139	61	Good	○
	12:56	26.9	5.8	-155	44	Good	X
	15:29	27.2	6.0	-244	-45	Partly white-color gill	X
	18:00	27.0	6.0	-233	-34	Black-color gill	X
	20:19	26.6	6.0	-244	-44	Pink-color gill, blood eye	X
	22:30	26.5	6.1	-239	-39	Black-color gill, yellow-color body	X
22.Feb	0:53	26.5	6.2	-272	-72	Soft body, black-color gill, clouded eye	X
	3:53	25.8	6.2	-296	-96	ditto	X

CB-50-1 (Tembang)

Date	Time	Body temp.	pH	Measured ORP (mV)	Temp. compensate ORP (mV)	Organoleptic observation	Ice
21.Feb	10:41	24.0	5.7	-133	69	Good	○
	13:23	25.3	6.0	-130	71	Good	○
	16:01	25.0	5.8	-151	50	Good	○
	18:25	21.7	5.9	-177	26	Good	△
	20:43	23.1	6.0	-181	21	Good	X
	22:57	22.7	6.1	-175	28	Partly white-color gill, blood eye	X
22.Feb	1:14	23.6	6.2	-193	9	Blood eye	X
	4:15	23.4	6.1	-206	-4	Yellow-color body	X
	6:15	23.2	6.1	-190	12	White-color gill, clouded eye	X
	8:10	24.1	6.0	-181	21	Good	X
	11:20	25.5	6.6	-157	43	Yellow-color body	X
	17:20	25.6	6.2	-243	-43	Soft body, white-color gill, clouded eye	X
	18:35	26.0	6.3	-219	-19	Good	X
23.Feb	8:05	26.7	7.1	-366	-166	Soft body, black-color gill, clouded eye	X

CB-100-1 (Tembang)

Date	Time	Body temp.	pH	Measured ORP (mV)	Temp. compensate ORP (mV)	Organoleptic observation	Ice
21.Feb	11:08	23.8	5.8	-69	133	Good	○
	13:47	24.4	5.8	-153	48	Good	○
	16:27	24.4	5.8	-118	83	Good	○
	18:51	21.0	6.0	-190	14	Good	○
	21:08	22.9	6.2	-188	14	Good	○
	23:19	21.8	6.0	-112	91	Blood eye	○
22.Feb	1:40	21.8	5.9	-168	35	Good	○
	4:38	21.3	5.9	-70	134	Good	○
	6:40	21.2	6.2	-179	25	Clouded eye	△
	8:40	22.2	5.9	-175	28	Good	X
	11:40	23.7	6.4	-154	48	Black-color gill	X
	17:40	24.8	6.5	-193	8	ditto	X
	19:00	24.4	6.3	-170	31	Soft body, clouded eye	X
23.Feb	7:40	25.6	6.4	-168	32	Clouded eye	X
	12:10	26.2	6.5	-223	-23	White-color gill, clouded eye	X
	16:25	26.0	6.7	-386	-186	Soft body, white-color gill, clounded eye	X

CB-200-1 (Tembang)

Date	Time	Body temp.	pH	Measured ORP (mV)	Temp. compensate ORP (mV)	Organoleptic observation	Ice
21.Feb	11:30	22.2	5.9	-76	127	Good	○
	14:38	22.8	5.8	-186	16	Good	○
	16:54	24.1	5.8	-159	43	Good	○
	19:16	22.5	6.0	-143	60	Good	○
	21:34	21.5	6.2	-175	28	Good	○
	23:45	22.0	6.0	-124	79	Good	○
22.Feb	2:06	21.5	5.9	-167	36	Pink-color gill, blood eye	○
	5:00	20.2	5.9	-143	61	Pink-color gill, clouded eye	○
	7:08	22.0	6.0	-151	52	Partly white-color gill, blood eye	○
	12:05	22.3	6.4	-172	31	Yellow-color body	○
	18:10	23.3	6.1	-157	45	ditto	○
23.Feb	8:20	22.2	6.6	-176	27	ditto	△
	12:40	24.3	6.2	-160	41	White-color gill, blood eye	X
	16:50	23.7	6.7	-135	67	Blood eye, yellow-color body	X

PC-0-2 (Kembung)

Date	Time	Body temp.	pH	Measured ORP (mV)	Temp. compensate ORP (mV)	Organoleptic observation	Ice
21.Feb	8:15	27.3	6.3	-143	56	Good	-
	10:07	27.7	6.5	-110	89	Good	-
	12:43	28.2	6.0	-193	5	Good	-
	15:16	28.0	6.0	-336	-137	Soft body, partly white-color gill	-
	17:47	27.3	6.0	-227	-28	Soft body	-
	20:13	26.8	6.3	-315	-115	Soft body, partly white-color gill, blood eye	-
	22:22	26.3	6.1	-325	-125	ditto + yellow-color body	-
22.Feb	0:41	26.3	6.3	-348	-148	ditto + yellow-color body	-

PC-50-2 (Kembung)

Date	Time	Body temp.	pH	Measured ORP (mV)	Temp. compensate ORP (mV)	Organoleptic observation	Ice
21.Feb	10:28	25.5	6.0	-147	53	Good	○
	13:10	27.4	5.8	-160	39	Good	X
	15:43	27.7	6.0	-231	-32	Soft body	X
	18:13	27.0	6.1	-256	-57	Sofy body, partly white-color gill	X
	20:31	26.3	5.9	-234	-34	Soft body, pink-color gill	X
	22:43	26.6	6.2	-253	-53	Soft body, clouded eye	X
22.Feb	1:03	26.2	6.3	-260	-60	Sofyt body, white-color gill, clouded eye	X
	4:05	25.4	6.5	-303	-102	ditto	X

CB-50-2 (Kembung)

Date	Time	Body temp.	pH	Measured ORP (mV)	Temp. compensate ORP (mV)	Organoleptic observation	Ice
21.Feb	10:53	25.5	5.8	-175	25	Good	○
	13:35	25.1	5.9	-153	48	Good	○
	16:13	23.1	5.8	-189	13	Good	○
	18:38	22.0	5.7	-154	49	Pink-color gill	△
	20:55	21.9	5.9	-184	19	Good	X
	23:07	23.2	6.0	-200	2	Good	X
22.Feb	1:27	23.8	6.2	-222	-20	Good	X
	4:27	23.4	6.2	-193	9	Clouded eye	X
	6:28	24.0	6.3	-189	13	Good	X
	8:24	24.4	6.1	-188	13	Good	X
	11:30	25.5	6.7	-164	36	Clouded eye	X
	17:30	27.0	6.6	-236	-37	Soft body, partly white-color gill, clouded eye	X
	18:50	26.1	6.5	-228	-28	Soft body, clouded eye	X
23.Feb	8:15	26.8	7.0	-354	-154	Soft body, black-colo gill, clouded eye	X

CB-100-2 (Kembung)

Date	Time	Body temp.	pH	Measured ORP (mV)	Temp. compensate ORP (mV)	Organoleptic observation	Ice
21.Feb	11:15	24.0	5.9	-157	45	Good	○
	13:58	23.8	6.1	-168	34	Good	○
	16:40	22.4	5.8	-142	61	Good	○
	19:03	22.0	6.0	-201	2	Good	○
	21:21	21.8	6.2	-172	31	Good	○
	23:32	21.2	6.0	-154	50	Good	○
22.Feb	1:53	21.4	6.0	-176	28	Good	○
	4:46	21.0	6.1	-188	16	Clouded eye	○
	6:53	21.2	6.1	-223	-19	Partly white-color gill, clouded eye	△
	9:53	21.9	6.2	-179	24	Good	X
	11:50	23.4	6.3	-175	27	Good	X
	17:55	24.7	6.4	-230	-29	Pink-color gill	X
	19:15	23.5	6.4	-183	19	Soft body	X
23.Feb	7:53	25.5	6.6	-162	38	Soft body	X
	12:25	26.7	6.7	-185	15	White-color gill, clouded eye	X
	16:40	26.7	6.9	-394	-194	Soft body, white-color gill, clounded eye	X

CB-200-2 (Kembung)

Date	Time	Body temp.	pH	Measured ORP (mV)	Temp. compensate ORP (mV)	Organoleptic observation	Ice
21.Feb	11:40	25.7	5.7	-122	78	Good	○
	14:32	22.9	5.9	-90	112	Good	○
	17:06	22.2	5.8	-173	30	Good	○
	19:28	21.4	6.1	-159	45	Partly white-color gill	○
	21:46	21.5	6.0	-146	57	Good	○
	23:58	21.8	6.0	-162	41	Good	○
22.Feb	2:19	21.2	5.9	-198	6	Partly white-color gill, blood eye	○
	5:12	20.5	6.2	-189	15	Good	○
	7:22	21.2	6.1	-189	15	Pink-color gill	○
	12:18	22.1	6.4	-156	47	Partly white-color gill	○
	18:22	22.2	6.3	-175	28	Good	○
23.Feb	8:30	22.3	6.6	-137	66	Good	△
	12:55	24.3	6.4	-121	80	Blood eye	X
	17:00	24.5	6.6	-195	6	Clouded eye	X

	Tembang		Kembung		Ice
	(pcs)	(kg)	(pcs)	(kg)	(kg)
PC-0	100	3.0	30	0.75	0.0
PC-50	100	3.0	30	0.75	2.0
CB-50	100	3.0	30	0.75	2.0
CB-100	100	3.0	30	0.75	4.0
CB-100	100	3.0	30	0.75	7.5

Landing site: Ampenan Utara beach - Lombok
Time of landing: 06:30, February 21, 2002
Time of separating into 5 samples: 08:00, February 21, 2002

Type of preserved methods	Durable time of ice (hrs.)	Time keeping ORP more than 0C (hrs.)	
		Tembang	Kembung
PC-0	-	7.0	5.0
PC-50	4.0	8.0	7.5
CB-50	12.0	26.0	25.0
CB-100	24.0	40.0	35.0
CB-200	48.0	over 48	over 48

3-2. Experimental Fish Processing

3-2-1. Methods and Procedure

(1) Objectives : To identify the appropriate types of fish processing which would be possible to introduce to fishing villages as well as applicable to local diet in the future.

(2) Place : 1) PPI-Sape (Bima)
2) PT. OKISHIN Processing Room, Larantuka (Flores Timur)

(3) Period : 1) Sape: Mar. 4-5 and Mar. 9, 2002 (3 days)
2) Larantuka: Mar. 14, 2002 (1 day)

(4) Target species: Small pelagic fishes for local consumption

(5) Type of processing and raw materials:

Type of Processing	Sape	Larantuka
Fish Ball (Bakso Ikan)	Tongkol: 40kg (Size: 400g/pc.) Layang: 10 kg (Size: 30g/pc.) Tembang: 10 kg (Size: 30g/pc.)	Tongkol: 20kg (Size: 100g/pc.) Layang: 15 kg (Size: 150g/pc.)
Bumbu-Soaked & Dried Fish (Ikan Berbumbu Kering)	Layang: 10 kg (Size: 30g/pc.) Tembang: 10 kg (Size: 30g/pc.)	Layang: 2.5 kg (Size: 150g/pc.)
Bumbu-Soaked & Pressure-Cooked Fish (Ikan Berbumbu Presto)	Layang: 10 kg (Size: 30g/pc.)	-
Boiled & Dried Fish (Ikan Rebus Kering)	Layang: 10 kg (Size: 30g/pc.) Tembang: 10 kg (Size: 30g/pc.)	Layang: 2.5 kg (Size: 150g/pc.)

(6) Methods :

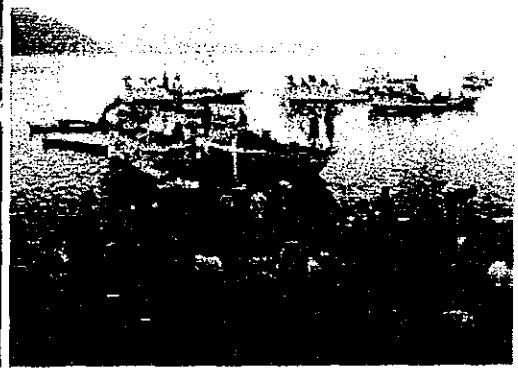
The above 4 types of processing which seems to be possible to introduce to fishing villages and acceptable by local diet were tested. Inviting about 10 village women, the experimental processing would be conducted at each site. After the experiment, the tasting and discussion were made to obtain participant's opinion on easiness of processing, points to be improved and local diet.

(7) Equipments used (per site) :

Pressure Cooker 1 unit

Cooking Stove	3 units
Hand mincer	2 units
Knife & Cutting Board	5 sets
Plastic tray (Large & Small Sizes)	each 2 pcs.
Cool Box (30L)	2 pcs.
Top-pan scale for cooking use	1 unit
Pallets for drying fish (120cm x 90cm, only for Sape)	6 pcs.
Baskets for boiling fish	2 pcs.
Plastic bags for packaging	1 box

Procurement of Raw Fish (PPI-Sape)



Procurement of Raw Fish (Larantuka)

3-2-2. Results of Experiments

(1) Fish Ball (Bakso Ikan)

1) Effective Rate of Fish Meat

The effective rate of fish meat after mincing, water-soaking and pressing (so called as "meat ratio") and the effective rate of products to raw materials (so called as "products ratio") were as shown on the following table respectively.

Raw fish	Sape			Larantuka		
	Size of fish	Meat ratio	Products ratio	Size of fish	Meat ratio	Products ratio
Tongkol	400g/pc.	37.5%	41.3%	100g/pc.	31.0%	38.0%
Layang	30g/pc.	33.0%	36.0%	150g/pc.	22.0%	24.7%
Tembang	30g/pc.	30.0%	34.0%	-	-	-

As shown on the above, both ratio were higher at Sape. The difference of ratio by locations seems to be caused by the different sizes of raw fishes more than the level of cutting techniques. In general, Tongkol (eastern little tuna) become fat in

accordance with growth showing the higher rate of meat by larger fish, while larger-sized layang (round scad) makes us difficult to take meat due to the hard bones. On the other hand, the effective ratio of tembang (sardine) becomes lower due to necessity of elimination of small bones. As the meat ratio is 20-25% in case of using machine (meat separator), it can be said that the above ratio (by hand) are very good results.

2) Composition of materials

a) Binder

Cassava (tapioka) starch was used as a main binder. The appropriate elasticity was obtained with the composition rate of cassava starch of 7-8% to fish meat volume, while the rate of 5% did not. At the same time the egg white (1-2 pcs.) to 1kg of fish meat was also added, but its effectiveness could not be identified. The cassava starch can be added up to 10% of fish meat volume without causing any effects on taste of products. As a result, the elasticity can be controlled only by cassava starch without using egg white that is more expensive. In case of tembang (sardine), however, the appropriate elasticity could not be obtained as same as the Japanese sardine-based fish ball (so called as "Tsumire" in Japan), even though adding cassava starch up to 10%.

b) Seasoning

As for seasoning, salt was firstly added and mixed at the rate of about 2% to fish meat volume. Next, the locally preferable seasoning so called as "Bumbu[1]" was added, and finally it was seasoned with small quantity of Ajinomoto. Mixing was made by hand. The appropriate rate of Bumbu was 3-4% to fish meat volume, but the higher rate caused too strong taste (too much garlic and too sour taste) while the lower rate brought punch-less taste (All local participants had same ideas). In case of tembang (sardine), however, it was better to increase the composition rate of Bumbu in order to take off the smell.

3) Procedure

a) Cutting and Meat Separation

Every process for meat separation was done by manual. After cutting fish to 3

[1] Local seasoning made from Katumbar (Corriander), Merica Biji (pepper), Bawang putih (white garlic), Bawang merah (red garlic), Kunyit (saffron), Laos & Jahe (ginger), Daun Selelri (sellery), and Asam (tamarind). All materials are grind into powder, added with a little water and mixed into paste.

pieces laterally, skin and bones were removed and the obtained 2 pieces of fillets were washed. In case of small-sized layang (round scad), the meat was directly removed by hand without removing skin, since it takes much time. In case of tembang (sardine) even the small-sized, however, the removal of scales and small bones was indispensable although it took much time. Working efficiency in this process was approximately 6-7kg/hour/person for tongkol and layang, while it was 3-4kg for tembang. The residue from processing was separately boiled mixing with another type of Bumbu for home consumption.

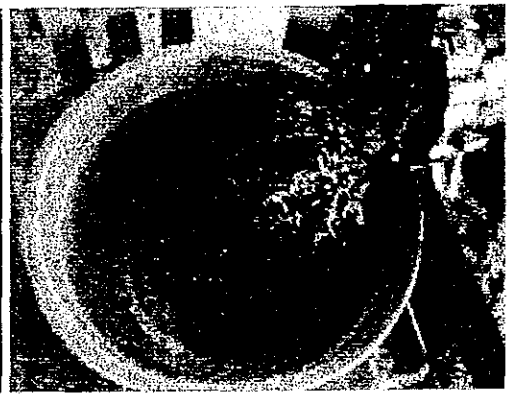
Cutting & Meat Separation (Sape)

Cutting & Meat Separation (Larantuka)

b) Mincing

Filleted fish meat was minced using a hand mincer. Time needed for this process differed depending on the condition of filleted meat (how well skin and bone were removed at the former process). In case of large-sized fish in particular, the dice of mincer were easy to be clogged if the filleted meat contained skin and bones. As a result, the fish meat ratio became lower as the clogged objects had to be removed in such cases.

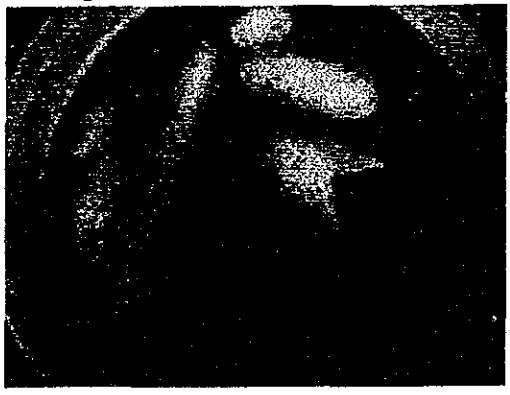
Mincing (Sape)



Minced Fish Meat

c) Soaking and Pressing

Minced meat was kept in the iced water for 0.5 – 1 hour with stirring by hand sometimes, and then filtered and pressed using Bagan net cloth (mesh: 2mm). After pressing, the meat was put into the different iced water again for repeating same process. This process has never been taken for the existing home-made fish ball, so that the most of participants showed the high interest. The Fish Marketing/Processing expert of the Study Team explained to let participants understand that it can be made better quality and tasted products having more whitish color and higher elasticity with less quantity of binder by taking this process although some essence of fish meat is extracted into water.



Soaking

Pressing (Sape)

Filtration before Pressing (Tongkol)

Meat after Pressing (Tembang)

d) Mixing and Kneading

After soaking and pressing twice, the fish meat was weighed and mixed well by hand with appropriate quantity of additives accordingly in orders of salt, binder (cassava starch, egg white), seasoning (bumbu, ajinomoto). The result of this process largely depends on the water content of fish meat after pressing, composition

ratio of binder, and mixing methods. The standards for controlling elasticity of fish ball are based on experiences.

Mixing & Kneading (Sape)

Mixing & Kneading (Larantuka)

e) Shaping, Boiling and Natural-Cooling

Well-mixed fish meat was shaped into balls by hand, and boiled in the hot flavored water for 15-20 minutes by sometimes checking the boiling condition. After boiled, the fish balls were naturally cooled. The sizes of fish balls slightly differed due to the shaping by the participants' eyes, but it can be uniformed by experiences.

Shaping (Sape)

Shaping (Larantuka)

f) Weighing and Packaging

Due to non-availability of vacuum packing machine this time, the fish balls were only packed into the ordinal plastic bags and weighed.

Weiging (Sape)

Packaging (Sape)

The detailed results including the composition of materials and production cost are shown on Table 3-2-1.

(2) Dried Fish

1) Pre-Treatment

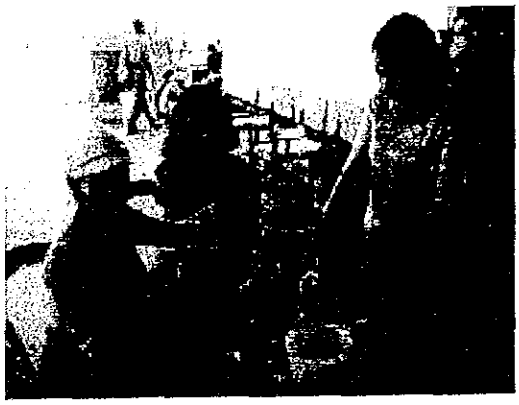
Using layang (round scad) and tembang (sardine), gutting and open-cutting of raw fish were made. It is usual in the Study Area to open-cut fish at dorsal part. In case of tembang (sardine), however, abdominal part is easy to be burst if the dorsal part is cut. In addition the removal of scales was done before cutting in case of tembang.

Pre-Treatment (Sape)

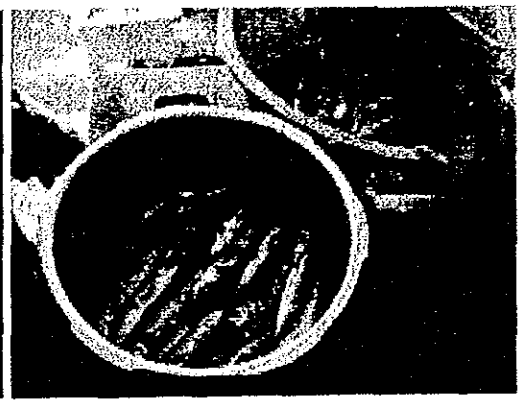
Pre-Treatment (Larantuka)

2) Soaking into Bumbu sauce

The open-cut fish was soaked into the bumbu, different regime from one used for fish ball, for 1-2 hours. The fish became light-yellowish with local flavor.



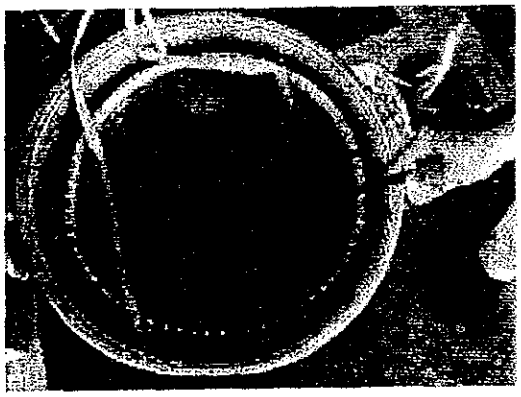
Preparation of Bumbu (Sape)



Bumbu-soaked fish

3) Immersing into boiled water

The open-cut fish was arranged in the bamboo- or steel-made baskets by piling up in orders of fish, salt and banana leave, and the top surface of basket was bind with strings so that fishes are not floated in the hot water. The fish contained baskets are immersed into boiled water. At the beginning the immersing was done for about 5 minutes in case of round fish and 2 minutes in case of open-cut fish, but most of fishes got out of shape. As a result, appropriate time for immersing would be about 1 minute for round fish and 20 seconds for open-cut fish.



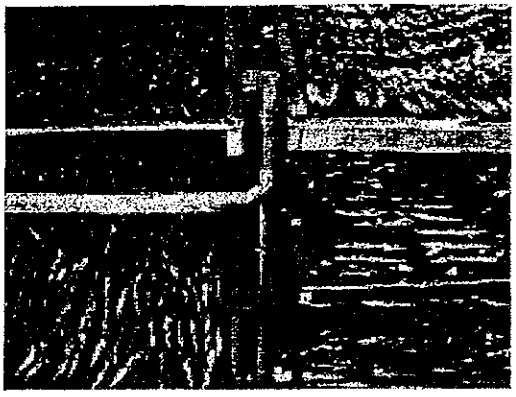
Immersing fish into Boiled Water

4) Drying under sun-shade

Fishes were arranged on the home-made drying pallets (size: 120 x 90cm, wooden-flame with Bagan net). Pallets were put on the wooden racks placed in the open-aired but under sun-shade, for drying fishes. The color of pre-treated fishes (immersed into boiled water) was whitish clearly showing the less oil content, comparing with non-treated fishes. During the drying process under sun-shade, however, numerous numbers of fries came to fishes. The another unit of pallet was

covered onto the fish-arranged pallet in order to protect fries, but fries were still attached to the both sides of pallets. Due to this condition, after 2-3 days, the most of dried fishes are deteriorated with worms and could not be used for human consumption. By the way, no fries come and attach onto fishes under direct sun-shine.

In Larantuka, due to the limited time for experiments, the quality of dried fish after treatment could not be checked.



Drying under sun-shade

Fried Fish

3-2-3. Considerations

(1) Fish Ball (Bakso Ikan)

Fish balls produced both in Sape and Larantuka were satisfactory in quality (elasticity) and taste, but it is necessary to consider the following points on production costs.

1) Purchase price of raw fish

The price of raw fish is one of the important factors affecting production cost. As of today, the commercialized fish ball in Indonesia is limited to one made from Tenggiri (spanish mackerel). Fish balls made from other fishes are only for home consumption. Fish ball made from Tenggiri (vacuum packed) is sold at supermarket "Hero" in Mataram – Lombok at price of Rp.33,000/kg at present. The fish balls produced on experimental base in this Study were could be compared favorably with the existing one in quality and taste. However, the Tenggiri has the high-value image with white-colored meat in Indonesia, while Tongkol, Layang and Tembang are deemed as low-priced fish. Accordingly, the expected retail price of fish balls produced in this Study would be approximately Rp.20,000/kg. In this case (assumed to ship to supermarkets in urban area such as Mataram, Denpasar,

Surabaya and Jakarta), the selling price of products at destination would have to be less than Rp.12,000/kg, and thus the price of raw fishes should be lower than those shown on the table below, based on the cost and benefit calculation by species and location (See the attached table 3-2-2).

	Tongkol	Layang	Tembang
Sape (Bima)	Rp.2,300/kg	Rp.1,790/kg	Rp.1,500/kg
Larantuka (Flores Timur)	Rp.2,070/kg	Rp.1,590/kg	Rp.1,300/kg

2) Manpower Cost

In the experiments, every process including meat separation, water-soaking, pressing, mixing, shaping and boiling was made by hand. Based on the working efficiency in the experiments, maximum volume of fish ball that can be produced per person per day (8 hours) would be about 6-7 kg (20kg in raw fish). On the other hand, based on the actual standard wage in the Study Area, it is necessary to pay daily wage of about Rp.20,000 (including lunch and transportation) in case of the out-sourced manpower, resulting in the manpower cost of Rp.3,000-3,500 for producing 1 kg of fish ball.

3) Consideration on Binders

In the experiments, cassava (tapioka) starch and egg white were used as binders. Since the higher composition rate of cassava starch affects to taste and flavor of fish ball, the egg white was also used. However, the proportion of egg to material cost is relatively high. As one of methods for cost down, it is necessary to do experiment on taste and elasticity by increasing cassava starch (max. 10%) instead of using egg white.

(2) Dried Fish

The existing dried fish is produced by adding salt and dried under direct sun-shine. In this method, however, due to the oxidization of oil contained in fish body, the durable periods of quality is only 1 month (actual period varies depending on fish species). The quality of dried fish is judged by color, and the brown-colored ones (oil-oxidized) are assumed to be cheap in price, although it depends on fish species. This is the fact from the dried fish wholesalers in Banyuwangii (East Java) where is one of the largest dried fish markets in Indonesia. For example, Teri (anchovy) lasts only a half month in case of salted/dried, while the boiled/dried ones can be kept for 3 months under normal temperature. In Banyuwangii, the quality of dried fishes are divided into 3-4 ranks (A, B, C and D), and the wholesale prices by species and qualities are as shown on the table below. The wholesale prices of

dried fish in Banyuwangii are almost a half of those retailed in the Study Area, due to the dealing in large volume.

(Unit: Rp./kg)

	A	B	C	D (for animal feed)
Teri	10,000～12,000	9,000	8,000	3,250
Layang	3,000	2,000	1,000	-

Reference: Retail price of Layang (dried) in Maumere: Rp.4,000-5,000/kg

Depending on fish species, it is recommended to immerse fish in boiled water within 1 minute before sun-drying or to dry fish in the open-aired sun-shade in case of non-immersing, in order to reduce the oxidization by oil.

Since the large volume of fishes for drying are landed in high fishing season, however, there seems to be the limitation on village manpower for treating fishes with immersing into boiled water.

In case of drying in the sun-shade, it is indispensable to take appropriate countermeasure (with low cost) against fries. As well it is desirable to concentrate on producing semi-dried products that can be made only in one night considering the limited space for drying fishes in fishing villages. Any measures requiring high cost would not be appropriate for extension to fishing villages. The space-saving structure for drying fishes would be also considered.

3-2-4. Conclusion

(1) Fish Ball (Bakso Ikan)

1) Technical Aspect

a) Unification of Sizes and Surface Treatment of Products

The shaping of fish ball was manually done by women, but the sizes were not unified and the surface was slightly rough. Although it is one of the solutions to introduce mixing and shaping machines, this matter can be improved through experiences. It is not desirable to mechanize the process before the products can be sold on constant level through sales promotion. At the time being, it is recommended to develop on domestic industrial basis.

b) Manpower Saving for Pressing Process

The pressing work needs much time and heavy burden in the fish ball processing. In particular the hand-pressing using cotton cloth or net cloth is heavy burden for women, so that the manpower saving should be ensured by introducing the manual-type pressing machine. The application of pressing machine would be also effective to unify the water contents of fish meat after pressing.

c) Diversification of Products

The fish meat after mixing can be easily diversified into sausage, hamburg, etc. other than fish ball, by shaping methods. In addition, the taste and flavor can be also diversified easily by changing the composition. It is important, therefore, to develop the various products on specifications needed at each market.

2) Cost Aspects

a) Price of Raw Fish

Although it is different by fish species and production sites, in case of sales in domestic markets, it seems to be not feasible except periods when the raw fishes can be procured at the price of less than Rp.1,500 – 2,000/kg. The beach prices of target species such as Tongkol, Layang and Tembang vary depending on sites, the periods that can be used as raw fishes for fish balls are limited to high fishing seasons in every site. The beach prices of target species in fishing seasons are as shown on the following table.

Major Sites	Peak Fishing Season	Beach Price in fishing season (Rp./kg)		
		Tongkol	Layang	Tembang
Waworada	July – Aug.	2,000	1,000	500 – 600
Kempo	May – Oct.	-	1,000 – 1,500	600 – 1,250
Hu'u	May – July	2,000	-	850 – 1,000
Larantuka	Apr. – Nov.	1,500 – 2,000	1,500 – 2,000	1,500 – 2,000
Lewoleba	Nov. – Apr.	-	700 – 1,500	200 – 1,000
Maumere	Mar. – Dec.	1,000 – 1,500	2,000 – 3,000	-
Paga	Apr. – Aug.	1,500 – 2,000	2,500 – 3,500	-
Ende	June – Aug.	1,500 – 2,500	3,000	1,000 – 1,500

Based on the above table, the possible species that can be used as raw fish for fish balls at each site are assumed as follows and its duration is about 3 months at each site.

Major Sites		Tongkol	Layang	Tembang
Waworada	July – Aug.	△	○	○
Kempo	May – Oct.	X	○	○
Hu'u	May – July	△	-	○
Larantuka	Apr. – Nov.	○	△	X
Lewoleba	Nov. – Apr.	X	○	○
Maumere	Mar. – Dec.	○	X	X
Paga	Apr. – Aug.	○	X	X
Ende	June – Aug.	△	X	△

(2) Dried Fish

Semi-Dried Fish Under Sun-Shade

1) Countermeasure against fries

A) To install the fry-traps (papers or electric apparatus) inside of drying place.

B) To physically control the entrance of fry by covering both sides of drying

pallets by nets.

2) Vertical utilization of drying space

A) To develop and utilize the multi-shelves drying racks.

B) To introduce the solar-battery type large fans for generating artificial winds.

Drying under Direct Sun-Shine

1) Countermeasure against oxidization by oil

To immerse fishes into boiled water before sun-drying. Since the extra work is needed, the immersing would be applied for relatively high-priced fishes such as Teri (anchovy) in the initial stage.

2) Countermeasure against rains

There is no substantial countermeasure with a low cost. The following methods are recommended.

A) To use drying pallets that can be easy to bring into the in-house storage before rains come, or to cover fishes by plastic sheets.

B) To make semi-dried fishes (with vacuum packing), as it takes several days for making dried fish during rainy seasons.

The introduction of drying machine costs too much to obtain the return from sales of products, so that it seems to be difficult to extend it to fishing households.

Table 3-2-1. Results of Experiments of Fish Ball Processing

RESULTS OF EXPERIMENTS ON FISH PROCESSING (BAKSO IKAN)

1. SAPE

(1) Tongkol

Materials	Volume	Unit	Composition	Unit Price	Total Price
Raw fish (400g/pc)	40	kg		5,000	200,000
Chopped/washed/pressed meat	15	kg	100.0%		
Salt	0.3	kg	2.0%	1,000	300
Bumbu	0.5	kg	3.3%	10,000	5,000
Tapioka starch	1	kg	6.7%	3,000	3,000
Egg white	15	pcs.		500	7,500
Ice	10	kg		500	5,000
Kerosine	0.4	liter		1,000	400
Total	16.5	kg (Bakso)			221,200
Unit Production Cost (Rp/kg)					13,406
Effective rate of fish meat			37.5%		
Effective rate of fish & materials to produce 1 kg Bakso			41.3%		

(2) Layang

Materials	Volume	Unit	Composition	Unit Price	Total Price
Raw fish (30g/pc)	10	kg		4,500	45,000
Chopped/washed/pressed meat	3.3	kg	100.0%		
Salt	0.065	kg	2.0%	1,000	65
Bumbu	0.2	kg	6.1%	10,000	2,000
Tapioka starch	0.25	kg	7.6%	3,000	750
Egg white	3	pcs.		500	1,500
Ice	4	kg		500	2,000
Kerosine	0.2	liter		1,000	200
Total	3.6	kg (Bakso)			51,515
Unit Production Cost (Rp/kg)					14,310
Effective rate of fish meat			33.0%		
Effective rate of fish & materials to produce 1 kg Bakso			36.0%		

(3) Tembang

Materials	Volume	Unit	Composition	Unit Price	Total Price
Raw fish (30g/pc)	10	kg		2,000	20,000
Chopped/washed/pressed meat	3	kg	100.0%		
Salt	0.04	kg	1.3%	1,000	40
Bumbu	0.25	kg	8.3%	10,000	2,500
Tapioka starch	0.15	kg	5.0%	3,000	450
Egg white	5	pcs.		500	2,500
Jeruk Nipis	5	pcs.		100	500
Ice	4	kg		500	2,000
Kerosine	0.2	liter		1,000	200
Total	3.4	kg (Bakso)			28,190
Unit Production Cost (Rp/kg)					8,291
Effective rate of fish meat			30.0%		
Effective rate of fish & materials to produce 1 kg Bakso			34.0%		

2. LARANTUKA

(1) Tongkol

Materials	Volume	Unit	Composition	Unit Price	Total Price
Raw fish (100g/pc)	20	kg		4,500	90,000
Chopped/washed/pressed meat	6.2	kg	100.0%		
Salt	0.15	kg	2.4%	2,000	300
Bumbu	0.24	kg	3.9%	10,000	2,400
Tapioka starch	0.45	kg	7.3%	3,500	1,575
Egg white	10	pcs.		333	3,330
Ice	0.5	block		7,000	3,500
Kerosine	0.2	liter		1,000	200
Total	7.6	kg (Bakso)			101,305
Unit Production Cost (Rp/kg)					13,330
Effective rate of fish meat			31.0%		
Effective rate of fish & materials to produce 1 kg Bakso			38.0%		

(2) Layang

Materials	Volume	Unit	Composition	Unit Price	Total Price
Raw fish (150g/pc)	15	kg		4,500	67,500
Chopped/washed/pressed meat	3.3	kg	100.0%		
Salt	0.1	kg	3.0%	2,000	200
Bumbu	0.16	kg	4.8%	10,000	1,600
Tapioka starch	0.3	kg	9.1%	3,500	1,050
Egg white	8	pcs.		333	2,664
Ice	0.5	block		7,000	3,500
Kerosine	0.2	liter		1,000	200
Total	3.7	kg (Bakso)			76,714
Unit Production Cost (Rp/kg)					20,734
Effective rate of fish meat			22.0%		
Effective rate of fish & materials to produce 1 kg Bakso			24.7%		

pallets by nets.

2) Vertical utilization of drying space

A) To develop and utilize the multi-shelves drying racks.

B) To introduce the solar-battery type large fans for generating artificial winds.

Drying under Direct Sun-Shine

1) Countermeasure against oxidization by oil

To immerse fishes into boiled water before sun-drying. Since the extra work is needed, the immersing would be applied for relatively high-priced fishes such as Teri (anchovy) in the initial stage.

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There is no substantial countermeasure with a low cost. The following methods are recommended.

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RESULTS OF EXPERIMENTS ON FISH PROCESSING (BAKSO IKAN)

1. SAPE

(1) Tongkol

Materials	Volume	Unit	Composition	Unit Price	Total Price
Raw fish (400g/pc)	40	kg		5,000	200,000
Chopped/washed/pressed meat	15	kg	100.0%		
Salt	0.3	kg	2.0%	1,000	300
Bumbu	0.5	kg	3.3%	10,000	5,000
Tapioka starch	1	kg	6.7%	3,000	3,000
Egg white	15	pcs.		500	7,500
Ice	10	kg		500	5,000
Kerosine	0.4	liter		1,000	400
Total	16.5	kg (Bakso)			221,200
Unit Production Cost (Rp/kg)					13,406
Effective rate of fish meat			37.5%		
Effective rate of fish & materials to produce 1 kg Bakso			41.3%		

(2) Layang

Materials	Volume	Unit	Composition	Unit Price	Total Price
Raw fish (30g/pc)	10	kg		4,500	45,000
Chopped/washed/pressed meat	3.3	kg	100.0%		
Salt	0.065	kg	2.0%	1,000	65
Bumbu	0.2	kg	6.1%	10,000	2,000
Tapioka starch	0.25	kg	7.6%	3,000	750
Egg white	3	pcs.		500	1,500
Ice	4	kg		500	2,000
Kerosine	0.2	liter		1,000	200
Total	3.6	kg (Bakso)			51,515
Unit Production Cost (Rp/kg)					14,310
Effective rate of fish meat			33.0%		
Effective rate of fish & materials to produce 1 kg Bakso			36.0%		

(3) Tembang

Materials	Volume	Unit	Composition	Unit Price	Total Price
Raw fish (30g/pc)	10	kg		2,000	20,000
Chopped/washed/pressed meat	3	kg	100.0%		
Salt	0.04	kg	1.3%	1,000	40
Bumbu	0.25	kg	8.3%	10,000	2,500
Tapioka starch	0.15	kg	5.0%	3,000	450
Egg white	5	pcs.		500	2,500
Jeruk Nipis	5	pcs.		100	500
Ice	4	kg		500	2,000
Kerosine	0.2	liter		1,000	200
Total	3.4	kg (Bakso)			28,190
Unit Production Cost (Rp/kg)					8,291
Effective rate of fish meat			30.0%		
Effective rate of fish & materials to produce 1 kg Bakso			34.0%		

2. LARANTUKA

(1) Tongkol

Materials	Volume	Unit	Composition	Unit Price	Total Price
Raw fish (100g/pc)	20	kg		4,500	90,000
Chopped/washed/pressed meat	6.2	kg	100.0%		
Salt	0.15	kg	2.4%	2,000	300
Bumbu	0.24	kg	3.9%	10,000	2,400
Tapioka starch	0.45	kg	7.3%	3,500	1,575
Egg white	10	pcs.		333	3,330
Ice	0.5	block		7,000	3,500
Kerosine	0.2	liter		1,000	200
Total	7.6	kg (Bakso)			101,305
Unit Production Cost (Rp/kg)					13,330
Effective rate of fish meat			31.0%		
Effective rate of fish & materials to produce 1 kg Bakso			38.0%		

(2) Layang

Materials	Volume	Unit	Composition	Unit Price	Total Price
Raw fish (150g/pc)	15	kg		4,500	67,500
Chopped/washed/pressed meat	3.3	kg	100.0%		
Salt	0.1	kg	3.0%	2,000	200
Bumbu	0.16	kg	4.8%	10,000	1,600
Tapioka starch	0.3	kg	9.1%	3,500	1,050
Egg white	8	pcs.		333	2,664
Ice	0.5	block		7,000	3,500
Kerosine	0.2	liter		1,000	200
Total	3.7	kg (Bakso)			76,714
Unit Production Cost (Rp/kg)					20,734
Effective rate of fish meat			22.0%		
Effective rate of fish & materials to produce 1 kg Bakso			24.7%		

Table 3-2-2. Cost and Benefit Calculation on Fish Ball Processing

PROPOSED RESUME AND COST ESTIMATE FOR FISH PROCESSING (BAKSO IKAN)
(BASED ON ONE-DAY OPERATION BY HOME INDUSTRY)

(1) Tongkol

					Sumbawa		Flores	
Item	Description	Volume	Unit	Composition	Unit Cost	Total Cost	Unit Cost	Total Cost
Raw Materials	Raw fish (100-400g/pc)	300	kg		2,307	691,950	2,077	623,100
	(Effective rate of meat)	35%						
	Chopped/washed/pressed meat	105	kg	100.0%				
	Salt	2.1	kg	2.0%	1,000	2,100	2,000	4,200
	Bumbu	3.2	kg	3.0%	10,000	31,500	10,000	31,500
	Tapioka starch	7.9	kg	7.5%	3,000	23,625	3,500	27,563
	Egg white	105	pcs.	0.5%	500	52,500	500	52,500
	Ajinomoto / Masako	5	packs		2,500	12,500	2,500	12,500
	Sub-Total					814,175		751,363
Consumable	Plastic bag (250g pack)	480	pcs.		200	96,000	200	96,000
	Labels	480	pcs.		50	24,000	50	24,000
	Sub-Total					120,000		120,000
Utility	Ice	75	kg		250	18,750	300	22,500
	Water	525	liter		30	15,750	30	15,750
	Kerosine	3	liter		1,000	3,000	1,000	3,000
	Sub-Total					37,500		41,250
Manpower	Workers (15 persons x 8 hrs.)	120	person-hr.		2,500	300,000	2,500	300,000
	Food & drink for workers	15	person		5,000	75,000	5,000	75,000
	Sub-Total					375,000		375,000
Total Production Cost		118	kg (Bakso)			1,346,675		1,287,613
Shipping Charge	Storage (for 10 days in freezer)	118	kg (Bakso)		100	11,813	100	11,813
	Transportation cost	118	kg (Bakso)		500	59,063	1,000	118,125
	Sub-Total					70,875		129,938
Total Production & Shipping Cost						1,417,550		1,417,550
Unit Production Cost (Rp/kg)		1	kg (Bakso)			11,400		10,900
Unit Shipping Charge (Rp/kg)		1	kg (Bakso)			600		1,100
Min. Selling Price at Mataram / Denpasar		1	kg (Bakso)			12,000		12,000

(2) Layang

					Sumbawa		Flores	
Item	Description	Volume	Unit	Composition	Unit Price	Total Price	Unit Price	Total Price
Raw Materials	Raw fish (30-150g/pc)	300	kg		1,792	537,450	1,593	477,900
	(Effective rate of meat)	30%						
	Chopped/washed/pressed meat	90	kg	100.0%				
	Salt	1.8	kg	2.0%	1,000	1,800	2,000	3,600
	Bumbu	2.7	kg	3.0%	10,000	27,000	10,000	27,000
	Tapioka starch	6.8	kg	7.5%	3,000	20,250	3,500	23,625
	Egg white	90	pcs.	0.5%	500	45,000	500	45,000
	Ajinomoto / Masako	4	packs		2,500	10,000	2,500	10,000
	Sub-Total					641,500		587,125
Consumable	Plastic bag (250g pack)	410	pcs.		200	82,000	200	82,000
	Labels	410	pcs.		50	20,500	50	20,500
	Sub-Total					102,500		102,500
Utility	Ice	75	kg		250	18,750	300	22,500
	Water	450	liter		30	13,500	30	13,500
	Kerosine	3	liter		1,000	3,000	1,000	3,000
	Sub-Total					35,250		39,000
Manpower	Workers (15 persons x 8 hrs.)	120	person-hr.		2,500	300,000	2,500	300,000
	Food & drink for workers	15	person		5,000	75,000	5,000	75,000
	Sub-Total					375,000		375,000
Total Production Cost		101	kg (Bakso)			1,154,250		1,103,625
Shipping Charge	Storage (for 10 days in freezer)	101	kg (Bakso)		100	10,125	100	10,125
	Transportation cost	101	kg (Bakso)		500	50,625	1,000	101,250
	Sub-Total					60,750		111,375
Total						1,215,000		1,215,000
Unit Production Cost (Rp/kg)		1	kg (Bakso)			11,400		10,900
Unit Shipping Charge (Rp/kg)		1	kg (Bakso)			600		1,100
Min. Selling Price at Mataram / Denpasar		1	kg (Bakso)			12,000		12,000

(3) Tembang

Item	Description	Volume	Unit	Composition	Sumbawa Unit Price	Sumbawa Total Price	Flores Unit Price	Flores Total Price
Raw Materials	Raw fish (30-150g/pc)	250	kg		1,505	376,125	1,306	326,500
	(Effective rate of meat)	30%						
	Chopped/washed/pressed meat	75	kg	100.0%				
	Salt	1.5	kg	2.0%	1,000	1,500	2,000	3,000
	Bumbu	2.3	kg	3.0%	10,000	22,500	10,000	22,500
	Tapioka starch	5.6	kg	7.5%	3,000	16,875	3,500	19,688
	Egg white	75	pcs.	0.5%	500	37,500	500	37,500
	Ajinomoto / Masako	3	packs		2,500	7,500	2,500	7,500
	Lime	100	pcs.		100	10,000	100	10,000
	Sub-Total					472,000		426,688
Consumable	Plastic bag (250g pack)	340	pcs.		200	68,000	200	68,000
	Labels	340	pcs.		50	17,000	50	17,000
	Sub-Total					85,000		85,000
Utility	Ice	62.5	kg		250	15,625	300	18,750
	Water	375	liter		30	11,250	30	11,250
	Kerosine	3	liter		1,000	3,000	1,000	3,000
	Sub-Total					29,875		33,000
Manpower	Workers (15 persons x 8 hrs.)	120	person-hr.		2,500	300,000	2,500	300,000
	Food & drink for workers	15	person		5,000	75,000	5,000	75,000
	Sub-Total					375,000		375,000
Total Production Cost		84	kg (Bakso)			961,875		919,688
Shipping Charge	Storage (for 10 days in freezer)	84	kg (Bakso)		100	8,438	100	8,438
	Transportation cost	84	kg (Bakso)		500	42,188	1,000	84,375
	Sub-Total					50,625		92,813
Total						1,012,500		1,012,500
Unit Production Cost (Rp/kg)		1	kg (Bakso)			11,400		10,900
Unit Shipping Charge (Rp/kg)		*1*	*kg (Bakso)*			*600*		*1,100*
Min. Selling Price at Mataram / Denpasar		1	kg (Bakso)			12,000		12,000

Reference:

Retail Price of Bakso Ikan (Tengeiri) at Mataram (Supermarket Hero)				33,000		33,000
Expected retail price of Bakso Ikan (Tongkol) at Mataram/Denpasar/Java				20,000		20,000
Target selling price of Bakso Ikan (Tongkol) to Mataram/Denpasar/Java				12,000		12,000