

According to the Final Report on the Kinabatangan River Basin Development Study (Ref. 9), a large-scale dam with the reservoir of somewhat 500 km<sup>2</sup> is proposed to be constructed on a tributary of the Kinabatangan river. From the viewpoint of freshwater fish culture, there is future possibility to develop a large-scale fish culture on a commercial base and also fish processing industry.

#### 4.1.3 Prospective direction of inland fishery development

Brackish pond culture, newly started from 1980, could be steadily grown by proper provision of technical and financial aid by the Government. On the other hand, freshwater pond culture showed a little bit declined tendency in its productivity during TMP period. The renovation of low productivity in freshwater pond culture will be expected to be performed through the Government's assistance with high priority. Under this Study, it is assumed that the average annual increase in surface area of freshwater pond during TMP period is kept in the future. This increase in surface area is 38.5 ha. Projected trend of fish pond area is illustrated in Fig. 24.

#### 4.1.4 Future water demand

In future, 70% of the total freshwater pond areas will be provided with water from irrigation canal and small streams. Based on the prospective increase of pond culture areas during the period from 1981 to 2000 and the said assumption on freshwater resources, it was estimated that the future water demand of freshwater pond in Sabah was 19.5 x 10<sup>6</sup> tons for 608 ha in 1990 and 28.1 x 10<sup>6</sup> tons for 878 ha in 2000, respectively, as shown in Table 21.

### 4.2 Sarawak

#### 4.2.1 Development policies of the State Government

The development policies taken up in TMP as described before are taken over to 4MP (Ref. 10). Under the policies, farmers are encouraged to establish fish ponds through the following assistances provided by the State Government:

- (a) fish pond subsidy scheme,
- (b) inland fisheries and aquaculture training program, and
- (c) establishment of inland fisheries and aquaculture station for the purpose of fish fry production for distribution to the farmers and of provision of demonstration and extension services.

Proposed budget for inland fisheries development under 4MP is about M\$10.0 x 10<sup>6</sup>, which is 16.2% of total proposed budget of M\$61.9 x 10<sup>6</sup> for fisheries project as shown in Table 20.

#### 4.2.2 Existing development plans

As of 1981, there is no particular development plan for the inland fisheries other than 4MP.

#### 4.2.3 Prospective direction of inland fishery development

In Sarawak, brackish pond culture is still under the experimental stage led by the Government. It might take another several years to transfer practical technology on mullet culture to fish farmers. It was assumed in this Study that brackish culture will be commenced in 5MP with the annual increase of 7 ha in brackish pond area. The surface area of freshwater pond will be extended following its past trend with the annual increase of 98.4 ha during TMP. However, availability of irrigation canal as freshwater source will be still limited up to 1990, because the expansion of irrigation system seems to be in early stage. Maximum 20% of 19.7 ha/y of freshwater pond areas, mainly dug-out type pond, will be able to be supplied with irrigated freshwater other than rainfalls. Projected trend of fish pond area is as shown in Fig. 25.

#### 4.2.4 Future water demand

Based on the prospective increase in pond culture areas during the period from 1981 to 2000, the future water demand of freshwater pond in Sarawak was estimated to be none in 1990 and 6.3 x 10<sup>6</sup> tons for 197 ha in 2000 as shown in Table 21.

## 5. PROBLEMS AND NEEDS

The freshwater pond development in both the States has been increasing in its surface areas through the subsidy assistance of the Governments. But the increase rate of fish production in these ponds has been slower due to low productivity caused by the following reasons:

- (1) Farmers technology is not enough to operate the pond designed by the Government;
- (2) Site selection of dug-out type is not suitable from the viewpoint of water balance;
- (3) The policy of fry distribution is not practical;
- (4) Back-up system for subsidized farmers is not practical; and
- (5) Systems of fish culture development is not practical to fish farmers with traditional way of thinking.

To clarify and overcome the causes of low production, the most urgent matter is to establish the more powerful extension service system in order to collect and analyze the various kind of fish farmers' needs and to give enough and suitable training, as well as to refine extension workers themselves.

## 6. CONSTRUCTION COST AND O&M COST FOR INLAND FISHERY SCHEMES

### 6.1 Constructed Pond Culture

Unit construction cost for constructed ponds excluding physical contingency was estimated at M\$17.5 x 10<sup>3</sup>/ha based on the required excavation volume and land acquisition cost obtained from the Inland Fishery Section of DOFS and Majuikan (Ref. 12). Total unit construction cost was, therefore, estimated at M\$22.8 x 10<sup>3</sup>/ha.

O&M cost for the construction ponds was assumed at 1% of the construction cost or M\$0.2 x 10<sup>3</sup>/ha/y based on the data obtained from DOFS and Majuikan (Ref. 12).

### 6.2 Cage Culture in Dams Reservoirs

Based on the data obtained from DOFS and Majuikan, unit construction cost for cage culture fishery in dams reservoirs excluding physical contingency was estimated at M\$500.5 x 10<sup>3</sup>/ha. Total unit construction cost, therefore, estimated at M\$650.7 x 10<sup>3</sup>/ha.

O&M cost for cage culture fishery was assumed at 2% of the construction cost or M\$13.0 x 10<sup>3</sup>/ha/y based on the data obtained from DOFS and Majuikan (Ref. 12).

### 6.3 Estimated Cost

Estimated investment cost (construction cost) together with the area of constructed ponds to be developed during 1980 - 2000 period by state is given in Sectoral Report Public Expenditure and Beneficial and Adverse Effects. Investment cost together with the area of cage culture in reservoirs (inland fishery in reservoirs) by basin is given for various alternatives for water source development and these under lower economic growth in the same sectoral report. Recurrent expenditure (O&M cost) for the constructed pond culture and cage culture in reservoirs for Sabah and Sarawak is also shown in the same report.

## 7. ECONOMIC BENEFIT AND COST FOR INLAND FISHERY

### 7.1 Economic Cost

Economic cost was obtained by deducting the transfer payments including taxes and local profits from the financial cost. In this Study, economic cost was assumed at 80% of the financial cost. Unit economic construction cost and economic O&M cost is shown in Table 30 together with unit financial costs.

### 7.2 Economic Benefit

Economic benefit derived from the constructed pond culture and cage culture in the reservoirs was estimated at 80% of the financial net production value, taking into account the transfer payments.

Gross unit production value of cage culture was estimated at M\$753.5 x 10<sup>3</sup>/ha/y, while financial production cost was estimated at M\$518.1 x 10<sup>3</sup>/ha/y. Net unit production value (financial) was calculated at M\$235.4 x 10<sup>3</sup>/ha/y. Net unit production value (economic) for cage culture was, thus, estimated at M\$188.3 x 10<sup>3</sup>/ha/y. Similarly, net unit production value (economic) for pond culture was estimated at M\$2.2 x 10<sup>3</sup>/ha/y. Details are given in Table 31.

### 7.3 Estimated Economic Benefit and Cost

Estimated annual equivalents of economic benefit and cost at the discount rate of 8% for pond culture by state and these for cage culture in reservoirs by basin are given in Sectoral Report Public Expenditure and Beneficial and Adverse Effects.

#### REFERENCES

1. FOCUS ON SABAH, 1981/1982, Focusasia (M), Sdh, Bhd
2. ANNUAL REPORT, 1970-1979, Department of Fisheries, Sabah
3. ANNUAL REPORT, 1967, 1968, 1970, 1972-1979, Marine Fisheries Department, Sarawak
4. SAMPLING SURVEY OF FRESHWATER POND PRODUCTION, 1972-1980, Inland Fishery and Aquaculture Section of State MOA, Sarawak
5. SABAH REGIONAL PLANNING STUDY, 1981, The Government of Malaysia and State of Sabah
6. REPORT ON THE FAO/SOUTH CHINA SEA FISHERIES DEVELOPMENT COORDINATING PROGRAM, 1975, FAO
7. THIRD MALAYSIA PLAN, 1976, State of Sabah
8. FOURTH MALAYSIA PLAN, 1981, Phase I Report, State of Sabah
9. FINAL REPORT ON THE KINABATANGAN RIVER BASIN DEVELOPMENT STUDY, 1981, JICA
10. FOURTH MALAYSIA PLAN (1981-1985), Volume I, 1980, State of Sarawak



## ***TABLES***





Table 1 ESTIMATED FISH PRODUCTION IN SABAH

Unit: 10<sup>3</sup> tons

Year	Freshwater Fish/ <u>1</u>	Marine Fish			Total
		NW Coast/ <u>2</u>	NE Coast/ <u>3</u>	SW Coast/ <u>4</u>	
1965	-	-	-	-	25.0
1966	-	-	-	-	25.8
1967	-	-	-	-	28.3
1968	-	-	-	-	29.4
1969	-	-	-	-	25.6
1970	1.0	10.5	10.3	5.2	27.0
1971	1.0	11.0	10.4	5.3	27.7
1972	1.0	11.2	10.1	5.8	28.1
1973	1.0	12.5	10.9	7.8	32.2
1974	1.0	12.7	11.2	8.4	33.3
1975	1.0	13.2	10.4	8.9	33.5
1976	1.2	10.7	10.6	9.2	31.7
1977	1.3	13.4	11.2	10.3	36.2
1978	1.5	14.6	11.3	14.2	41.6
1979	1.7	16.3	10.5	13.4	41.9

Remarks; /1: Produced only from interior Districts such as Tenom, Keningau and Kinabatangan.

/2: Labuan and Sipitang, Beaufort, Papar, Kota Kinabalu, Tuaran, Kota Belud and Kudat.

/3: Beluran and Sandakan

/4: Lahad Datu, Semporna and Tawau

Source; Ref. 2

Table 2 NUMBER OF TRAWLERS IN SABAH AND SARAWAK

Year	Sabah		Sarawak	
	Estimated Total	Licensed <sup>/1</sup>	Total	Average Monthly Frequency of Trawling <sup>/2</sup>
1966	-	152	-	-
1967	-	221	-	-
1968	-	315	20	-
1969	-	312	60	-
1970	-	294	176	-
1971	-	301	243	-
1972	-	334	433	-
1973	-	333	472	-
1974	-	359	479	-
1975	620	322	530	-
1976	700	360	569	-
1977	730	525	713	(461)
1978	750	536	744	(542)
1979	800	594	807	(584)

Remarks; /1: A lot of trawlers has not been licensed yet in Sabah.

/2: Figures of monthly frequency show more realistic trawl activities than total number of trawlers in Sarawak.

Source; Refs. 2 & 3

Table 3 HISTORICAL RECORD OF FRESHWATER  
FISH POND IN SABAH

Unit: Number 10<sup>2</sup>  
Area ha

Year	West Coast & Kudat		Sandakan		Tawau		Labuan & Interior		Total	
	No.	A.	No.	A.	No.	A.	No.	A.	No.	A.
1961	2	9	0	1	0	0.6	5	12.6	7	23
1962	3	9	0	1	0	0.6	5	12.6	8	23
1963	3	10	0	1	0	1	5	13	8	25
1964	3	11	0	1	0	1	5	14	8	27
1965	4	20	0	2	0	2	5	14	9	38
1966	4	22	0	2	0	2	5	18	9	44
1967	5	28	0	2	0	3	6	24	11	57
1968	6	38	0	3	1	7	6	29	13	67
1969	7	56	0	4	1	8	7	38	15	106
1970	8	77	1	5	1	14	7	43	17	139
1971	10	105	1	7	1	14	8	47	20	173
1972	12	126	1	7	1	14	8	54	22	201
1973	13	144	1	10	1	15	9	61	24	230
1974	14	153	1	28	1	15	9	63	25	259
1975	15	165	2	31	1	26	10	69	28	291
1976	17	201	2	34	1	28	10	78	30	341
1977	19	222	2	37	1	30	11	85	33	374
1978	21	262	2	37	1	31	11	88	35	418
1979	22.8	288	2.6	44	1	31	12	91	38	454
1980	23.4	316	2.6	44	1	32	13	92	40	484
	(-)	(-)	(0)	(23)	(0)	(13)	(-)	(-)	(0)	(36)

Remarks; Figures in parentheses show the number and area of brackish pond newly constructed in 1980.

Source; Ref. 2

Table 4 IMPORT AND EXPORT OF FISHERY PRODUCTS IN SABAH

Unit: 10<sup>3</sup> tons

Year	Dried & Salted				Frozen or Chilled				Canned or Preserved				Total			
	Import		Export		Import		Export		Import		Export		Import		Export	
	AF.	CF.	AF.	CF.	AF.	CF.	AF.	CF.	AF.	CF.	AF.	CF.	AF.	CF.	AF.	CF.
1970	0.6	1.1	0.3	0.5	0.1	0.1	1.6	1.6	1.8	3.5	0.0	0.0	2.5	4.7	1.9	2.1
1971	0.6	1.1	0.2	0.3	0.0	0.0	1.8	1.8	1.9	3.6	0.0	0.0	2.5	4.7	2.0	2.1
1972	0.7	1.3	0.3	0.5	0.1	0.1	2.0	2.0	2.3	4.4	0.0	0.0	3.1	5.8	2.3	2.5
1973	0.6	1.1	0.2	0.4	0.1	0.1	2.3	2.3	2.9	5.5	0.1	0.3	3.6	6.6	2.6	3.0
1974	0.3	0.6	0.1	0.2	0.3	0.3	2.3	2.3	3.3	6.3	0.0	0.0	3.9	7.2	2.4	2.5
1975	0.5	0.9	0.4	0.8	0.4	0.4	2.2	2.2	3.2	6.0	0.0	0.0	4.1	7.3	2.6	3.0
1976	0.6	1.1	0.8	1.5	1.0	1.0	3.0	3.0	3.8	7.2	0.1	0.1	5.4	9.3	3.9	4.6
1977	0.3	0.5	0.2	0.4	0.2	0.2	3.2	3.2	3.3	6.3	0.1	0.2	3.8	7.0	3.5	3.8
1978	0.2	0.5	0.3	0.5	0.2	0.2	3.4	3.4	4.5	8.5	0.0	0.1	4.9	9.0	3.7	4.0
1979	0.2	0.4	0.2	0.3	0.4	0.4	3.8	3.8	6.5	12.3	0.2	0.3	7.1	13.1	4.2	4.4

Remarks; AF.: Actual Figure  
 CF.: Convert Figure as net weight,  
 Conversion rate: Dried & Salted = 0.53  
 Frozen & Chilled = 1.00  
 Canned & Preserved = 0.53

Source; Ref. 2

Table 5 MARINE FISHERY RESOURCES IN SABAH AND SARAWAK  
ESTIMATED BY MALAYSIAN GOVERNMENT AND FAO

Unit: 10<sup>3</sup> tons

Fish Type	Source of Data	Sabah <sup>/1</sup>		Sarawak <sup>/2</sup>		Total
		West	East	West	East	
Pelagic Fish	M.G. <sup>/3</sup>	-	-	-	-	143
	FAO	25	10	64	24	123
Demersal Fish	M.G.	(87) <sup>/4</sup>		(103) <sup>/4</sup>		190
	FAO	39	39	69	37	184
Total	M.G.	-	-	-	-	333
	FAO	64	49	133	61	307

Remarks; /1: West covers the northwest coast bordered to the South China Sea. East covers the northeast coast bordered to the Sulu Sea and the south-east coast bordered to the Celebes Sea.

/2: West covers the coast faced to the Sarawak bay. East covers the coast faced to the eastward far from the Sarawak bay.

/3: Malaysia Government

/4: Figures in parentheses show the total figures.

Source; Refs. 5 & 6

Table 6 FISHERY RESOURCES AND FISH CATCH  
IN SABAH IN 1979

Unit: 10<sup>3</sup> tons

Classification	Coast	Fisheries Resources	Fish Catch	Balance
Pelagic Fish	West	25	11.6	13.4
	East	10	18.3	-8.3
Demersal Fish <sup>/1</sup>	West	39	4.7	34.3
			(33.3) <sup>/2</sup>	(5.7) <sup>/2</sup>
	East	39	5.6	33.4
			(133.3) <sup>/2</sup>	(-94.3) <sup>/2</sup>

Remarks; /1: Only fishes caught by trawl nets are counted as demersal fish.

/2: Figures estimated show discarded fishes by prawn trawlers, based on survey result of DOFS, SABAH

Source; Refs. 2, 4 & 6

Table 7 FISHING EFFORT IN RIVERS IN SABAH<sup>/1</sup>

Unit: kg/d

River	Fish Catch in 10-20 Years Before	Fish Catch in the Present Time	Cause <sup>/2</sup> of Fish Decrease
1. Moyog (Upstream)	12 - 13	1 - 4	S, P
2. Moyog (Middle stream)	6 - 7	None	S
3. Padas (Middle stream)	2 - 3	2 - 3	-
4. Padas (A tributary in the middle stream)	13 - 19	More than 1	P
5. Padas (Middle stream)	-	4 - 5	S
6. Padas (Downstream)	30	3 - 7	S
7. Padas (Downstream)	30 - 50	5 - 7	?
8. Labuk (Upstream)	6 - 7	1 - 2	P
9. Labuk (Middle stream)	Very easy to catch fish	3 - 4	S
10. Labuk (Downstream)	Much more	3 - 4	P
11. Sugut (Upstream) <sup>/3</sup>	Much more	in 1975, 1 - 2	?
12. Sugut (Middle stream) <sup>/3</sup>	Very easy to catch fish	in 1973, 4 - 5	S
13. Sugut (Downstream)	50 - 60	1 - 2	S

Remarks; <sup>/1</sup>: Result of interview survey on river fishing to village people who have been living for a long time and have usually gone fishing along rivers.

<sup>/2</sup>: S = Siltation, P = Increase of fish catch population

<sup>/3</sup>: These villages are located in downstream areas of Mamut copper mine. The State Government recommended the people not to use the river.

Table 8 ESTIMATED OPERATION RATE OF FRESHWATER POND BY DISTRICT IN SABAH IN 1979

District	Area of Pond (ha)	S.N. (Tails x 10 <sup>3</sup> )	O.N. (Tails x 10 <sup>3</sup> )	O.R. (%)
1. Kudat	14.0	27.7	10.0	36.1
2. Pitas	-	-	-	-
3. K. Marudu	4.4	8.7	0.0	0.0
4. K. Belud	128.9	254.8	18.1	7.1
5. Tuaran	46.2	91.3	9.5	10.4
6. K. Kinabaku	22.1	43.7	54.1	123.8
7. Penampang	9.7	19.2	3.9	20.3
8. Papar	32.0	63.3	31.5	49.8
9. Membakut	1.4	2.8	3.6	128.6
10. Beaufort	23.7	46.9	13.0	27.7
11. Kuala Penyu	0.7	1.4	0.0	0.0
12. Labuan	8.6	17.0	6.5	38.2
13. Sipitang	3.6	7.1	0.0	0.0
14. Ranau	35.8	70.8	28.5	40.3
15. Tambunan	14.6	28.9	2.8	9.7
16. Keningau	28.4	56.0	21.8	38.9
17. Tenom	8.2	16.2	1.8	11.1
18. Pensiangan	0.8	1.6	0.0	0.0
19. Beluran	-	-	-	-
20. Sandakan	39.1	77.3	20.5	26.5
21. Lahad Datu	1.4	2.8	3.3	117.8
22. Semporna	0.6	1.2	0.3	25.0
23. Tawau	29.8	58.9	1.4	2.4
Total	454.0	897.6	230.6	25.7

Remarks; S.N.: Standard number of fish fry to be stocked = 1977 tails/ha (800 tails/acre)  
D.N.: Distributed number of fish fry by the Government  
O.R.: Operation rate of pond = D.N./S.N. x 100

Source; Ref. 2



Table 9 . LANDINGS OF PRAWNS, TRASH FISH  
AND OTHER FISHES IN SARAWAK

Unit: 10<sup>3</sup> tons

Year	Prawns	Trash Fish	Other Fisheries Products	Total
1968	3.1 (23.0)	3.9 (28.4)	6.7 (48.6)	13.7 (100.0)
1969	-	-	-	-
1970	1.7 (11.6)	1.6 (11.2)	11.1 (77.2)	14.3 (100.0)
1971	-	-	-	-
1972	2.7 (16.5)	3.6 (22.1)	10.1 (61.4)	16.5 (100.0)
1973	8.2 (21.2)	12.8 (33.4)	17.4 (45.4)	48.4 (100.0)
1974	15.8 (30.4)	13.5 (26.0)	22.7 (43.6)	51.9 (100.0)
1975	5.6 (8.7)	20.4 (32.0)	38.0 (59.3)	63.9 (100.0)
1976	10.3 (14.1)	26.7 (36.5)	36.2 (49.4)	73.2 (100.0)
1977	9.5 (11.4)	23.0 (27.6)	50.9 (61.0)	83.3 (100.0)
1978	14.2 (18.3)	23.7 (30.6)	40.0 (51.1)	77.5 (100.0)
1979	16.2 (19.8)	24.6 (29.9)	41.4 (50.3)	82.3 (100.0)

Remarks; Figures in parentheses show proportion to total landings (%)

Source; Ref. 2

Table 10 HISTORICAL RECORD OF LANDINGS  
OF RIVER FISH IN SARAWAK

Unit: tons

Year	A	B	C	D	E	F	G	H	I	Total
1960-65	2.0	-	-	-	12.1	-	-	4.8	12.1	18.9
1966-70	1.7	-	-	-	40.4	-	-	4.0	-	46.1
1971	0.3	-	-	-	2.1	-	-	0.8	-	3.2
1972	0.1	0.3	0.7	-	0.3	-	-	17.1	0.0	18.5
1973	19.1	7.0	-	-	4.9	2.3	7.6	29.2	-	70.1
1974	4.7	5.0	-	5.7	10.1	0.1	4.0	5.5	-	35.1
1975	2.1	2.0	33.2	11.6	15.3	0.9	-	-	-	65.1
1976	2.3	-	62.0	23.7	42.1	1.6	-	5.7	-	137.4
1977	2.3	-	26.1	6.4	15.4	1.3	-	5.5	-	56.9
1978	-	-	-	3.1	4.3	0.9	-	-	-	8.3
1979	-	-	-	0.5	-	0.5	-	-	-	1.0
1980	-	-	-	12.9	-	-	-	-	-	12.9

Remarks; A: Serian, B: Pantu, C: Simunjan, D: Belaga,  
E: Kapit, F: Kanowit, G: Sibul, H: Marudi, and  
I: Lawas.

Source; Inland Fisheries and Aquaculture Section, MOA,  
Sarawak.

Table 11 HISTORICAL RECORD OF FRESHWATER  
FISH POND IN SARAWAK (1/2)

Unit: Number 10<sup>3</sup>  
Area ha

Year	First Division		Second Division		Third Division		Fourth Division	
	No.	Area	No.	Area	No.	Area	No.	Area
1957	1	1	-	-	-	-	-	-
1958	2	2	1	1	0.0	0	0.3	0
1959	7	7	2	2	0.4	1	0.5	0
1960	13	12	5	4	0.6	1	0.6	0
1961	19	17	10	8	1	2	3	3
1962	28	37	16	22	2	4	5	8
1963	32	47	21	36	2	5	6	10
1964	37	60	23	42	2	6	7	13
1965	43	97	27	70	2	9	8	21
1966	47	120	28	78	2	12	10	35
1967	51	160	29	93	3	22	11	49
1968	56	230	31	121	4	40	12	61
1969	61	271	34	150	6	58	13	70
1970	65	312	36	175	7	71	14	83
1971	69	359	37	186	9	90	15	98
1972	73	408	39	205	11	108	16	109
1973	76	444	40	216	12	132	17	121
1974	78	467	42	235	13	150	18	131
1975	82	502	44	255	15	173	19	139
1976	86	546	46	273	16	190	20	146
1977	90	591	47	285	17	201	20	152
1978	94	657	49	310	18	209	21	158
1979	97	710	51	326	19	216	22	168
1980	101	756	53	346	20	225	23	176

Source; Inland Fisheries and Aquaculture Section  
in State MOA

Table 12: HISTORICAL RECORD OF FRESHWATER  
FISH POND IN SARAWAK (2/2)

Unit: Number 10<sup>3</sup>  
Area ha

Year	Fifth Division		Sixth Division		Seventh Division		Total	
	No.	Area	No.	Area	No.	Area	No.	Area
1957	-	-	-	-	-	-	1	1
1958	0.0	0	0.0	0	-	-	3.3	3
1959	0.1	0	0.5	0	-	-	10.5	10
1960	0.2	0	0.6	0	-	-	20.0	17
1961	0.3	0	1	0	-	-	34.3	30
1962	2	5	2	1	-	-	55	77
1963	2	6	2	2	-	-	65	106
1964	3	7	3	5	-	-	75	133
1965	3	9	4	11	-	-	87	217
1966	3	11	5	21	-	-	95	277
1967	4	13	6	31	-	-	104	368
1968	4	17	7	46	-	-	114	515
1969	5	29	8	55	-	-	127	633
1970	7	45	9	63	-	-	138	749
1971	8	54	10	76	-	-	148	863
1972	9	62	12	94	-	-	160	986
1973	9	66	12	100	1	8	167	1,087
1974	9	68	13	104	2	12	175	1,167
1975	10	71	14	116	2	13	186	1,269
1976	10	73	14	124	2	14	194	1,366
1977	11	75	15	132	2	16	202	1,452
1978	12	76	16	139	2	17	212	1,566
1979	12	78	16	145	2	19	219	1,662
1980	13	81	17	152	3	25	229	1,761

Source; Inland Fisheries and Aquaculture Section  
in State MOA

Table 13 ESTIMATED FISH PRODUCTION OF FRESHWATER  
POND BY DIVISION IN SARAWAK

Unit: tons

Year	Division							Total
	1st	2nd	3rd	4th	5th	6th	7th	
1972	441	123	35	53	18	80	-	750
1973	479	130	43	59	19	86	2	818
1974	503	141	49	64	20	89	3	869
1975	541	153	56	68	21	99	3	941
1976	588	164	62	72	22	107	3	1,015
1977	636	171	66	75	23	113	4	1,088
1978	707	186	68	78	23	120	4	1,186
1979	761	195	70	83	23	125	5	1,265
1980	813	207	73	87	24	132	6	1,342

Remarks; Estimated Production: Surface Area x Estimated Productivity of Division

Estimated Productivity was obtained from field survey record of fish production of representative ponds in each Division during 1972 - 1980.

Estimated figures are as follows;

1st Division = 1.07 ton/ha/y

2nd Division = 0.59 ton/ha/y

3rd Division = 0.32 ton/ha/y

4th Division = 0.51 ton/ha/y

5th Division = 0.36 ton/ha/y

6th Division = 0.89 ton/ha/y

7th Division = 0.24 ton/ha/y

Source; Ref. 7

Table 14 IMPORT AND EXPORT OF FISHERY PRODUCTS IN SARAWAK

Unit: 10<sup>3</sup> tons

Year	Dried & Salted				Frozen or Chilled				Canned or Preserved				Total			
	Import		Export		Import		Export		Import		Export		Import		Export	
	AF.	CF.	AF.	CF.	AF.	CF.	AF.	CF.	AF.	CF.	AF.	CF.	AF.	CF.	AF.	CF.
1970	2.4	4.5	0.0	0.0	0.6	0.6	0.3	0.3	2.1	4.0	0.0	0.0	5.1	9.1	0.3	0.3
1971	1.9	3.6	0.1	0.2	0.5	0.5	0.8	0.8	1.8	3.4	0.0	0.0	4.2	7.5	0.9	1.0
1972	1.8	3.4	0.1	0.2	0.5	0.5	1.0	1.0	1.8	3.4	0.0	0.0	4.1	7.3	1.1	1.2
1973	2.0	3.8	0.2	0.4	0.6	0.6	1.2	1.2	3.7	7.0	0.0	0.0	7.9	11.1	1.4	1.6
1974	1.3	2.4	0.3	0.6	0.6	0.6	1.2	1.2	2.5	4.7	0.0	0.0	4.4	7.7	1.5	1.8
1975	1.4	2.6	0.1	0.2	0.8	0.8	1.3	1.3	2.7	5.1	0.2	0.4	4.9	8.5	1.6	1.9
1976	1.5	2.8	0.6	1.1	0.2	0.2	1.9	1.9	3.6	6.8	0.2	0.4	5.3	9.8	2.7	3.4
1977	1.6	3.0	1.3	2.4	0.4	0.4	1.9	1.9	3.5	6.6	0.1	0.2	5.5	10.0	3.3	4.5
1978	1.4	2.6	0.2	0.4	0.3	0.3	1.9	1.9	4.3	8.1	0.1	0.2	6.0	11.0	2.2	2.5
1979	1.5	2.8	0.2	0.4	0.2	0.2	2.4	2.4	4.4	8.3	0.2	0.4	6.1	11.3	2.8	3.2

Remarks; AF.: Actual figures in the statistics

CF.: Converted figures to fresh weight.

Conversion rate of each fishery product is as follows;

1) Dried & Salted Fish = 0.53

2) Frozen and Chilled Fish = 1.0

3) Canned and Preserved Fish = 0.53

Source; Department of Statistics, Sarawak

Table 15 COMPARISON OF FISHERY RESOURCES  
WITH FISH CATCH IN SARAWAK IN 1979

Unit: 10<sup>3</sup> tons

Classification	Coast	Fisheries Resources	Fish Catch	Balance
Pelagic Fish	West	64	19.6	44.3
	East	24	3.8	20.2
Demersal Fish <sup>/1</sup>	West	69	31.4	37.6
	East	37	27.5	9.5

Remarks; <sup>/1</sup>: Only fishes caught by trawl nets were counted as demersal fish.

Source; Refs. 3 & 6

Table 16 FISHING EFFORT IN RIVERS IN SARAWAK <sup>/1</sup>

Unit: kg/d

River	Fish Catch in 10-20 Years Before	Fish Catch in the Present Time	Cause <sup>/2</sup> of Fish Decrease
1. Kayan (Upstream)	3 - 4	1	S
2. Kayan (Middle stream)	6 - 12	1 - 3	S
3. Kayan (Downstream)	30 - 36	12 - 18	?
4. Sarawak (Upstream)	1 - 2	None	S
5. Sarawak (Downstream)	1 - 9	1 - 9	No change
6. Rajang (Middle stream)	Fish catch decreased half.		O, S
7. Rajang (Downstream)	18 - 19	9 - 36	?

Remarks; <sup>/1</sup>: Results of interview survey on river fishing to village people who have been living for a long time and have usually going fishing along rivers.

<sup>/2</sup>: S = Siltation, O = Over fishing

Table 17 AVERAGE EVAPORATION IN SABAH

Unit: tons/ha

Location	Evaporation <sup>/1</sup>	Location	Evaporation
Kudat	47.7	Ranau	36.0
K. Marudu	47.7	Sandakan	39.3
Pitas		Beluran	39.3
K. Belud		Tawau	35.8
Tuaran	47.7	Semporna	35.8
K. Kinabalu	47.7	Lahad Datu	35.8
Perampan	47.7		
Paper	39.3		
Beaufort	39.3		
Kuala Penyu	39.3		
Manibakut	39.3		
Labuan	39.3		
Sipitang	39.3		
Tenom	42.3		
Pensiungan	42.3		
Keningau	42.3		
Tambunan	42.3		

Remarks; <sup>/1</sup>: Evaporation of fish pond is assumed to be 90% of pan evaporation figures.

Source; Ref. Sectoral Report Vol. 11



Table 18 ESTIMATED WATER DEMAND OF DUG-OUT POND BY DISTRICT IN SABAH IN 1980

District	Surface Area of Dug-out Pond (ha)	Initial Water ( $10^3\text{m}^3$ )	Daily <sup>/1</sup> Water ( $10^3\text{m}^3/\text{d}$ )	Daily Total ( $10^3\text{m}^3/\text{y}$ )	Total ( $10^6\text{m}^3/\text{y}$ )
Kudat	10.2	102	0.69	252	0.35
K. Marudu	3.2	32	0.22	80	0.11
Pitas	0.0	0	0.00	0	0.00
K. Belud	101.2	1,012	6.86	2,504	3.52
Tuaran	32.5	325	2.21	807	1.13
K. Kinabalu	16.0	160	1.08	394	0.55
Penampian	7.0	70	0.47	172	0.24
Papar	23.4	234	1.39	507	0.74
Membakut	1.1	11	0.07	26	0.04
Kuala Penyu	0.5	5	0.03	11	0.02
Beaufort	16.6	166	0.98	358	0.52
Labuan	6.0	60	0.36	131	0.19
Sipitang	2.6	26	0.15	55	0.08
Tenom	6.1	61	0.38	139	0.20
Pensiangan	0.6	6	0.04	15	0.02
Keningau	21.0	210	1.31	113	0.32
Tambunan	10.2	102	0.64	234	0.34
Ranau	27.8	278	1.56	569	0.85
Sandakan	30.1	301	1.78	650	0.95
Beluran	0.4	4	0.02	7	0.01
Tawau	20.9	209	1.17	427	0.63
Semporna	0.4	4	0.02	7	0.01
Lahad Datu	1.1	11	0.06	22	0.03
Total	338.9	3,389	21.49	7,480	10.85

Remarks; <sup>/1</sup>: Daily water supply = (Evaporation/d + Percolation/d) x Surface Area of Dug-out pond

Evaluation/day = Ref. Table 16

Percolation/day = 2 mm/d = 20 tons/ha/d

Table 19 SUMMARY ON THE PROPOSED FISHERY DEVELOPMENT  
BUDGET DURING 4MP IN SABAH

Unit: M\$10<sup>6</sup>

Project Categories	Amount of Funds in 4MP	Composition (%)
Marine Continuous Projects Federal Funded	13.8	(48.6)
Marine Continuous Projects State Funded	3.4	(12.0)
Sub-total (1)	17.2	(60.6)
Marine New Projects Federal Funded	5.2	(18.2)
Marine New Projects State Funded	1.8	(6.5)
Sub-total (2)	7.0	(24.7)
Total of Marine Projects (1) + (2)	24.2	(85.3)
Inland Continuation Projects Federal Funded (Brackish)	0.7	(2.5)
Inland Continuation Projects State Funded <sup>/1</sup>		
Brackish	0.3	(1.1)
Freshwater	1.2	(4.2)
Sub-total (3)	2.2	(7.8)
Inland New Projects Federal Funded	-	( - )
Inland New Projects State Funded		
Brackish and Freshwater	2.0	(6.9)
Sub-total (4)	2.0	(6.9)
Total of Inland Projects (3) + (4)	4.2	(14.7)
Grand Total	28.4	(100.0)

Remarks; <sup>/1</sup>: Estimated allocation to both water bodies

Source; Fourth Malaysia Plan (PHASE I)

Table 20 SUMMARY ON THE PROPOSED FISHERY DEVELOPMENT  
BUDGET DURING 4MP IN SARAWAK

Unit: M\$10<sup>6</sup>

Project Categories	Amount of Funds in 4MP	Composition (%)
Inshore Marine Fisheries Federal Funded	39.6	(64.0)
Offshore Marine Fisheries Federal Funded	12.3	(19.8)
Total of Marine Projects	51.9	(83.8)
Inland Fisheries State Funded	10.0	(16.2)
Grand Total	61.9	(100.0)

Source; Fourth Malaysian Plan (PHASE II)

Table 21 FUTURE WATER DEMAND OF FRESHWATER PONDS  
BY IRRIGATION IN SABAH AND SARAWAK

Year	Area (ha)	Initial (10 <sup>6</sup> m <sup>3</sup> )	Daily <sup>/1</sup> (10 <sup>3</sup> m <sup>3</sup> )	Daily Total (10 <sup>6</sup> m <sup>3</sup> /y)	Total (10 <sup>6</sup> m <sup>3</sup> /y)
Sabah					
1980	339	3.39	21.49	7.48	10.85
1990	608	6.08	38.54	13.41	19.49
2000	878	8.78	55.66	19.35	28.13
Sarawak					
1980	-	-	-	-	-
1990	-	-	-	-	-
2000	197	1.97	12.40	4.35	6.32

Remarks; <sup>/1</sup>: Average daily demand of Sabah in 1980 is used for daily demand of Sabah and Sarawak in 1990 and 2000. (Ref. Table 16)

Table 22 UNIT CONSTRUCTION AND O&M COSTS

Costs	Constructed Pond Culture	Cage Culture
<b>Financial</b>		
Construction (M\$10 <sup>3</sup> /ha)	22.8	650.7
O&M (M\$10 <sup>3</sup> /ha/y)	0.2	13.0
<b>Economic</b>		
Construction (M\$10 <sup>3</sup> /ha)	18.2	520.6
O&M (M\$10 <sup>3</sup> /ha/y)	0.2	10.4

Remarks; (1) At 1980 end price  
 (2) Including physical contingency but excluding price contingency

Table 23 NET ANNUAL PRODUCTION VALUE OF CAGE CULTURE AND POND CULTURE

Unit: M\$10<sup>3</sup>/ha/y

Item	Cage Culture	Pond Culture
1. Gross Production Value		
(1) Productivity	269.1 tons/ha/y	1.34 tons/ha/y
(2) Fish price	M\$2.8 x 10 <sup>3</sup> /ton	M\$2.8 x 10 <sup>3</sup> /ton
Gross production value	753.5	3.8
2. Financial Production Cost		
(1) Labor		
M\$275/month/74.3 m <sup>2</sup> (2 rafts)/ 10,000 m <sup>2</sup> /ha x 12 months/y	444.2	
(2) Seeds		
140 x 10 <sup>3</sup> pcs/ha/y x M\$0.4/pce	56.0	
(3) Fuel		
M\$11/month/74.3 m <sup>2</sup> x 10,000 m <sup>2</sup> x 12 months/y	17.8	
(4) Licence fee	0.1	
Total	518.1	1.0
3. Net Annual Production Value (Financial)		
M\$753.5 x 10 <sup>3</sup> /ha/y - M\$518.1 x 10 <sup>3</sup> /ha/y	235.4	
M\$3.8 x 10 <sup>3</sup> /ha/y - M\$1.0 x 10 <sup>3</sup> /ha/y		2.8
4. Net Annual Production Value (Economic)		
M\$235.4 x 10 <sup>3</sup> /ha/y x 0.8	188.3	
M\$2.8 x 10 <sup>3</sup> /ha/y x 0.8		2.2

Remarks; (1) At 1980 end price  
 (2) Including physical contingency but excluding price contingency

## ***FIGURES***



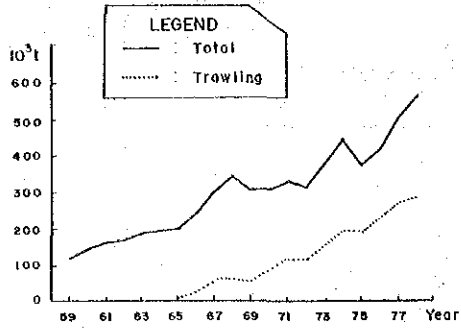


Fig.1 Trend of Annual Marine Fish Landing

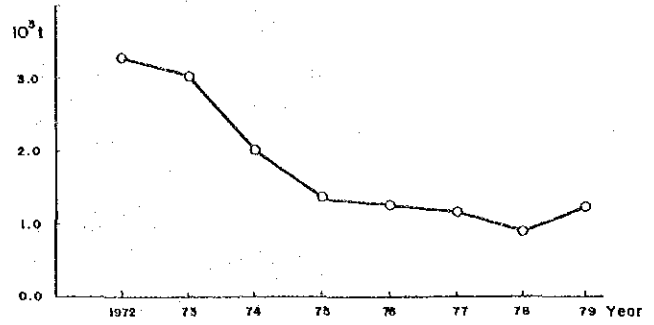


Fig.2 Trend of Annual Freshwater Fish Landing

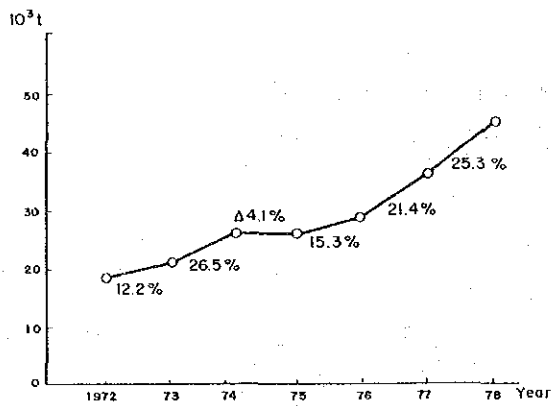


Fig.3 Fish Consumption (1972 - 1978)

Remarks ; Based on landing figures.

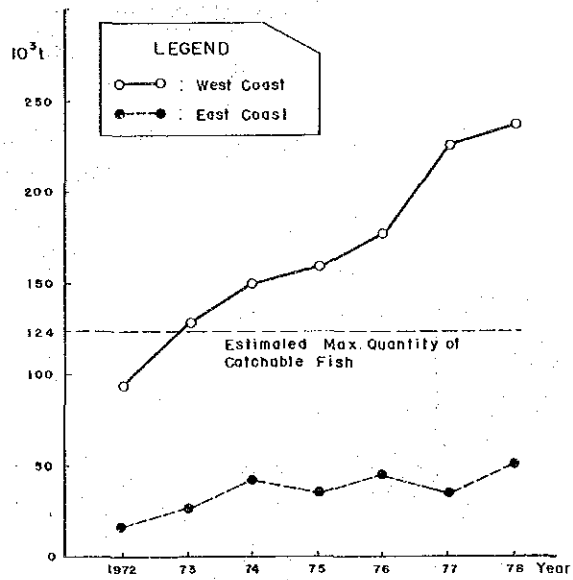


Fig.4 Trend of Annual Landing by Trawling

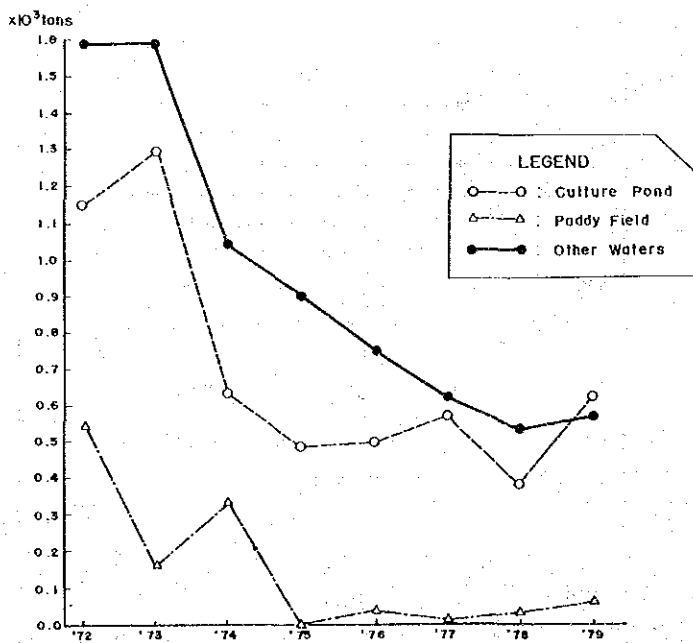


Fig. 5 Estimated Composition of Fish Landing from Culture Ponds, Paddy Fields and Other Waters



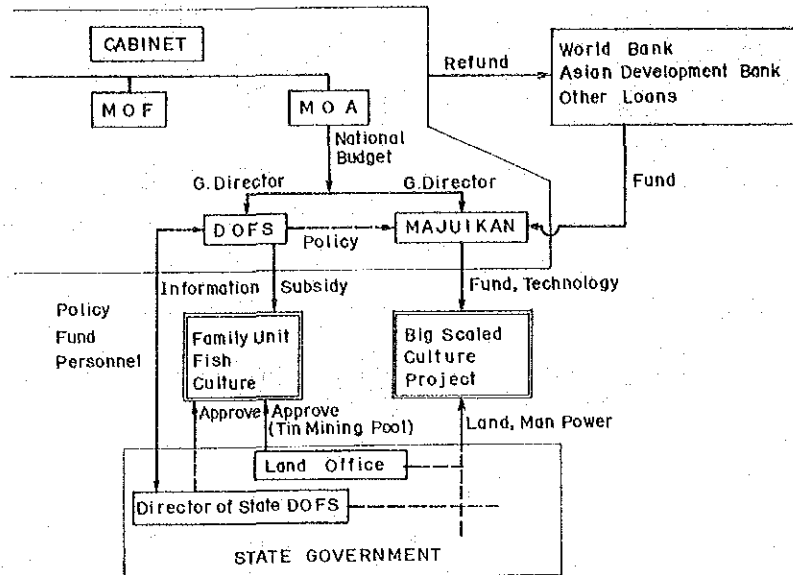


Fig.6 Relations Between DOFS, State DOFS and MAJUIKAN on Inland Fisheries Activities

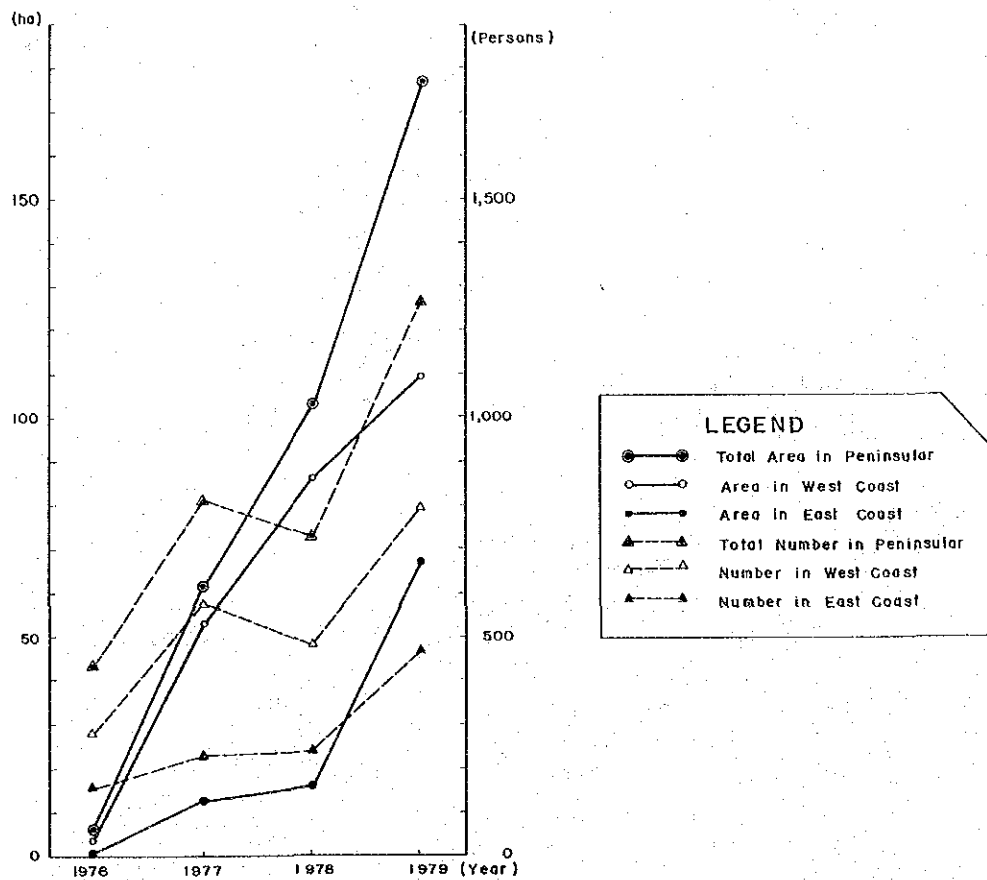


Fig.7 Trend of Culture Pond Area and Number of Culture Farmers

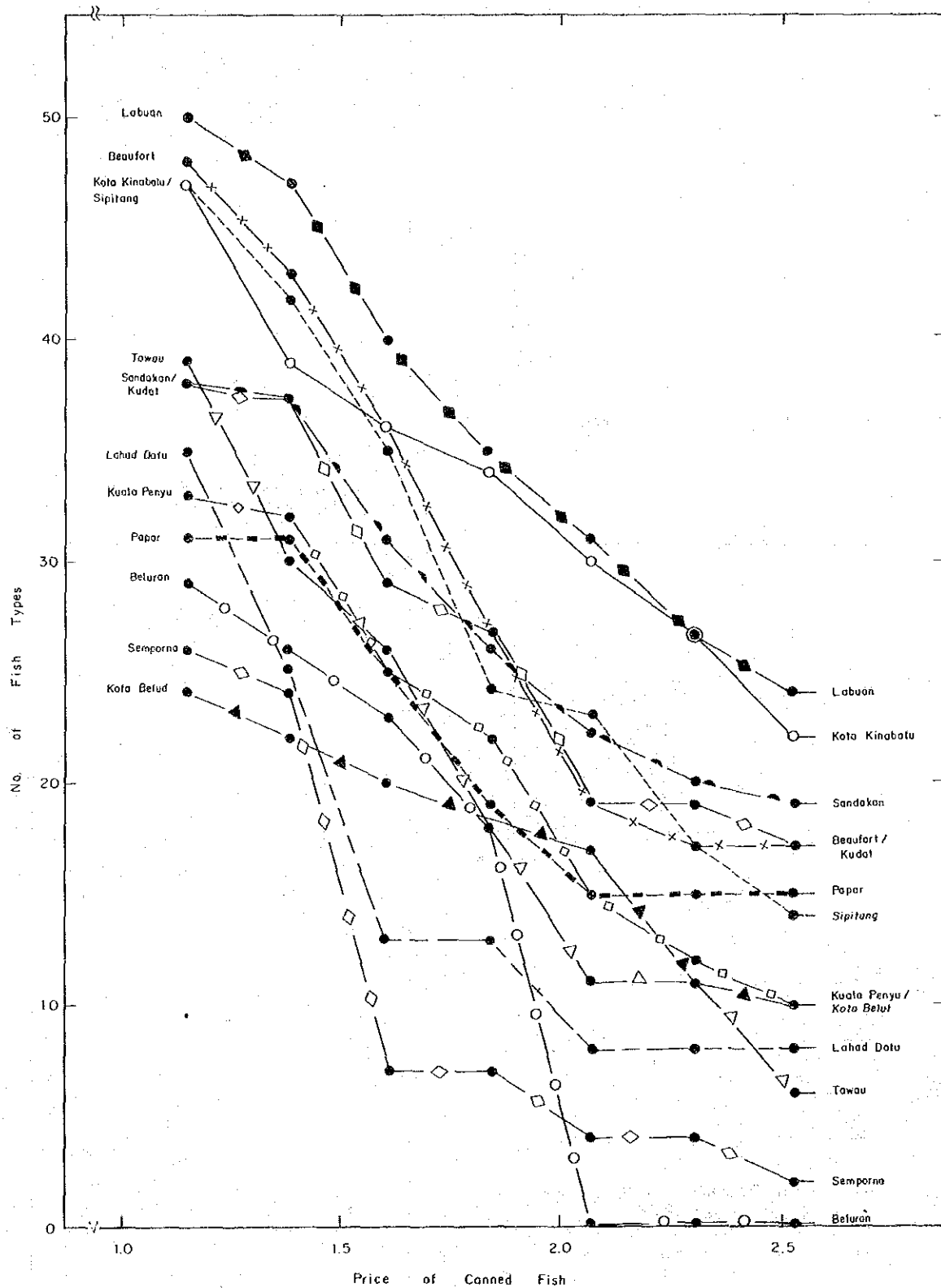


Fig. 8 Relation Between Price of Imported Canned Fish and Number of Fish Types at Same Price at Main Markets in Sabah, 1979

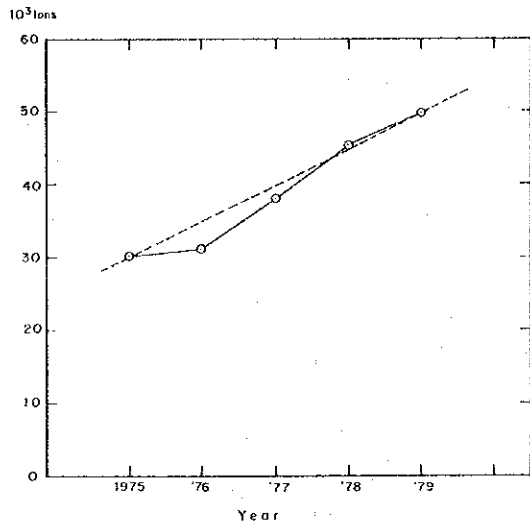


Fig.9 Trend of A.F.P.S in Sabah

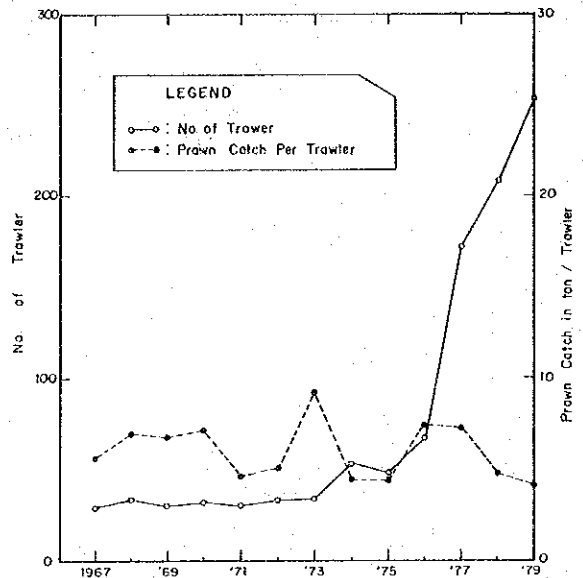


Fig.11 Trend of No. of Trawlers and Prawn Catch Per Trawler in Northwest Coast, Sabah(1/3)

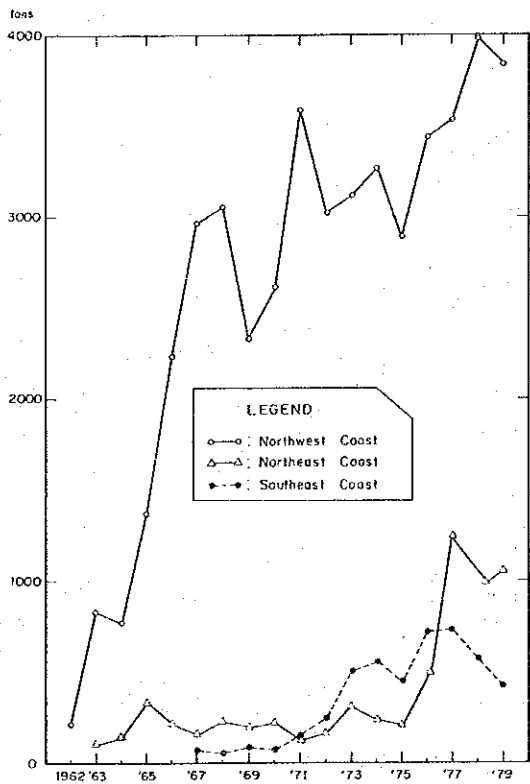


Fig.10 Trend of Prawn Catch by Coast in Sabah (1962-1979)

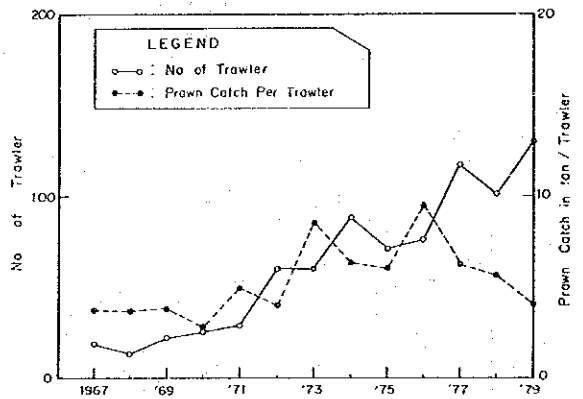


Fig.12 Trend of No. of Trawler and Prawn Catch Per Trawler in Southeast Coast, Sabah(2/3)

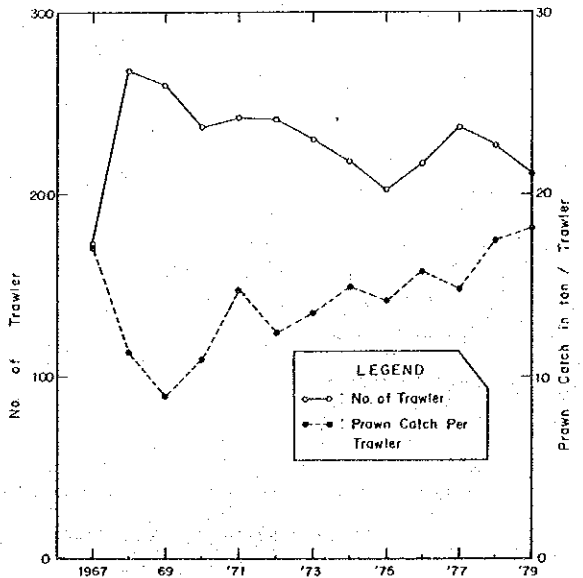


Fig.13 Trend of No. of Trawler and Prawn Catch Per Trawler in Northeast, Sabah (3/3)

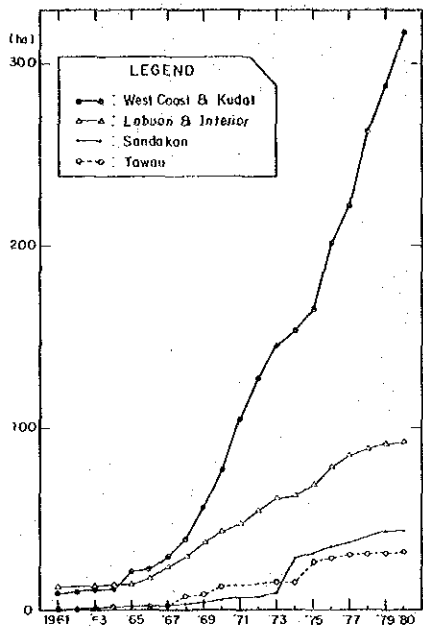


Fig.14 Trend of Surface Area of Freshwater Pond in Sabah

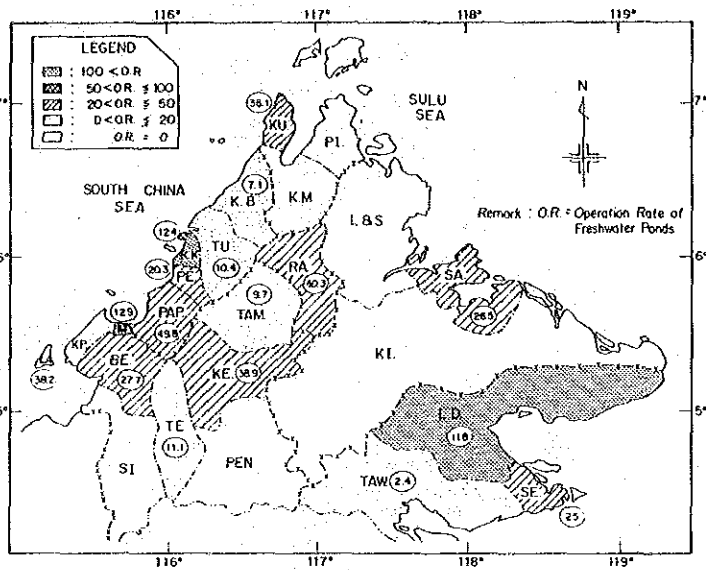


Fig.15 Comparison of Operation Rate of Freshwater Pond by District in Sabah, 1979

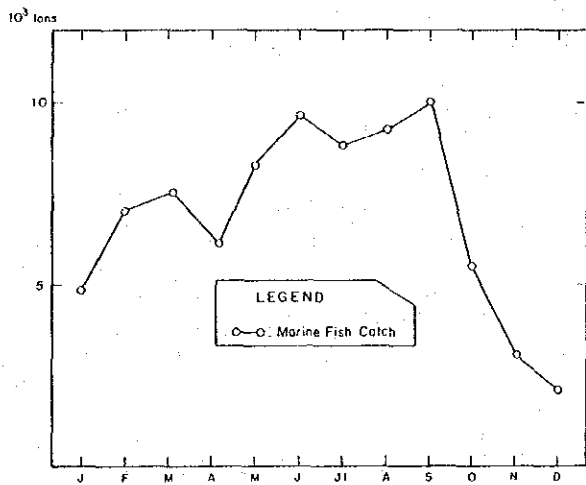


Fig.16 Seasonal Change of Marine Fish Catch in Sarawak, 1979

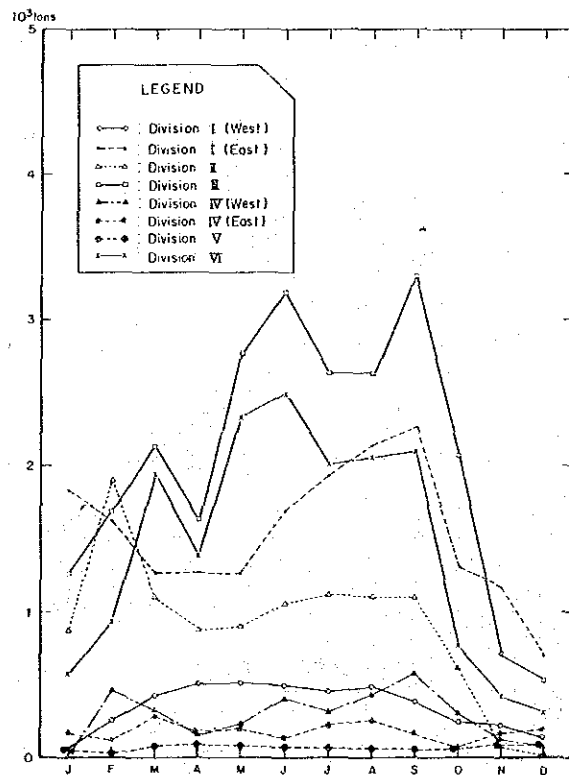


Fig.17 Seasonal Change of Marine Fish Catch by Division in Sarawak, 1979

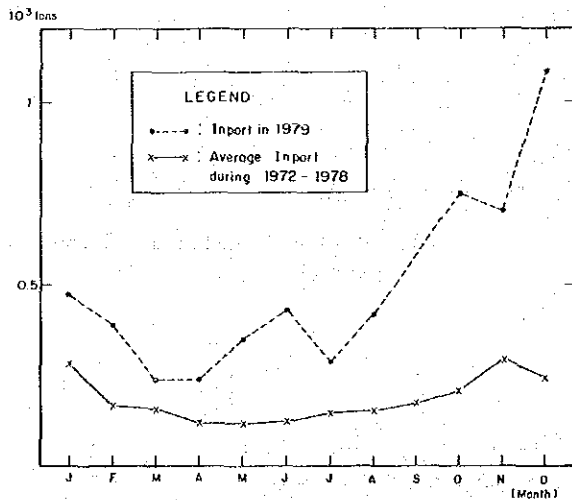


Fig.18 Seasonal Change of Import of Fishery Products in Sarawak, 1972 - 1979

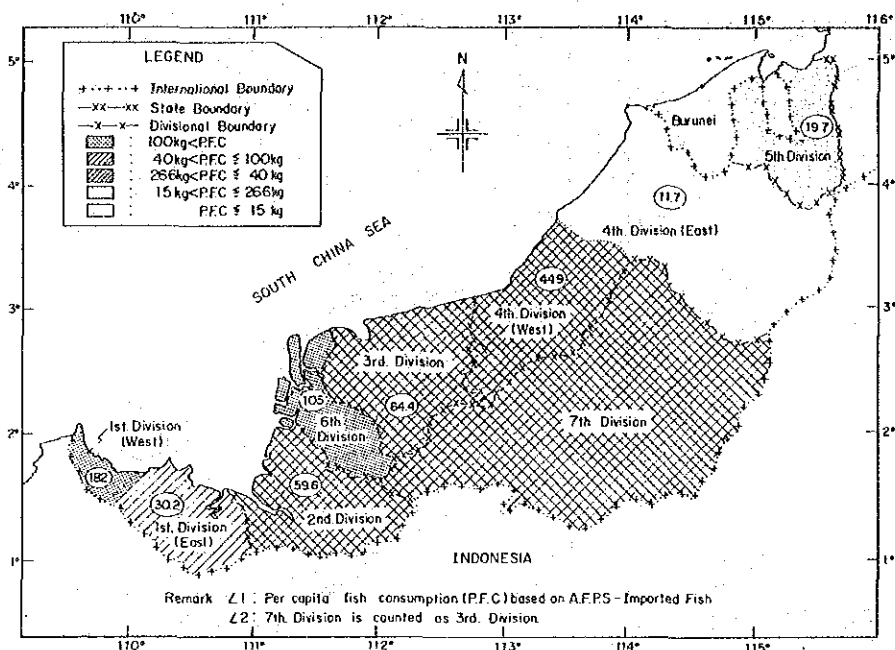


Fig.19 Comparison of Per Capita Fish Consumption by Division in Sarawak, 1979

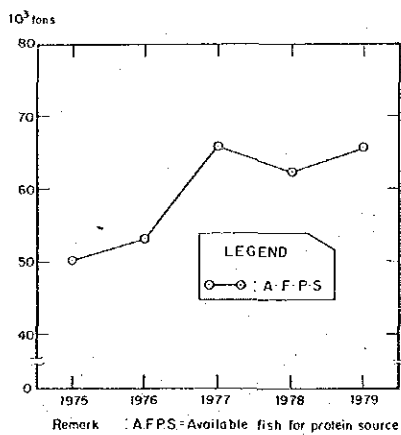


Fig.20 Trend of A.F.P.S in Sarawak

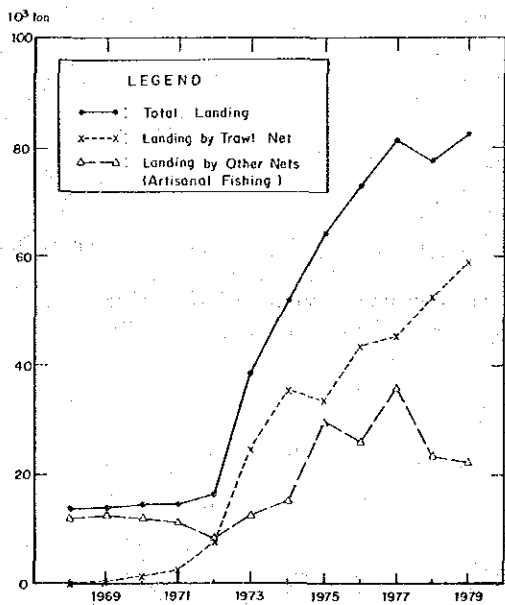


Fig.21 Trend of Landings of Total Marine Fish, by Trawling and by Artisanal Fishing in Sarawak

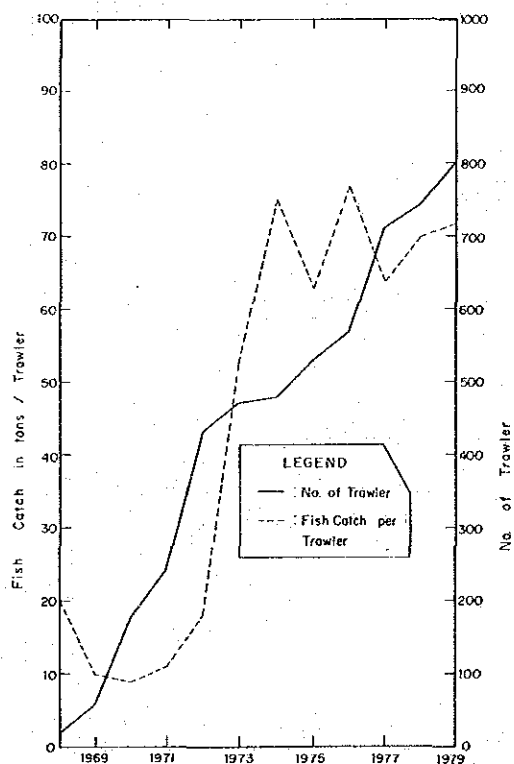


Fig.22 Trend of Fish Catch per Trawler in Sarawak

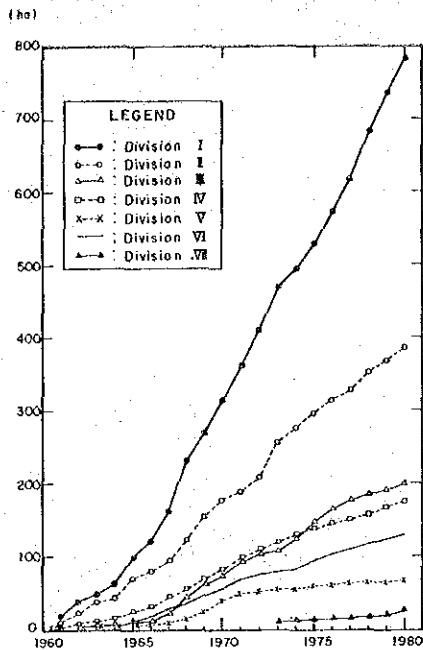


Fig.23 Trend of Surface Area of Freshwater Pond in Sarawak

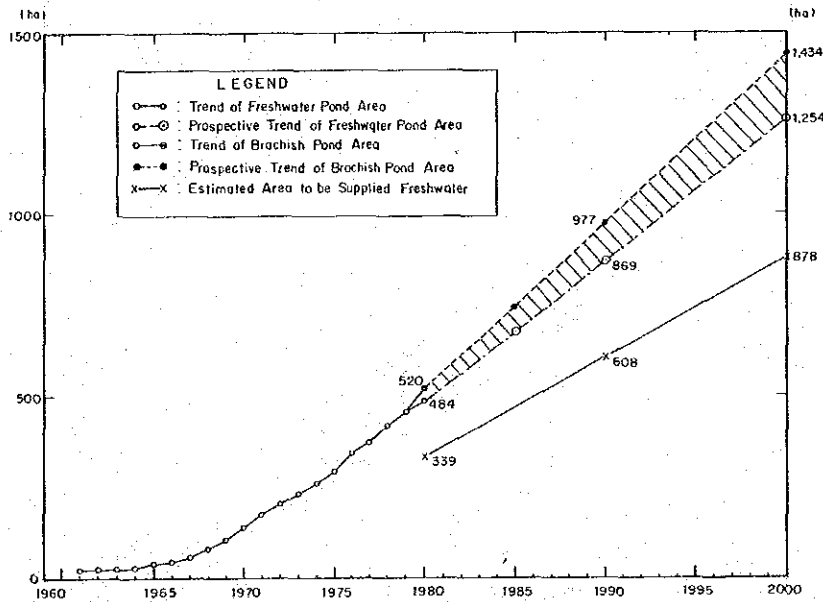


Fig.24 Prospective Trend of Areas of Inland Pond Culture and Pond Area to be Supplied Freshwater in Sabah

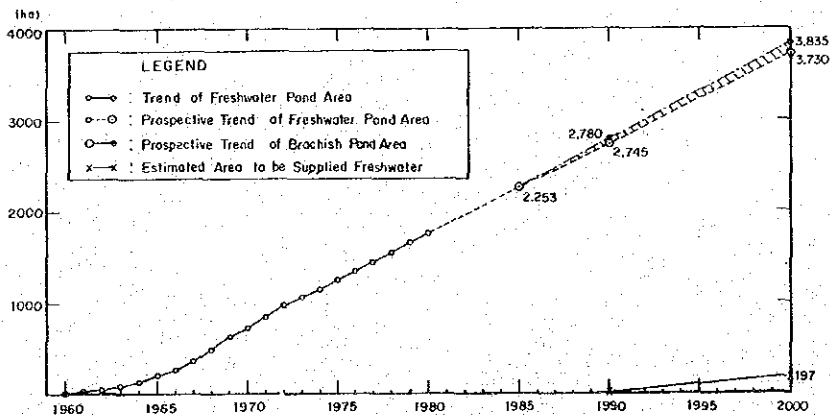


Fig.25 Propective Trend of Areas of Inland Pond Culture and Pond Area to be Supplied Freshwater in Sarawak



