PART II THE FIRST PHASE DEVELOPMENT PLAN OF KELANTAN PORT

CHAPTER 4 SIGNIFICANCE OF THE PLAN

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4-1 Background

The west coast area of Peninsular Malaysia, where international shipping bases have been located, has long prospered due to their economic and natural advantages. Industries have developed, and commodity distribution has been concentrated in and around two major ports, Kelang Port and Penang Port.

On the contrary, the east coast area lays far behind the west coast area in terms of economic output. In particular, Kelantan is economically the least developed state mainly because of lack of infrastructures, low productivity of Kelantan's principal industries such as agriculture, forestry, fishery, damage by flooding, etc.

The Federal and State Governments have been foregoing industrialization, and making efforts to support the primary sector activities in the state under the Third Malaysia Plan.

It is indispensable to develop transport infrastructures such as highway, port, irrigation facility, in order to realize and accelerate the government policies mentioned above. Highway projects and irrigation schemes have been carried out and will continue over a long period. But no port project has been executed.

Once Tumpat Port functioned as a port of call for coastal and ocean shipping, but presently, it is useless because deposition of soil and sand discharged from the Kelantan River, and littoral drifts have almost blocked the estuary and shallowed the basin. Since the sand bars of the river mouth are developing westerly, it is economically difficult to continue to use the port. Therefore Kelantan has no port at present, and the necessity of a new port, where ships can call throughout the year, is increasingly important as a physical distribution center.

Besides a commercial port, a fishing port, which will enable fishermen to operate fishing boats if the weather permits, is also needed, since estuaries of rivers are almost blocked by littoral drifts, and the fishing boats have difficulties in passing through the river mouth.

4-2 Objective and Basic Line

The objective of the First Phase Development Plan is to develop a minor commercial cum fishing port as a physical distribution center, and a coastal and pelagic fishery base, in order to promote industrialization in Kelantan, and to improve the standard of living of Kelantan's people, especially fishermen.

The basic lines to achieve the above objectives are as follows;

i) To construct commercial port facilities which will mainly enable the import of consumer goods, construction materials, fuels, fertilizers, and the export agricultural and forest products.

ii) To construct fishing port facilities which make it possible to go fishing throughout the year if the weather permits, and supply fresh fish to Kelantan's people.

iii) To improve and construct access roads connecting the Port to the hinterland.

4-3 Target Year

The target year of the Plan is determined as the year 1987, considering the necessary period for the detail design and construction work of port facilities. And the construction period is five years from 1983 to 1987.

CHAPTER 5 ESTIMATE OF PORT NEEDS

CHAPTER 5 ESTIMATE OF PORT NEEDS

5-1 Socio-Economic Frame

In general present and future populations, and the gross domestic product of a country or a port hinterland concerned are indispensable to estimate future port cargo traffic and marine fish landings which are vitally important factors to determine the size of a port.

The present population and gross domestic product of Malaysia, Peninsular Malaysia, and Kelantan are estimated by the government authorities concerned.

The future gross domestic product and population in 1990 are given in the Third Malaysia Plan whose target year is 1980 as shown in Table 1-5. However it is not suitable to use them in order to make plans for the development of Kelantan Port, because the basic data employed to estimate them were out of date and a different method was applied in projecting the gross domestic product in the Mid Term Review of the Third Malaysia Plan. And the Fourth Malaysia Plan, the next five-year socio-economic development plan, which will present a new socio-economic frame is now in the process of preparation.

Therefore we have no such authorized socio-economic frames that we can use for the estimation of the port traffic at present. So we estimate the necessary frames of Malaysia, Peninsular Malaysia, and Kelantan based on a few assumptions, considering the Third Malaysia Plan, the existing data given by the government authorities, etc.

5-1-1 Hinterland and Foreland

(1) Hinterland

A hinterland of an existing port is usually determined by the origin-destination survey of port cargoes. If there are several competitive ports, the boundary of the area where the port cargoes are generated or distributed is complicated and difficult to set up.

In the case of a newly developed port, like Kelantan Port, the O-D survey is not naturally available. A lot of factors should be taken into consideration to decide the hinterland. For example, port development policies of the government, existing and potential economic activities, location of competitive ports, development of infrastructures such as roads, railways and airports, transportation costs, etc.

If Kelantan Port is given a competitive function to major ports, Kelang, Penang, Johore and Kuantan Ports, the hinterland will be extended to some parts of Trengganu, Pahang, and Kedah as well as Kelantan. But Kelantan Port is expected to play an important but limited role of economic development core of Kelantan, the hinterland is determined for the whole Kelantan area.

(2) Foreland

A foreland of a port is defined as an area or a country which produces commodities transported to the hinterland via the port, and vice versa, consumes goods produced in the hinterland and supplied through the port.

The foreland of Kelantan Port is determined by considering the location of the port, the present trade pattern of Malaysia, economy of Kelantan, in particular, agricultural and forestry

activities, etc. Therefore, the foreland is assumed as South East Asia and Far East; Brunei, China, Hong Kong, Indonesia, Japan, Korea (Republic), Philippines, Taiwan, Thailand, Vietnam, Singapore, East Malaysia, and the east coast states of West Malaysia in this study.

5-1-2 Population

Future populations of Malaysia, Peninsular Malaysia, and Kelantan are estimated by employing the following annual growth rates which will have a decreasing tendancy according to family planning, migration, etc. Population growth rates are assumed as follows.

Malaysia		
1980	2.70%	(Average Annual Growth Rate 1975–1979, Economic Report 1979/1980)
1981–1990	2.60%	(The Third Malaysia Plan)
1991–2000	2.50%	(Assumption of the OCDI Study Team)
Peninsular Malaysia		
1978–1980	2.55%	(Average Annual Growth Rate 1974–1977)
1981–1990	2.50%	(The Third Malaysia Plan)
1991–2000	2.40%	(Assumption of the OCDI Study Team)
Kelantan		
1981–1985	2.20%	(Assumption of SEPU Kelantan)
1986–1990	2.15%	(ditto)
1991–2000	2.10%	(Assumption of the OCDI Study Team)

Therefore the populations are projected as follows;

	1980	1987	1990	2000
Malaysia	13,608,000	16,286,000	17,590,000	22,517,000
Peninsular Malaysia	11,335,000	13,474,000	14,510,000	18,394,000
Kelantan	855,900	995,800	1,061,400	1,306,600

According to the above projections, the population of Kelantan, the hinterland of Kelantan Port, will be 995,800 in 1987 and 1,306,600 in 2000, which are approximately 1.2 times and 1.5 times that of 1978, respectively.

Annual populations of Malaysia, Peninsular Malaysia, and Kelantan are shown in Table 5-1, and Fig. 5-1.

5-1-3 Gross Domestic Product

Future gross domestic products of Malaysia, Peninsular Malaysia, and Kelantan are estimated on the basis of the following average annual growth rates and proportions.

Growth Rate

Malaysia		
1981–1990	8.0%	(The Third Malaysia Plan)
1991–2000	7.0%	(Assumption of the OCDI Study Team)
Peninsular Malaysia		
1981–1990	8.0%	(The Third Malaysia Plan)
1991–2000	7.0%	(Assumption of the OCDI Study Team)

Proportion

Kelantan		
1980	45%	(Assumption of the OCDI Study Team)
1990	55%	(ditto)
2000	70%	(ditto)

$$\text{Proportion} = \frac{\text{Per Capita GDP of Kelantan}}{\text{Per Capita GDP of Malaysia}}$$

Therefore the gross domestic products of Malaysia and Peninsular Malaysia are estimated as follows;

	1980	1987	1990	2000
Malaysia	25,650	43,959	55,376	108,932
Peninsular Malaysia	22,025	37,747	47,550	93,538

(unit: M$ million in 1970 constant prices)

From the above gross domestic products and population projections, per capita GDP of Malaysia can be calculated as M$1,885 in 1980, M$3,148 in 1990, and M$4,838 in 2000, in 1970 constant prices. Therefore the per capita gross domestic product will increase at an average growth rate of about 5.4 percent from 1980 to 1990, and 4.4 percent from 1990 to 2000.

And the per capita gross domestic product of Kelantan can be calculated as M$848 in 1980, M$1,731 in 1990, and M$3,387 in 2000, in 1970 constant prices according to the assumed proportions and projected Malaysian per capita gross domestic product.

This projection shows that the per capita gross domestic product of Kelantan will increase at an annual growth rate of 7.4 percent between 1980 and 1990, and 6.9 percent between 1990 and 2000, which are larger than those of Malaysia, approximately 2 percent.

The gross domestic product of Kelantan is calculated by multiplying the per capita gross domestic product by the population. Therefore a gross domestic product of M$726 million in 1980, M$1,837 million in 1990, and M$4,425 million in 2000 of in 1970 constant prices can be gained, and the annual average growth rates of gross domestic products are about 10 percent between 1980 to 1990, and 9 percent between 1990 to 2000. By applying the growth rate, gross domestic product in 1987 will be M$1,390 million in 1970 constant prices.

Past and future annual gross domestic products of Malaysia, Peninsular Malaysia, and Kelantan are shown in Table 5-2, 5-3, and 5-4 and Fig. 5-2.

Table 5-1 Population of Malaysia, Peninsular Malaysia and Kelantan

Year	Malaysia	Peninsular Malaysia	Kelantan
1970	10,439,430[1]	8,809,557[1]	686,000[1]
1971	na	na	na
1972	na	9,262,688[3]	na
1973	na	9,502,688[3]	na
1974	na	9,742,211[3]	na
1975	11,910,000[2]	9,997,252[3]	795,000[4]
1976	12,230,000[2]	10,242,352[3]	na
1977	12,560,000[2]	10,510,095[3]	na
1978	12,900,000[2]	10,778,000	844,000[4]
1979	13,250,000[2]	11,053,000	na
1980	13,608,000	11,335,000	855,900
1981	13,962,000	11,618,000	874,700
1982	14,250,000	11,909,000	893,900
1983	14,697,000	12,207,000	913,600
1984	15,079,000	12,512,000	933,700
1985	15,471,000	12,825,000	954,300
1986	15,847,000	13,145,000	974,800
1987	16,286,000	13,474,000	995,800
1988	16,710,000	13,811,000	1,017,200
1989	17,144,000	14,156,000	1,039,100
1990	17,590,000	14,510,000	1,061,400
1991	18,030,000	14,858,000	1,083,700
1992	18,480,000	15,215,000	1,106,400
1993	18,943,000	15,580,000	1,129,700
1994	19,416,000	15,954,000	1,153,400
1995	19,901,000	16,337,000	1,177,600
1996	20,399,000	16,729,000	1,202,400
1997	20,909,000	17,130,000	1,227,600
1998	21,432,000	17,542,000	1,253,400
1999	21,968,000	17,963,000	1,279,700
2000	22,517,000	18,394,000	1,306,600

Source 1: General Report, Population Census of Malaysia, 1970
Department of Statistics
2: Economic Report 1979/1980, Ministry of Finance
3: Monthly Statistical Buttelin, Peninsular Malaysia (Ogos 1979)
Department of Statistics
4: Mid-Term Review of the Third Malaysia Plan 1976–1980

Fig. 5-1 Population of Malaysia, Peninsular Malaysia, and Kelantan

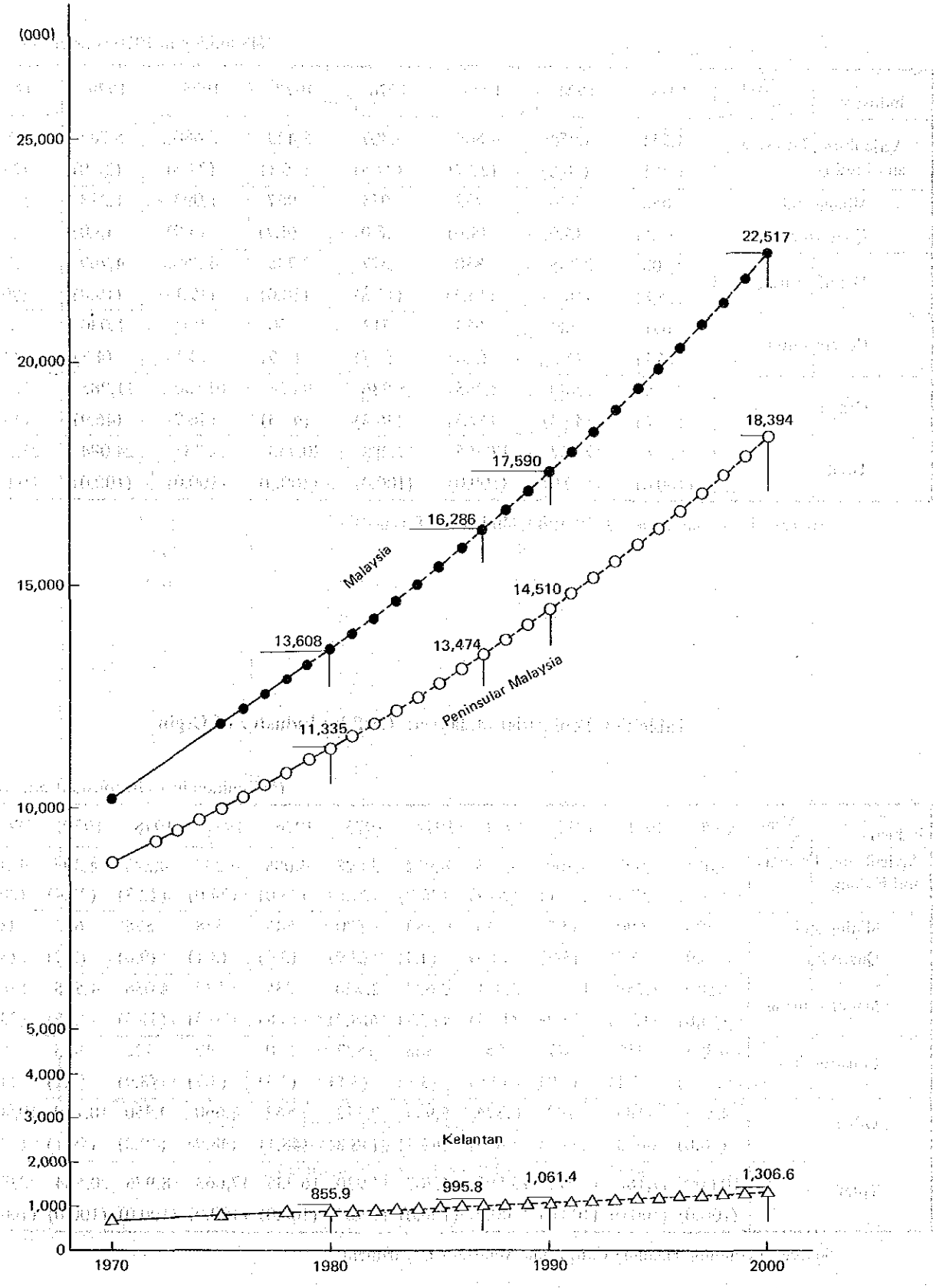


Table 5-2 Malaysia: GDP by Industry of Origin

(M$ million in 1970 constant prices)

Industry \ Year	1973	1974	1975	1976	1977	1978	1979	1980
Agriculture, Forestry and Fishing	4,534	4,954	4,804	5,307	5,423	5,480	5,787	5,990
	(29.1)	(28.8)	(27.7)	(27.5)	(26.1)	(24.6)	(24.0)	(23.4)
Mining and Quarrying	852	796	792	955	967	1,093	1,213	1,286
	(5.4)	(4.6)	(4.6)	(5.0)	(4.7)	(4.9)	(5.0)	(5.0)
Manufacturing	2,508	2,768	2,850	3,377	3,735	4,258	4,769	5,246
	(15.8)	(16.1)	(16.4)	(17.5)	(18.0)	(19.1)	(19.8)	(20.5)
Construction	651	729	654	713	800	904	1,030	1,150
	(4.1)	(4.2)	(3.8)	(3.7)	(3.9)	(4.1)	(4.3)	(4.5)
Others	7,259	7,980	8,265	8,936	9,828	10,550	11,285	11,978
	(45.6)	(46.3)	(47.5)	(46.3)	(47.3)	(46.9)	(46.9)	(46.6)
Total	15,904	17,227	17,365	19,288	20,753	22,285	24,084	25,650
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

Source: Economic Report 1979/1980, Ministry of Finance

Table 5-3 Peninsular Malaysia: GDP by Industry of Orgin

(M$ million in 1970 constant prices)

Industry \ Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Agriculture, Forestry and Fishing	3,051	3,997	3,309	3,633	3,974	3,828	4,088	4,232	4,228	4,397	4,507
	(28.8)	(27.7)	(27.1)	(26.7)	(26.9)	(25.6)	(25.0)	(24.0)	(22.3)	(21.4)	(20.4)
Mining and Quarrying	728	690	695	646	583	580	545	578	578	655	664
	(6.9)	(6.2)	(5.7)	(4.9)	(4.4)	(3.9)	(3.6)	(3.1)	(3.0)	(3.2)	(3.0)
Manufacturing	1,549	1,759	1,942	2,381	2,627	2,720	3,235	3,577	4,088	4,578	5,082
	(14.6)	(15.7)	(15.9)	(17.5)	(17.8)	(18.2)	(19.8)	(20.3)	(21.5)	(22.2)	(23.0)
Construction	395	455	477	545	566	527	570	649	732	835	936
	(3.7)	(4.1)	(3.9)	(4.0)	(3.8)	(3.5)	(3.5)	(3.7)	(3.9)	(4.1)	(4.2)
Others	4,886	5,185	5,792	6,374	6,954	7,272	7,862	8,660	9,350	10,119	10,906
	(46.0)	(46.3)	(47.7)	(46.9)	(47.1)	(48.8)	(48.1)	(48.9)	(49.3)	(49.1)	(49.4)
Total	10,609	11,186	12,215	13,595	14,767	14,930	16,335	17,663	18,976	20,584	22,095
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

Source: Economic Planning Unit, Prime Minister's Department

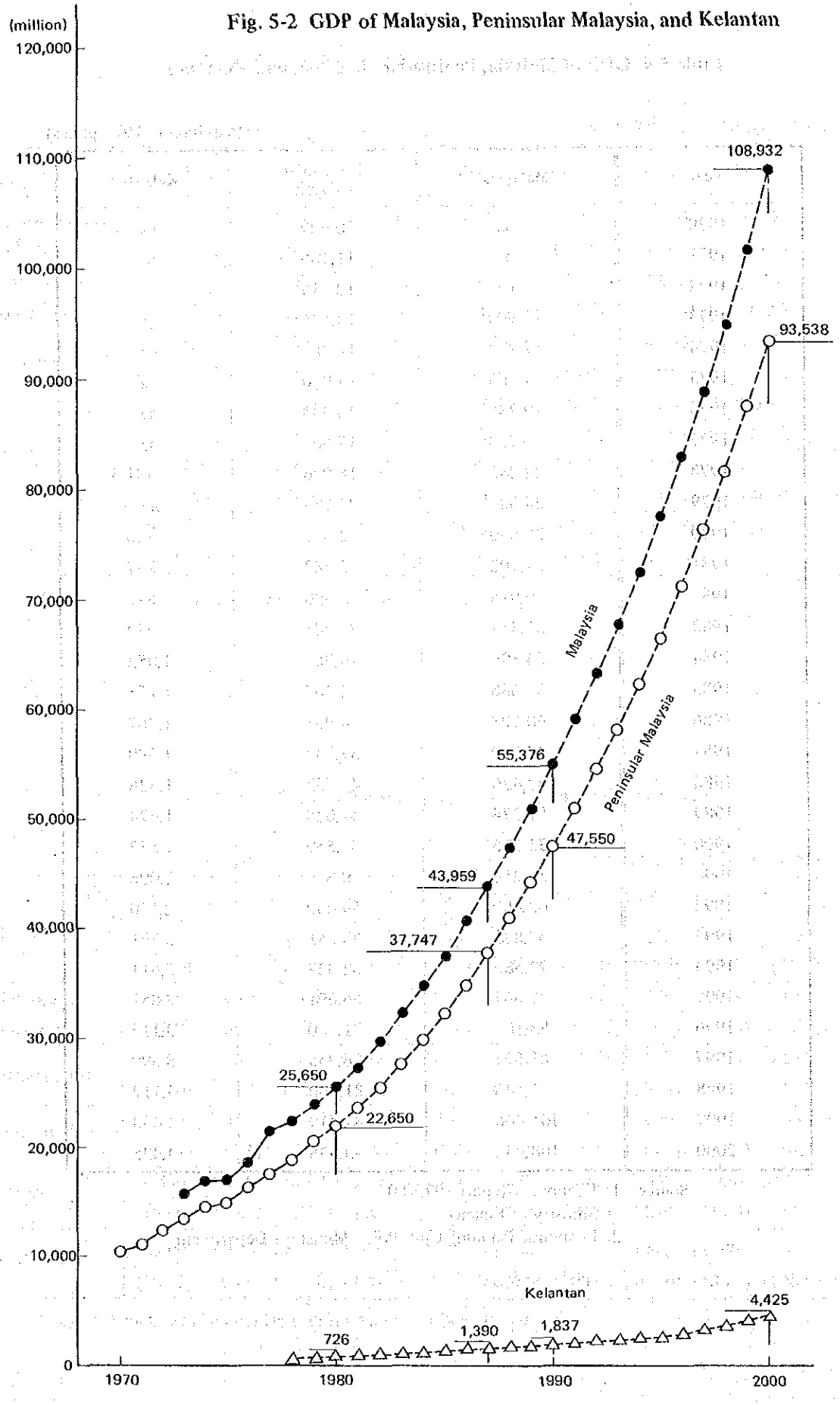
Table 5-4 GDP of Malysia, Peninsular Malaysia, and Kelantan

(M$ million in 1970 prices)

Year	Malaysia	Peninsular Malaysia	Kelantan
1970	na	10,609[2]	na
1971	na	11,186[2]	na
1972	na	12,215[2]	na
1973	15,904[1]	13,595[2]	na
1974	17,227[1]	14,767[2]	na
1975	17,365[1]	14,930[2]	na
1976	19,288[1]	16,335[2]	na
1977	20,753[1]	17,663[2]	na
1978	22,285[1]	18,976[2]	531.3
1979	24,084[1]	20,584[2]	na
1980	25,650[1]	22,025[2]	726
1981	27,702	23,787	797
1982	29,918	25,690	879
1983	32,312	27,745	959
1984	34,896	29,965	1,052
1985	37,688	32,362	1,155
1986	40,703	34,951	1,267
1987	43,959	37,747	1,390
1988	47,476	40,767	1,526
1989	51,274	44,028	1,674
1990	55,376	47,550	1,837
1991	59,252	50,879	2,006
1992	63,400	54,440	2,190
1993	67,838	58,251	2,391
1994	72,586	62,328	2,611
1995	77,667	66,691	2,851
1996	83,104	71,360	3,113
1997	88,921	76,355	3,399
1998	95,146	81,700	3,712
1999	101,806	87,419	4,053
2000	108,932	93,538	4,425

Source 1: Economic Report 1979/80
Ministry of Finance
2: Economic Planning Unit, Prime Minister's Department

Fig. 5-2 GDP of Malaysia, Peninsular Malaysia, and Kelantan



5-2 Commercial Port Traffic

5-2-1 Estimate of Cargo Traffic Volume

Macroscopic estimate of cargo traffic is one method to calculate future total traffic volume of port cargo, using cargo volume handled at a port concerned, population or gross domestic product of the port hinterland or whole country of the past and future. This is a very simple but useful way of estimating future cargo traffic in order to form rough images of port development. But the estimated cargo volume is not appropriate to plan port facilities, because it is necessary that port facilities are provided dependent on the character of the commodity. Therefore estimate of cargo traffic volume by commodity, another method of cargo estimate, is quite important so as to develop various port facilities.

Although two methods of estimate are made in the study, the latter is applied to port development plans, and the former is used only for the first stage of projection.

(1) Macro-scopic Estimate of Cargo Traffic

Port cargoes loaded and discharged at Peninsular Malaysian ports have increased in line with the economic development of Peninsular Malaysia as shown in Table 5-5.

Table 5-5 Cargo Loaded and Discharged and Gross Domestic Products (Peninsular Malaysia)

(000 tons, M$ million in 1970 prices)

Year	Cargo [1]			GDP [2]
	Loaded	Discharged	Total	
1972	5,392	7,612	13,005	12,215
1973	5,608	8,452	14,060	13,595
1974	5,566	9,168	14,734	14,767
1975	6,427	8,854	15,281	14,930
1976	7,180	10,104	17,284	16,335
1977	8,249	11,521	19,970	17,663
1978	9,354	13,462	22,816	18,976
1979	10,485	14,880	25,365	20,584

Source 1. Monthly Statistical Bulletin, Peninsular Malaysia, March 1980 Department of Statistics

2. Economic Planning Unit, Prime Minister's Department

Based on the data tabulated above, the correlation formula between total port cargo volume handled in Peninsular Malaysia, and gross domestic product can be obtained by the following equation.

$Vi = 1.559 \times Gi - 7.362$ ($\gamma = 0.98$)

where, Vi: Total Cargo Volume in The $Year_i$ (000 tons)

Gi: Gross Domestic Product in The $Year_i$ (M$ million)

γ: Coefficient of Correlation

And the potential volume of cargoes which will be loaded and unloaded at Kelantan Port is calculated by the following formula.

$$vi = Vi \times \frac{gi}{Gi}$$

where, vi: Total Potential Cargo Volume Handled at Kelantan Port in The $Year_i$ (000 tons)

Vi: Total Cargo Volume Handled at Peninsular Malaysian ports in The Year i (000 tons)

gi: Gross Domestic Product of Kelantan in The $Year_i$ (M$ million)

Gi: Gross Domestic Product of Peninsular Malaysia in The Year i (M$ million)

Gross domestic products of Kelantan and Peninsular Malaysia have already estimated in the proceeding section as shown below.

Year	Peninsular Malaysia	Kelantan
1987	37,747	1,390
2000	93,538	4,425

(M$ million in 1970 constant prices)

Therefore, potential cargo volumes at Peninsular Malaysian ports and Kelantan Port are calculated as:

Year	Peninsular Malaysian Ports	Kelantan Port
1987	51,485,000	1,896,000
2000	138,463,000	6,550,000

(tons)

The above estimated cargo volume at Kelantan Port will be justified if the port has competitive functions to those of major ports, such as Kelang Port, Penang Port. Kelantan Port is expected, however, to function as a gate way for exports or imports mainly with Far East and Wouth East Asian countries, and have terminal facilities for conventional cargo vessels and oil tankers. In consequence, the target volume of port cargo at Kelantan Port in 1987 and 2000, will be far less than the estimated potential cargo volumes.

In this study, a quarter of the total potential cargo is assumed to be loaded and discharged at the port in 1987 and 2000, considering present marine trade between Peninsular Malaysia and the foreland countries, improvement of containerization in the international marine transportation, etc.

Therefore, the target volumes are estimated as 474,000 tons in 1987, 1,638,000 tons in 2000, by the macro-scopic estimate.

(2) Estimate of Cargo Traffic Volume by Commodity

Future cargo volume by commodity loaded or discharged at Kelantan Port is estimated by using the data on population, gross domestic product, agricultural, forest and land developments, and cargoes transported by railway, etc. in Malaysia, Peninsular Malaysia and Kelantan.

Considering present situation and potentials of economic activities in Kelantan, the commodities to be estimated in this study are as follows;

- o Wood Products
- o Rubber
- o Palm Oil
- o Fertilizer
- o Cement
- o Petroleum Products
- o Rice
- o Miscellaneous

Table 5-6 and Fig. 5-3 show the result of estimate.

Table 5-6 Estimate of Cargo Traffic at Kelantan Port

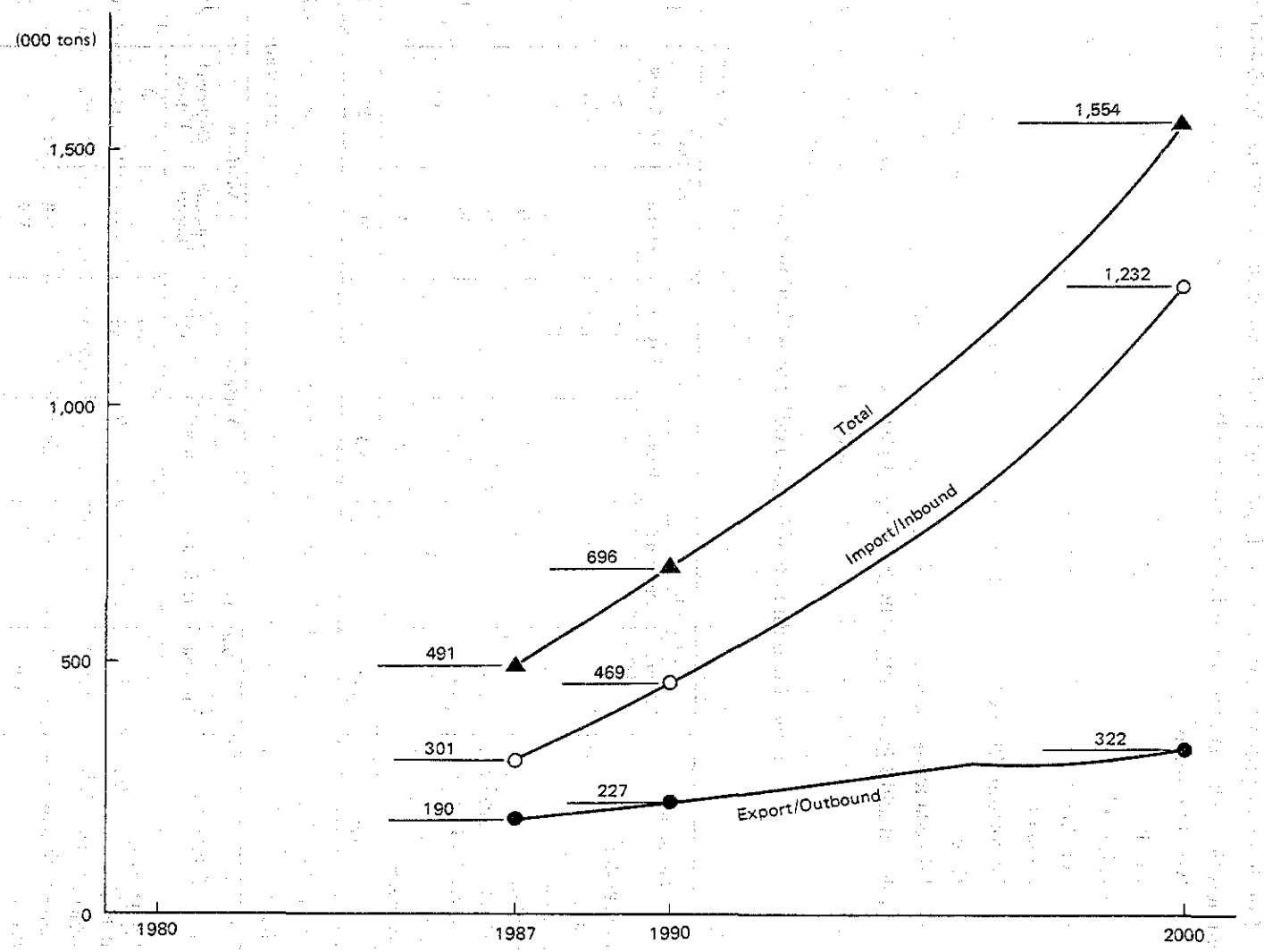
1987 (000 tons)

Commodity	Domestic		Foreign		Sub-Total		Total
	Inbound	Outbound	Import	Export	Inbound	Outbound	
Wood Products				49		49	49
Rubber				41		41	41
Palm Oil				47		47	47
Fertilizer			41		41		41
Cement	72				72		72
Petroleum Products	139				139		139
Rice		53				53	53
Miscellaneous			49		49		49
Total	211	53	90	137	301	190	491

2000 (000 tons)

Commodity	Domestic		Foreign		Sub-Total		Total
	Inbound	Outbound	Import	Export	Inbound Import	Outbound Export	
Wood Product				38		38	38
Rubber				133		133	133
Palm Oil				62		62	62
Fertilizer			76		76		76
Cement	379				379		379
Petroleum Products	653				653		653
Rice		88				88	88
Miscellaneous			125		125		125
Total	1,032	88	201	233	1,233	321	1,554

Fig. 5-3 Cargo Traffic at Kelantan Port



① Wood Products

Kelantan is now one of main producing states for logs in Peninsular Malaysia. A large quantity of sawlogs are transported to Pahang, Johor, Selangor and Negeri Sembilan to be processed into timber, plywood, veneer, etc. According to the data from the Forest Department, Kelantan, production and transhipment of sawlogs were approximately 700,000 cu. tons and 200,000 cu. tons, respectively.

Future production of logs, processed wood products, and export of wood products can be estimated, considering forest area, land development projects, timber industry developments, yield per ha and quality of logs, etc. Fig. 5-4 shows the flow of estimate.

Forests in Kelantan comprises primary hill forests, disturbed hill forests, upper hill forests, and forests for wildlife reserves, and the forest area is about 1.1 million hectares as shown in Table 5-7. Of the total forests, primary forests from moderate to superior categories, and hill forests excluding those shifted to agricultural use consist of commercial forests. 75 percent of commercial forests, 560,000 hectares, is harvestable forest. Table 5-8 shows forest area by type.

Based on the projected yields per hectare shown in Table 5-9, and the harvestable forest area, total exploitable timber in Kelantan's forest is estimated at 14,426,000 cu. tons in medium term logging, and 21,661,000 cu. tons in long term logging, as shown in Table 5-10.

Future sawlog production in Kelantan is estimated as follows.

i) Land Use Conversion

The southern area of Kelantan is in the process of having up to 121,140 hectares converted to agriculture. Of the total area, 101,180 hectares are projected to be logged in accordance with the following schedule.

1980 – 1984	9,710 ha/year
1985 – 1986	6,070 〃
1987 – 1996	4,050 〃

Since 1966, the area to be changed into farm land is primary forest and disturbed hill forest, and the land is to be cleared and burned after logging. Therefore the yield per hectare is assumed to be 35.7 cu. tons/ha, an average of medium and long term yields in the forest types mentioned above.

Accordingly, annual sawlog production by the land conversion is estimated as follows.

1980 – 1984	347,000	cu. tons/year
1985 – 1986	217,000	〃
1987 – 1996	145,000	〃

And the accumulated production will be 3,619,000 cu. tons.

ii) Kemubu Timber Complex

The area of 92,410 hectares is reserved for the development project of the Kemubu Timber Complex, and of the total reserved area, the commercial forest area is 92,410 hectares. Assuming

that the commercial forest area will be 75 percent exploitable, the harvestable forest is 55,720 hectares. The forest area by type is shown below.

	Commercial Forest (ha)	Harvestable Forest (ha)
Primary	60,060	45,050
Superior	890	670
Good	8,780	6,590
Moderate	50,390	37,790
Disturbed	14,220	10,670
Total	72,280	55,720

By applying the yields per hectare projected previously, total exploitable timber in the Kemubu project reserved area is estimated at 2,181,000 cu. tons in the long term. Therefore an annual cutting rate of 55,000 cu. tons is planned according to the forty-year logging cycle.

iii) Other

The remaining exploitable timber in Kelantan can be calculated by subtracting the timber produced by the land conversion and the Kemubu Timber Complex Development Project, from the total exploitable timber in the state. Therefore, the rest of the harvestable timber is estimated at 15,861,000 cu. tons, and the annual production of sawlogs would be 397,000 cu. tons, based on a 40-year cutting cycle.

Table 5-11 shows annual production of sawlogs in Kelantan.

There will not be enough processing capacity of sawlogs in Kelantan by the early 1980's. Accordingly, a considerable volume of logs would be shipped to other states to be processed into wood products. But in the latter half of the 1980's, processing mills will be developed, and the total produced sawlogs would be processed in Kelantan. Based on the Jurutera Konsultant study in 1979, sawlogs to be processed are estimated at 597,000 cu. tons per annum between 1987 to 1996, and 452,000 cu. tons per annum between 1997 to 2000, as shown in Table 5-12.

According to the officials of the Forest Department, Kelantan, annual sawlog production of around 500,000 cu. tons can be expected in the future, based on a 40-year cutting cycle. So there is no difference between the two estimates.

And the recovery rate by processing from sawlogs into wood products is assumed to be 65 percent, annual wood products in Kelantan would total 388,000 cu. tons between 1987 to 1996, and 293,000 cu. tons between 1997 to 2000. Table 5-13 shows annual processed wood products by producing area.

Of the total, annual export grade wood products are forecasted at 78,000 cu. tons between 1987 to 1996, and 59,000 cu. tons between 1997 to 2000, on the assumption that the export grade of wood will be 20 percent of the total wood. These wood products are exported mainly to European countries at present.

In general, wood consumption increasingly grows in accordance with the development of industry, improvement in the people's standard living, the increase of population, etc. Kelantan is not an exception to this. In several studies, the consumption of wood products is estimated to increase to the level of 300,000 cu. tons per annum. If the surplus betwen production and

consumption is shipped to other states or to the foreland countries of Kelantan Port, only a small volume of wood product exports will be expected via proposed Kelantan Port. But actually, this might not happen because some portion of export grade wood products would be exported in order to make more profit from it, even if there is a shortage of wood products. This shortage will be supplemented by importing cheaper timbers from neighbouring countries, or by utilizing different kinds of wood which is now considered useless.

At present sawlogs or processed wood produced in Kelantan, are distributed by rail or by road directly to the exporting ports, or mills in other states to be processed. With the development of Kelantan Port, a part of the export grade products will be transported by ship to the foreland countries via the port, since it is less expensive to use the port than to use competitive Kuantan Port and Penang Port.

Fig. 5-5 shows the future distribution pattern of wood products to be exported through Kelantan Port.

It is assumed that half of the export grade wood products will be shipped via Kelantan Port, the cargo volume of wood products is estimated at 39,000 cu. tons or 49,000 freight tons in 1987, and 30,000 cu. tons or 38,000 freight tons in 2000.

Annual production of wood products and its exports are shown in Table 5-15 and, Fig. 5-6.

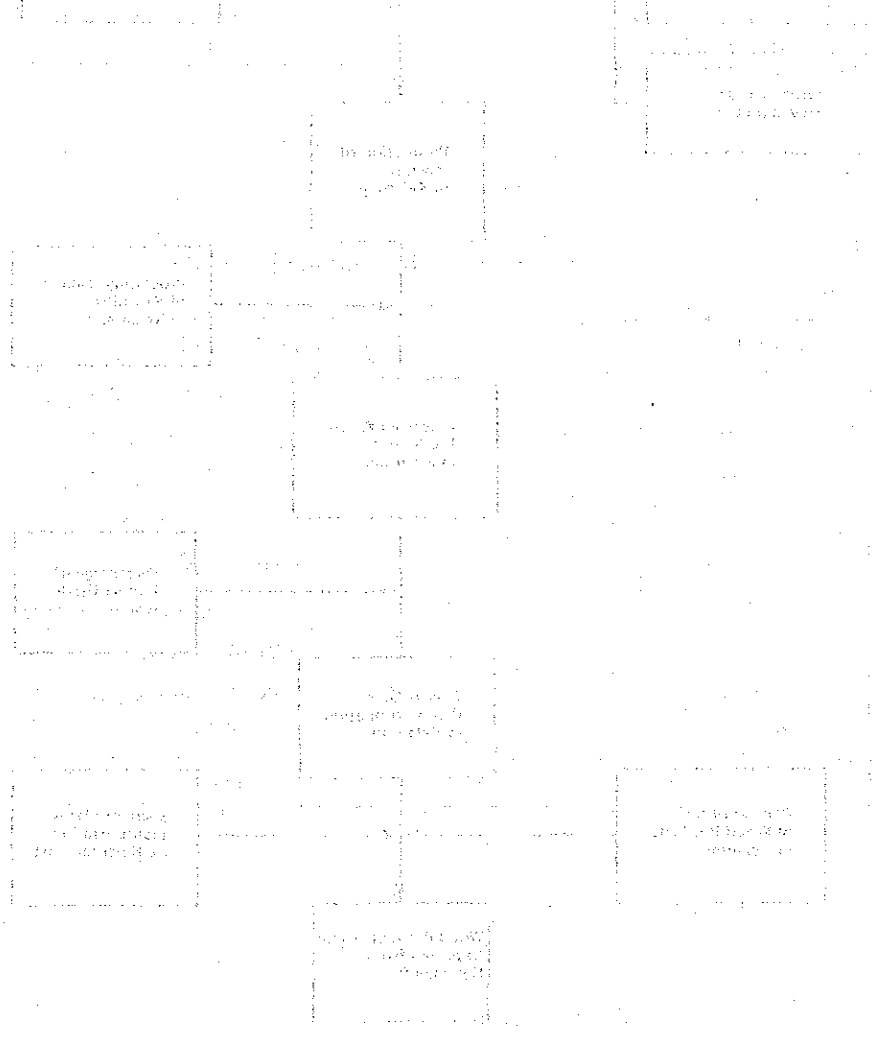


Fig. 5-4 Estimate Flow of Wood Product Export

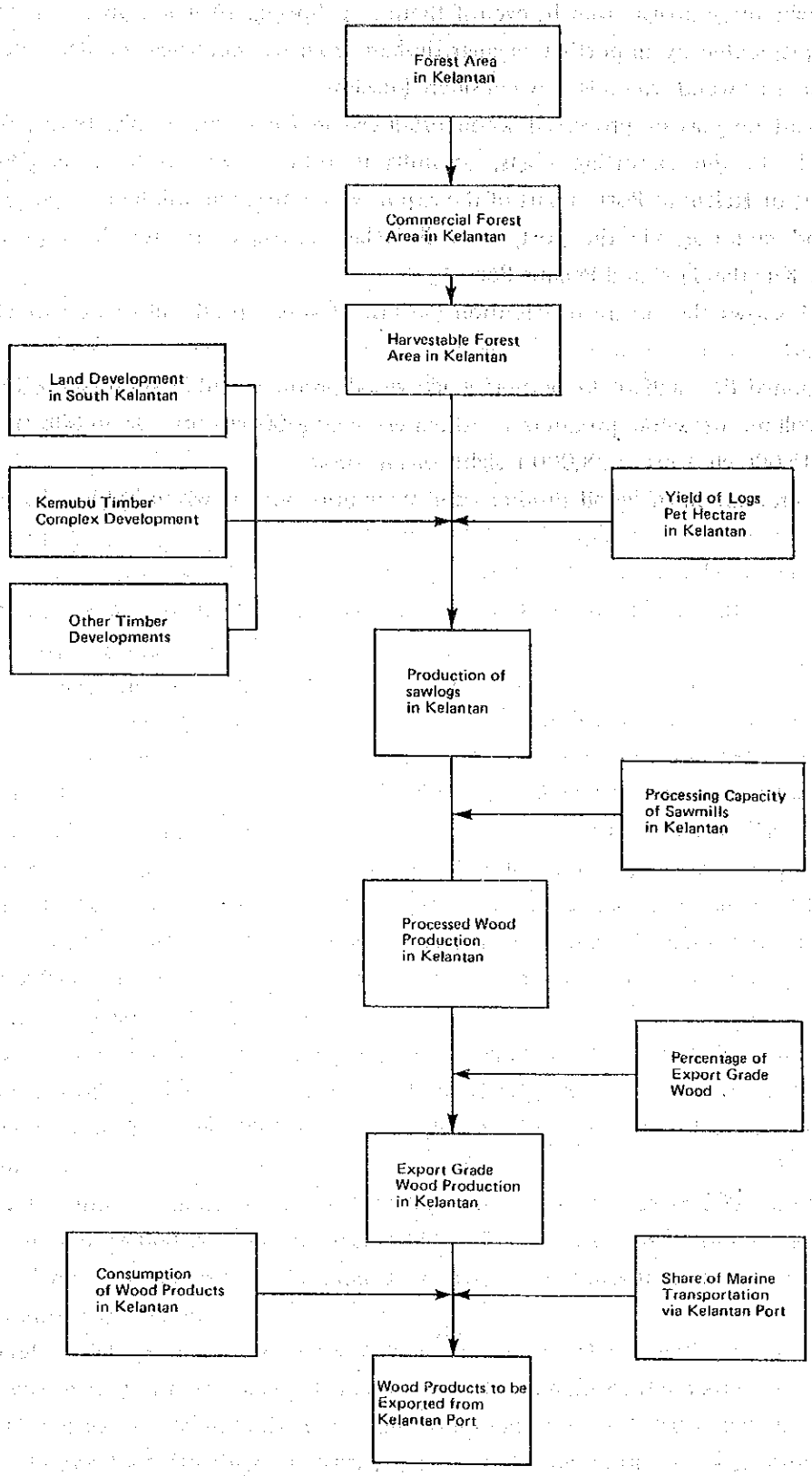


Table 5-7 Kelantan Forests (As of 31 Dec. 1978)

(ha)

Forest Type	Area
Primary Hill Forests	
Superior	25,900
Good	47,350
Moderate	117,770
Poor	100,770
Sub-Total	291,790
Disturbed Hill Forests	
Shifting Agriculture (1966)	87,820
Harvested prior to 1966	94,700
Harvested since 1966	462,170
Sub-Total	644,690
Upper Hill Forests	51,400
Wildlife Reserves	108,860
Total	1,096,740

Table 5-8 Estimated Harvestable Forests

(ha)

Forest Type	Area
Primary Hill Forests	
Superior	19,420
Good	35,510
Moderate	88,320
Sub-Total	143,260
Disturbed Hill Forests	
Logged prior to 1966	70,820
Logged since 1966	346,830
Sub-Total	417,650
Total	560,910

Table 5-9 Projected Yields

(cu. tons/ha)

Forest Types	Medium Term	Long Term
Primary Forest		
Superior	36.1	54.1
Good	35.1	52.6
Moderate	27.9	42.0
Average	30.9	46.5
Logged Forest		
Prior to 1966	13.1	19.8
Since 1966	26.2	39.3

Table 5-10 Exploitable Timber

(cu. tons)

Forest Types	Medium Term	Long Terms
Primary Forest		
Superior	701,000	1,051,000
Good	1,246,000	1,869,000
Moderate	2,464,000	3,709,000
Logged Forest		
Prior to 1966	928,000	1,402,000
Since 1966	9,087,000	13,630,000
Total	14,426,000	21,661,000

Table 5-11 Projected Kelantan Sawlog Production

(000 cu. tons)

Year	Land being converted to Agriculture	Kembu Timber Complex	Other	Total
1980	347	–	397	744
1981	347	–	397	744
1982	347	–	397	744
1983	347	–	397	744
1984	347	55	397	799
1985	217	55	397	669
1986	217	55	397	669
1987	145	55	397	597
1988	145	55	397	597
1989	145	55	397	597
1990	145	55	397	597
1991	145	55	397	597
1992	145	55	397	597
1993	145	55	397	597
1994	145	55	397	597
1995	145	55	397	597
1996	145	55	397	597
1997	–	55	397	452
1998	–	55	397	452
1999	–	55	397	452
2000	–	55	397	452

Table 5-12 Sawlogs Processed in Kelantan

(000 cu. tons)

Year	Kemubu/Manek Urai	Gua Musang	Interestate Shipments
1979[1]	310	20	241
1980[1]	340	20	384
1981[1]	410	20	314
1982[1]	410	30	304
1983[1]	464	70	210
1984[1]	517	90	192
1985[1]	523	110	36
1986[1]	523	110	36
1987[2] – 1996	448	149	–
1997[2] – 2000	339	113	–

Note 1. Source: Route Location and Feasibility Study of Highway Linking Towns of Gua Musang, Kuala Lipis and Bentong. Economic Appendicies. 1979. Jurutera Konsultant (S.E.A.) SDN. BHD.

2. Assuming that the input of sawlogs into mills is determined by the processing capacity of factories.

Kemubu and Manek Urai	523,000 cu. tons/year	(75%)
Gua Musang	179,000 cu. tons/year	(25%)

Table 5-13 Projected Kelantan Processed Wood Production

(000 cu. tons)

Year	Recovery Rate (%)	Production in Kemubu and Manek Urai	Production at Gua Musang	Total
1980	53	180	11	191
1981	55	226	11	237
1982	58	238	17	255
1983	60	278	42	320
1984	63	328	57	385
1985 – 1986	65	340	72	412
1987 – 1996	65	291	97	388
1997 – 2000	65	220	73	293

Table 5-14 Distribution of Logs from Kelantan by Railway (1979)

(tonnes)

Origin / Destination	Ulu Kelantan Gua Musang Kuala Krai, etc.	Tanah Merah Machang	Pasir Mas	Tumpat A Wakaf Bahru Kota Bharu Tumpat, etc.	Total
Penang Port	6,630	757	2,919	1,961	12,267
Port Kelang	6,155	952	1,169	654	8,930
Pahang	218,563	8,013	25	643	227,244
Johore	83,847	5,180	–	–	89,027
Kelantan	7,162	1,209	122	382	8,875
Kuala Lumpur (A.B.D.)	86,260	–	25	30	86,315
Others	40,920	1,879	75	236	43,110
Total	449,537	17,990	4,335	3,906	475,768

Source: Origin and Destination, 1979, Malayan Railway

Table 5-15 Export of Wood Products through Kelantan Port

Year	Export Grade Wood Products (cu. tons)	Wood Products Loaded at Kelantan Port (cu. tons)	Wood Products Loaded at Kelantan Port (f. tons)
1987 ~ 1996	78,000	39,000	49,000
1997 ~ 2000	59,000	30,000	38,000

Fig. 5-5 Distribution Pattern of Port Cargo
– Wood Products –

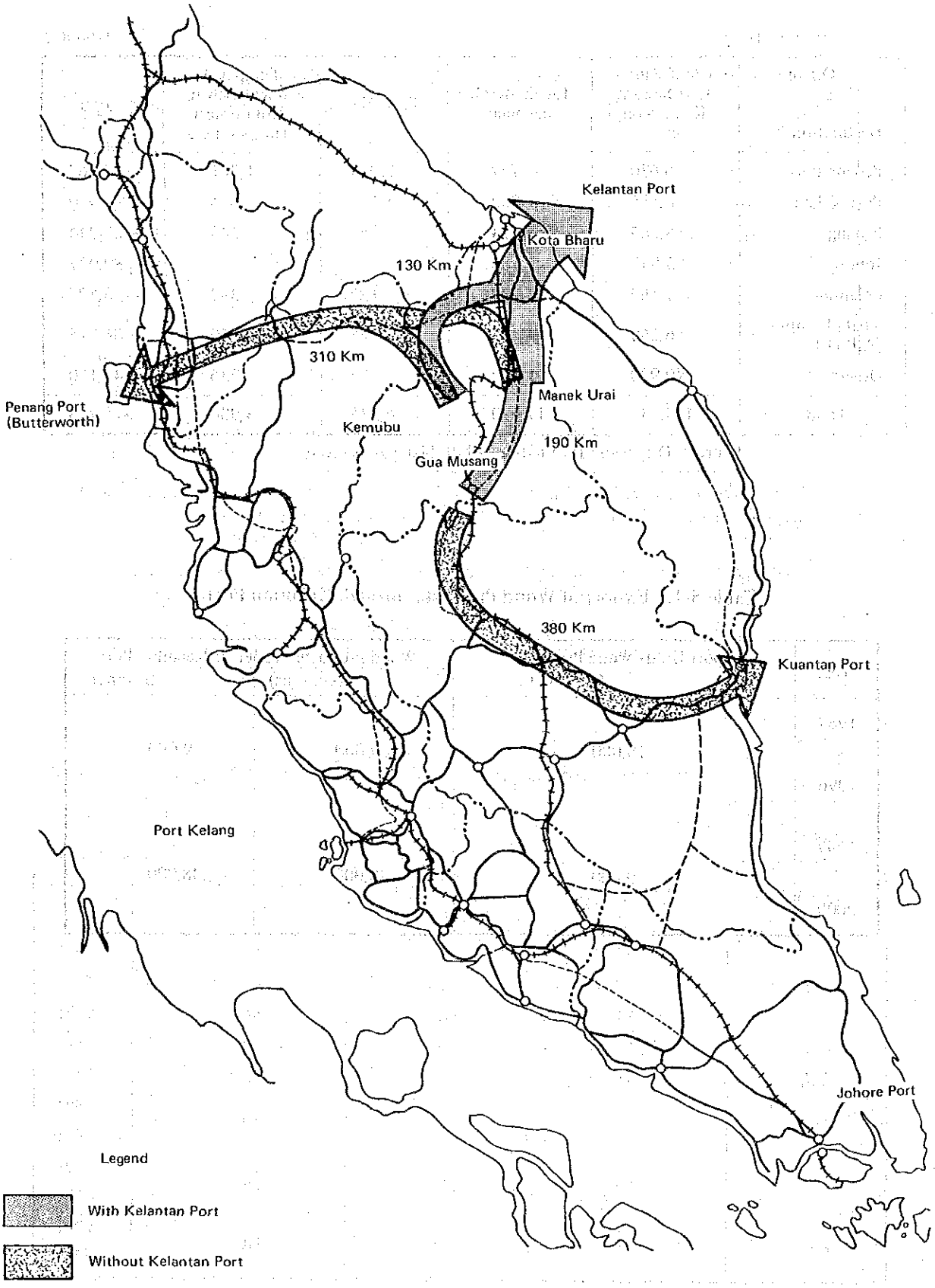
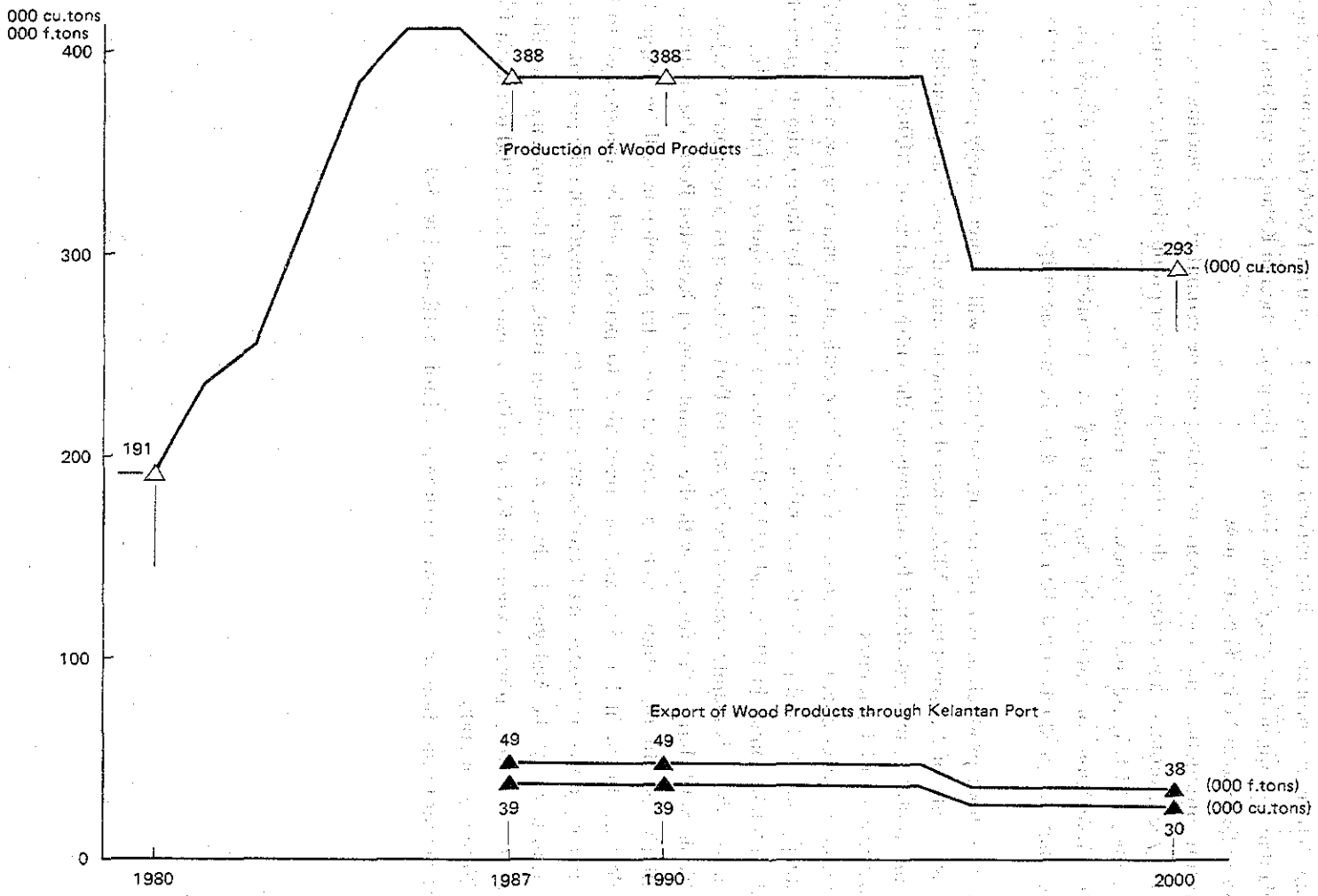


Fig. 5-6 Wood Production in Kelantan and Export through Kelantan Port



② Rubber

Kelantan has been only a minor producer of rubber in Peninsular Malaysia. In 1979, its production was the least consisting of 41,318 tonnes which is only 3 percent of the total production, followed by Trengganu. At present rubber is cultivated by smallholders and at estates in Kelantan, but several projects will be carried out by the Federal and State Governments in the South Kelantan Region in and after 1980. However the production in Kelantan will still be small in quantity in Peninsular Malaysia as it is now.

The future production and the export of rubber can be estimated, considering the present production by smallholders and estates, the estimation of rubber production under governmental projects by the KESEDA, etc. Fig. 5-7 shows the estimate flow.

Future production of rubber by smallholders is estimated at 27,000 tonnes on the assumption that the production will be maintained at the average output level between 1975 and 1979.

The state rubber production is projected assuming that it will be increasingly produced at an average growth rate of 2 percent until 2000, when the production will reach the potential output of rubber of 26,000 tonnes calculated by multiplying the cultivated area of 20,000 hectares by the yield per hectare of 1.3 tonnes.

Production by government projects has already been estimated, and was given by KESEDA.

Accordingly, future total production of rubber can be obtained by those estimates described above, and is 68,630 tonnes in 1987, and 222,150 tonnes in 2000, as shown in Table 5-16.

At present rubber is mainly transported by rail to Port Kelang and Singapore to export, as shown in Table 5-17, but in the future, with the completion of Kelantan Port, the distribution pattern will change. In this study, sixty percent of the total production will be shipped to Kelantan Port as shown in Fig. 5-8, and the remaining 40 percent will be transported to the existing exporting ports or processing factories by road or by rail considering the present volume of rubber transport by the Malayan Railway, and rubber trade with the foreland countries of Kelantan Port. Therefore, rubber export via Kelantan Port is estimated at 41,200 tonnes in 1987 and 133,300 tonnes in 2000.

Annual rubber production and export are shown in Table 5-18 and Fig. 5-9.

Fig. 5-7 Estimate Flow of Rubber Export

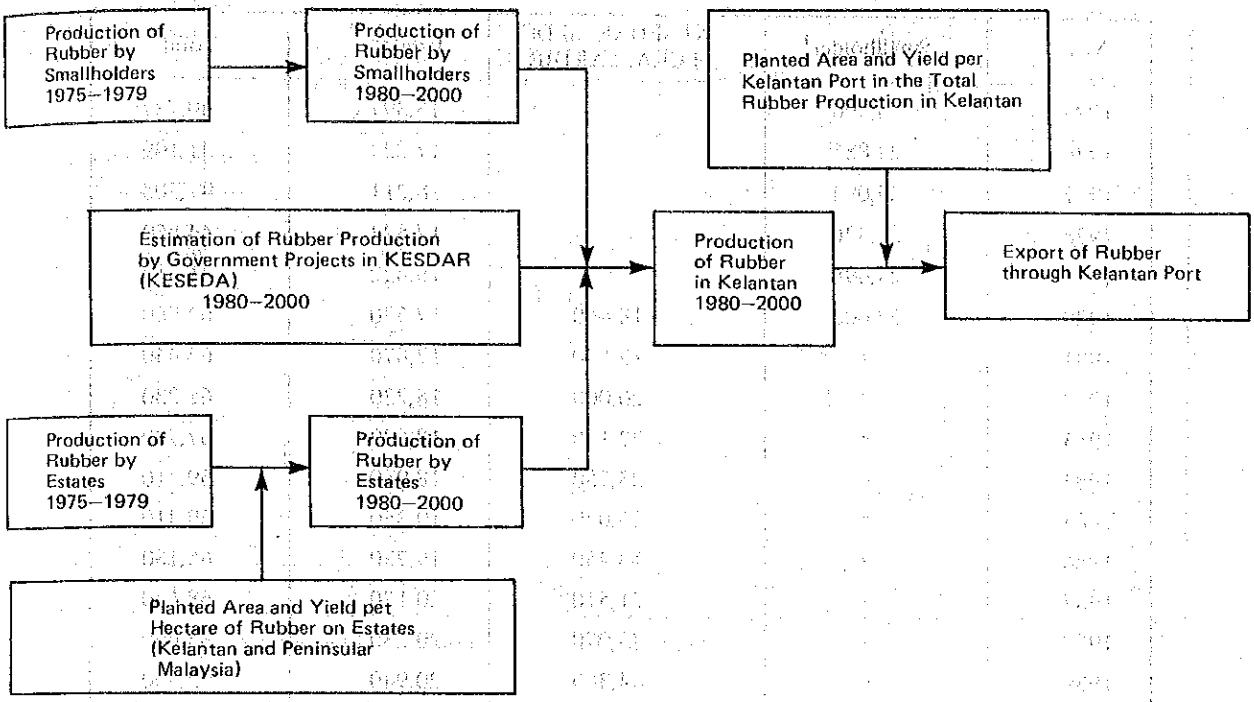


Table 5-16 Production of Rubber in Kelantan

(tonnes)

Year	Smallholder[1]	KESEDAR, SEDC, FLCRA, TAKDIR[2]	Estate[3]	Total
1975	25,390	–	15,397	40,787
1976	23,885	–	17,224	41,109
1977	29,094	–	18,211	47,305
1978	27,326	–	17,524	44,850
1979	24,496	–	16,822	41,318
1980	27,000	18,440	17,520	62,960
1981	"	19,570	17,870	64,440
1982	"	20,000	18,230	65,230
1983	"	22,110	18,590	67,700
1984	"	23,750	18,960	69,710
1985	"	23,070	19,340	69,410
1986	"	18,450	19,730	65,180
1987	"	21,510	20,120	68,630
1988	"	35,070	20,530	82,600
1989	"	44,360	20,940	92,300
1990	"	55,200	21,360	103,560
1991	"	64,460	21,780	113,240
1992	"	76,350	22,220	125,570
1993	"	89,340	22,660	139,000
1994	"	100,980	23,120	151,100
1995	"	113,160	23,580	163,740
1996	"	121,950	24,050	173,000
1997	"	132,560	24,530	184,090
1998	"	143,830	25,020	195,850
1999	"	157,920	25,520	210,440
2000	"	169,150	26,000	222,150

Source: 1 & 3 Rubber Monthly Statistics of Malaysia
Department of Statistics (1975–1979)
2 Investment Opportunities in South Kelantan (KESEDAR) 1980

Table 5-17 Distribution of Rubber from Kelantan by Railway (1979)

(tonnes)

Origin / Destination	Ulu Kelantan Gua Musang Kuala Krai, etc.	Tonah Merah Machang	Pasir Mas	Tumpat A Wakaf Bahru Kota Bharu Tumpat, etc.	Total
Kuala Lumpur A Kuala Lumpur, etc.	–	48	474	672	1,194
Port Kelang	661	5,085	–	6,157	11,903
Tampin	719	1,513	–	–	2,232
Segdmat	1,209	534	–	–	1,743
Kluang	732	–	–	–	732
Johore Bharu	1,059	15	–	–	1,074
Kelantan	1,123	–	–	16	1,139
Singapore	193	5,711	72	7,047	13,023
Others	194	–	16	–	210
Total	5,890	12,906	562	13,892	33,250

Source: Origin and Destination, 1979, Malayan Railway.

Table 5-18 Export of Rubber through Kelantan Port

(tonnes)

Year	Rubber Loaded at Kelantan Port (Export)
1987	41,200
1988	49,600
1989	55,400
1990	62,100
1991	67,900
1992	75,300
1993	83,400
1994	90,700
1995	98,200
1996	103,800
1997	110,500
1998	117,500
1999	126,300
2000	133,300

Fig. 5-8 Distribution Pattern of Port Cargo

– Rubber –

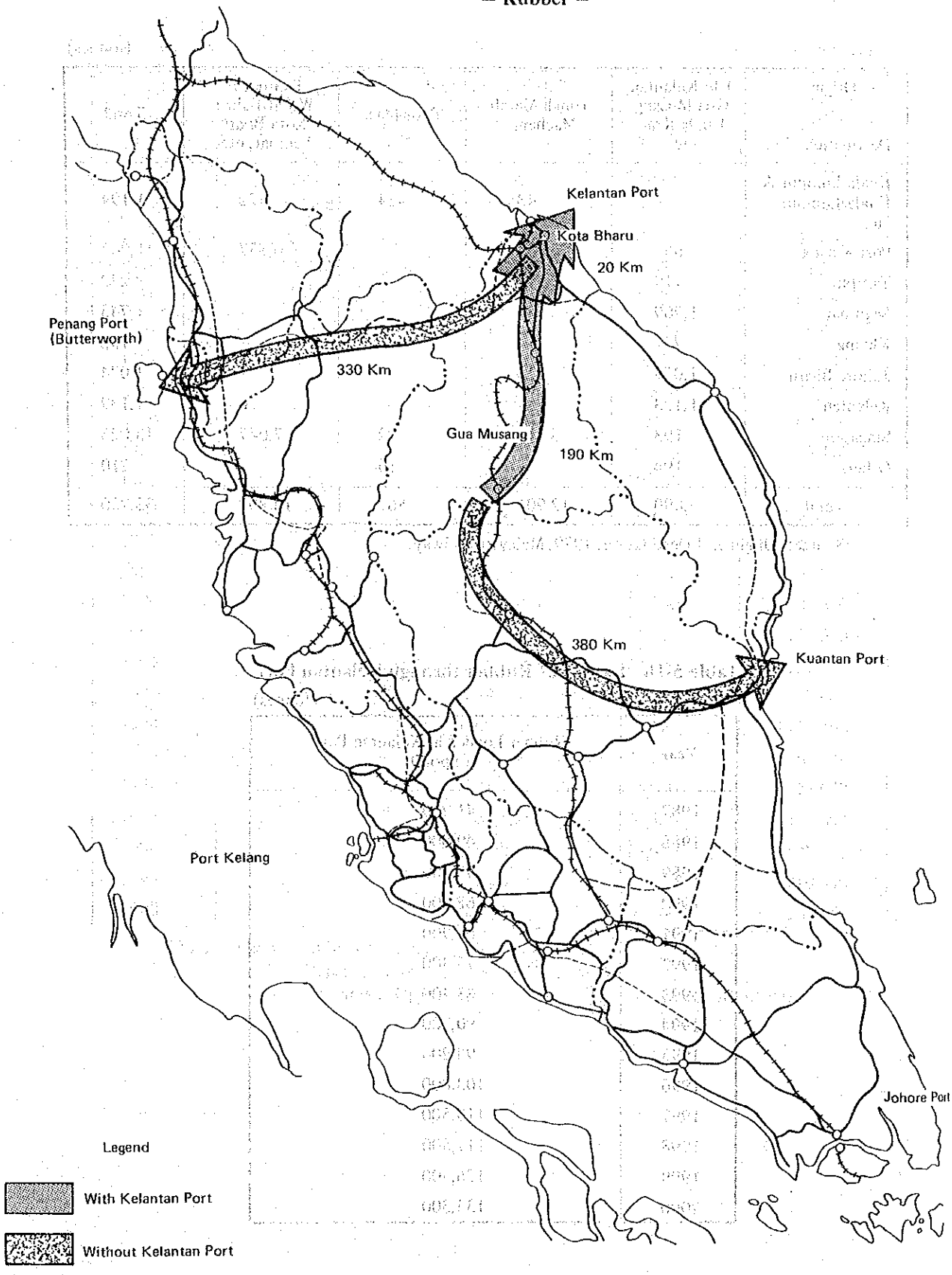
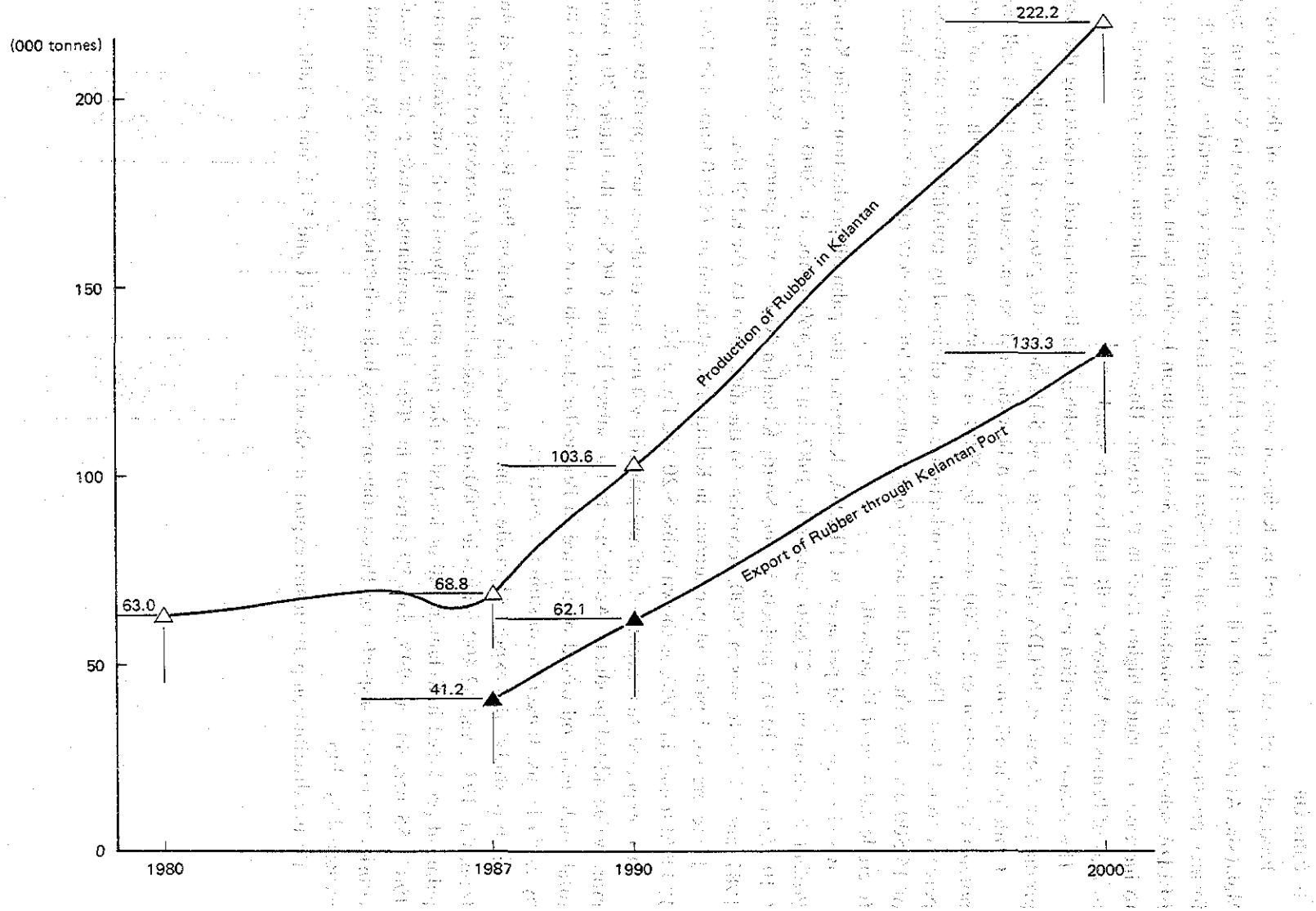


Fig. 5-9 Production of Rubber in Kelantan and Export from Kelantan Port



③ Palm Oil

Production of crude palm oil in Kelantan was less than one percent of that of Peninsular Malaysia. At present palm oil is produced by the FELDA and estate holders in Kelantan, and the former produces crude palm oil of about half of the latter in terms of quantity. With the new FELDA schemes in Kemahang and the South Kelantan Region, palm oil production is expected to increase to a much higher level in the future. However the Kelantan rubber production share to that of Peninsular Malaysia will still be very small.

The future production and the export of rubber can be estimated, considering the present production at estates, FELDA schemes, etc. Fig. 5-10 shows the process of the estimate.

Crude palm oil production at estates can be estimated on the assumption that it will reach a potential production of 23,700 tonnes by 2000 at an average annual growth rate of about 3 percent from 1980. The potential production can be obtained by multiplying the cultivated area of 15,500 acres by the yield per acre of 8.5 tonnes and the recovery rate of processing from FFB to crude palm oil of 18 percent.

Based on the yield per acre by FELDA, Kelantan, the palm oil production in the Kemahang Project is estimated at 27,860 tonnes in 1987, and 27,460 tonnes in 2000 as shown in Table 5-19. And the FELDA projects in the South Kelantan Region will produce 33,860 tonnes in 1987, and 73,710 tonnes in 2000, according to the data given by the KESEDA.

Therefore total palm oil production in Kelantan is estimated at 78,080 tonnes in 1987, and 124,870 tonnes in 2000, as shown Table 5-20 and Fig. 5-12.

It is expected that export of refined palm oil will increase to obtain more profit by exporting more value added products. According to the survey by the CPCS, in the future 70 percent of total crude palm oil would be refined in Peninsular Malaysia as a whole, and transported mainly by exclusive use tanker to consuming countries.

In this study, the export of crude palm oil through Kelantan Port is estimated at 46,800 tonnes in 1987, and 62,400 tonnes in 2000 on the assumption that 60 percent of the total crude palm oil produced in Kelantan will be loaded at the port and shipped to the foreland countries in 1987, 55 percent in 1995, and 50 percent in 2000. The remaining crude palm oil would be considered to be transported to the existing or newly built refineries by road or by rail, and then exported by ship.

Future distribution pattern and export are shown in Fig. 5-11 and 5-12, and in Table 5-22.

Fig. 5-10 Estimate Flow of Crude Palm Oil Export

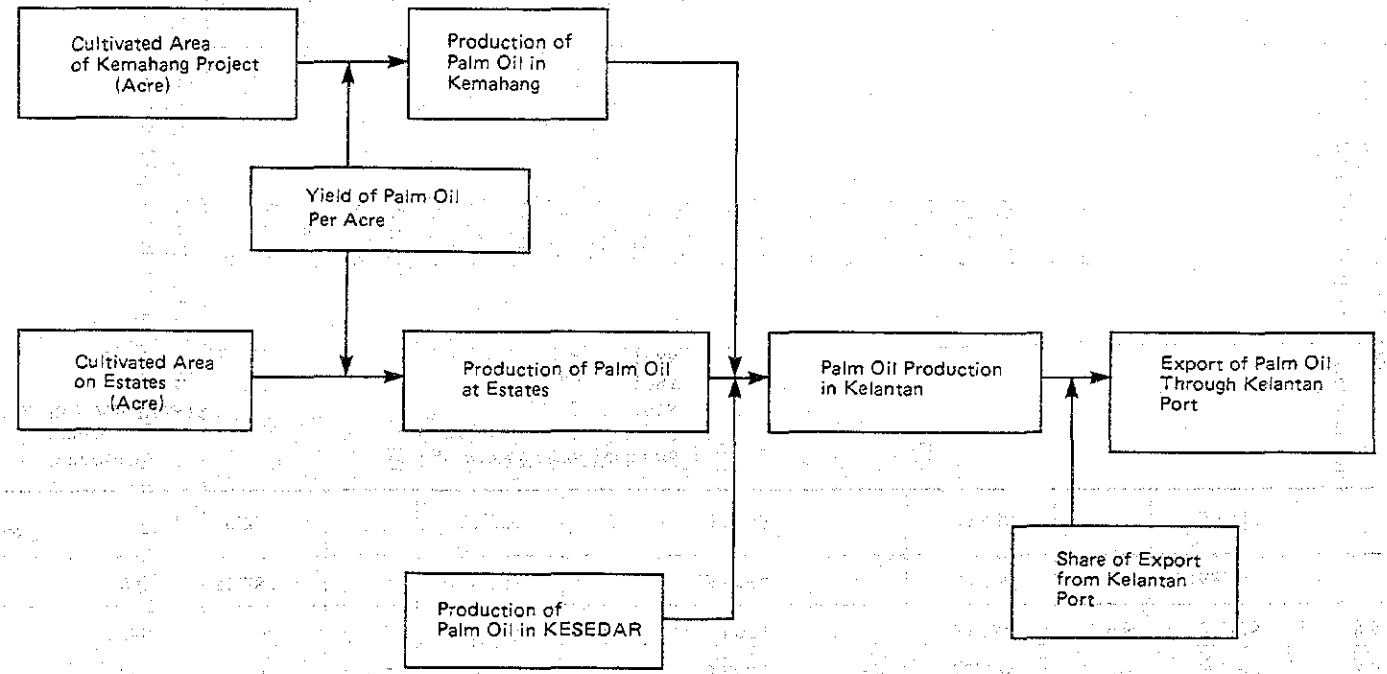


Table 5-19 Production Crude Palm Oil in Kemahang Project

Scheme \ Area, Year	Area (acre)	1980 Production	1985		1987		1990		1995		2000	
			Yield[1]	Production[2]	Yield[1]	Production[2]	Yield[1]	Production[2]	Yield[1]	Production[2]	Yield[1]	Production[2]
Kemahang 1	6,623	51,289	10.0	115,980	9.5	110,182	8.9	103,222	7.9	91,624	7.2	83,506
" 2	4,975											
" 3	5,505	–	0.5	2,753	6.3	34,682	9.5	52,298	9.3	51,147	8.3	45,692
" 4	2,750	–	–	–	3.6	9,900	9.0	24,750	9.5	26,125	8.5	23,375
Total	19,853	51,289		118,733		154,764		180,270		168,946		152,573
Production Crude Palm Oil (tonne)		9,230		21,370		27,860		32,450		30,410		27,460

Note 1. tonnes/acre
2. tonnes
3. Recovery Rate 18%

1st Harvesting Year of Each Project

Kamahang	1	1978
"	2	1978
"	3	1985
"	4	1986

Table 5-20 Production of Crude Palm Oil

(tonnes)

Year	FELDA		Estate	Total
	Kemahang Project[1]	Kesedar Project[2]		
1974	–	–	na	na
1975	–	–	na	na
1976	–	–	10,990	10,990
1977	–	–	11,260	11,260
1978	4,220	–	11,250	15,470
1979	6,730	–	13,020	19,750
1980	9,230	–	13,400	22,630
1981	10,920	–	13,780	24,700
1982	12,920	380	14,180	27,480
1983	15,280	3,010	14,590	32,880
1984	18,070	8,400	15,020	41,490
1985	21,370	16,130	15,450	52,950
1986	24,400	25,180	15,900	65,480
1987	27,860	33,860	16,360	78,080
1988	29,310	43,070	16,830	89,210
1989	30,840	51,660	17,320	99,820
1990	32,450	59,660	17,820	109,930
1991	32,030	66,760	18,330	117,120
1992	31,620	73,320	18,860	123,800
1993	31,210	77,850	19,410	128,470
1994	30,810	80,280	19,970	131,060
1995	30,410	80,720	20,550	131,680
1996	29,800	80,110	21,140	131,050
1997	29,190	78,940	21,760	129,890
1998	28,600	77,360	22,390	128,350
1999	28,030	75,450	23,030	126,510
2000	27,460	73,710	23,700	124,870

1. Estimates based on the FELDA data.
2. Investment Opportunities in South Kelantan (KESEDAR), 1980

Table 5-21 Distribution of Crude Palm Oil from Kelantan by Railway (1979)

(tonnes)

Destination \ Origin	Ulu Kelantan (Gua Musang, Kuala Krai, etc.)
Krian & Larut (Taipin, Port Weld, etc.)	51
Kuala Lumpur D (Petaling)	3,503
Kelang (Kelang, Port Kelang, etc.)	405
Port Kelang-Goods	4,910
Tampin	53
Temerloh	34
Kuala Lipis	17
Total	8,973

Source: Origin and Destination 1979, Malayan Railway

Table 5-22 Export of Crude Palm Oil through Kelantan Port

(tonnes)

Year	Crude Palm Oil Loaded at Kelantan Port
1987	46,800
1988	49,500
1989	52,200
1990	55,200
1991	58,200
1992	61,500
1993	64,900
1994	68,600
1995	72,400
1996	70,300
1997	68,200
1998	66,300
1999	64,300
2000	62,400

Note: Assuming that 60 percent of palm oil (crude) production will be exported through Kelantan Port in 1987, 55 percent in 1995, and 50 percent in 2000.

Fig. 5-11 Distribution Pattern of Port Cargo
– Crude Palm Oil –

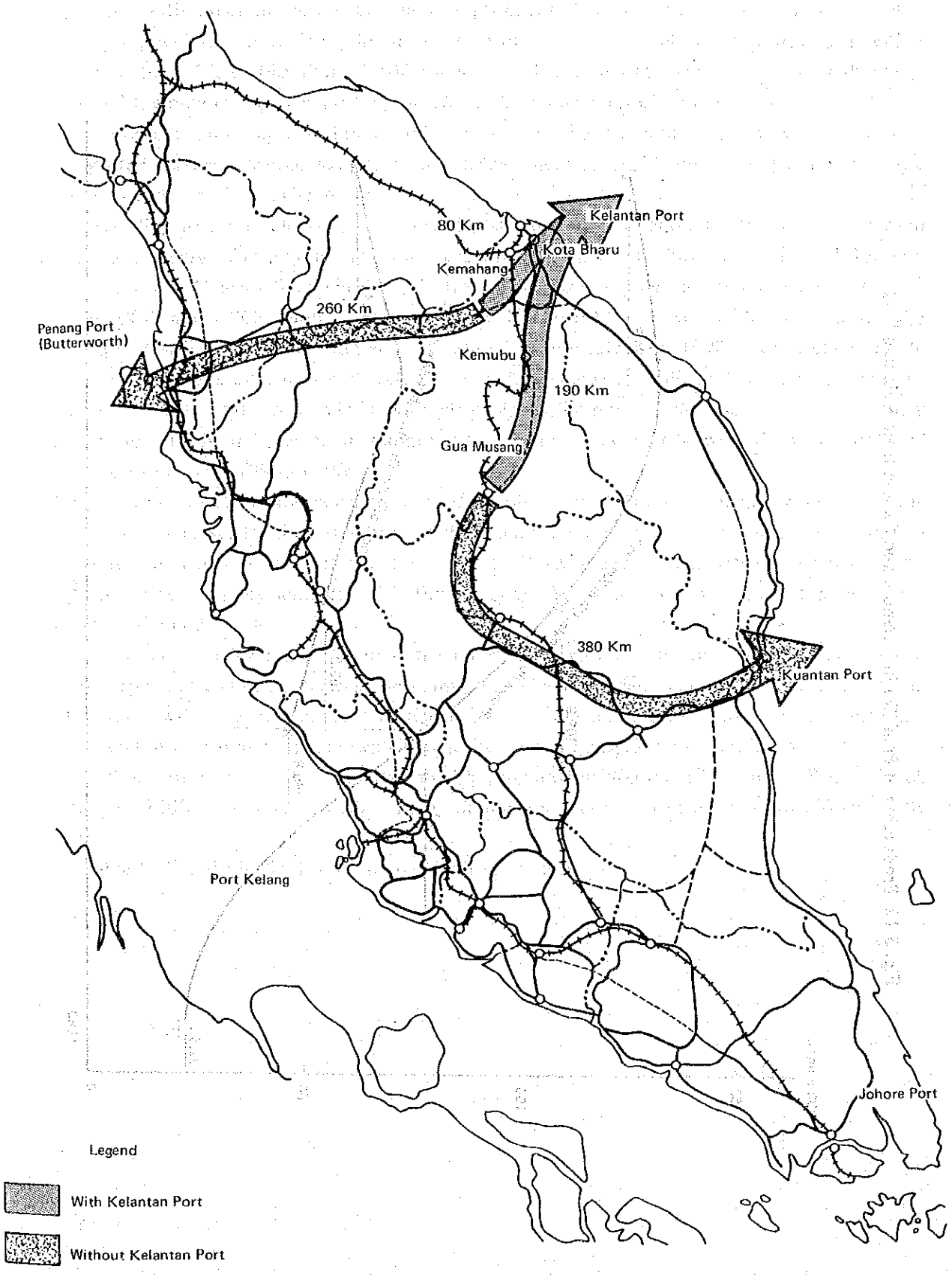
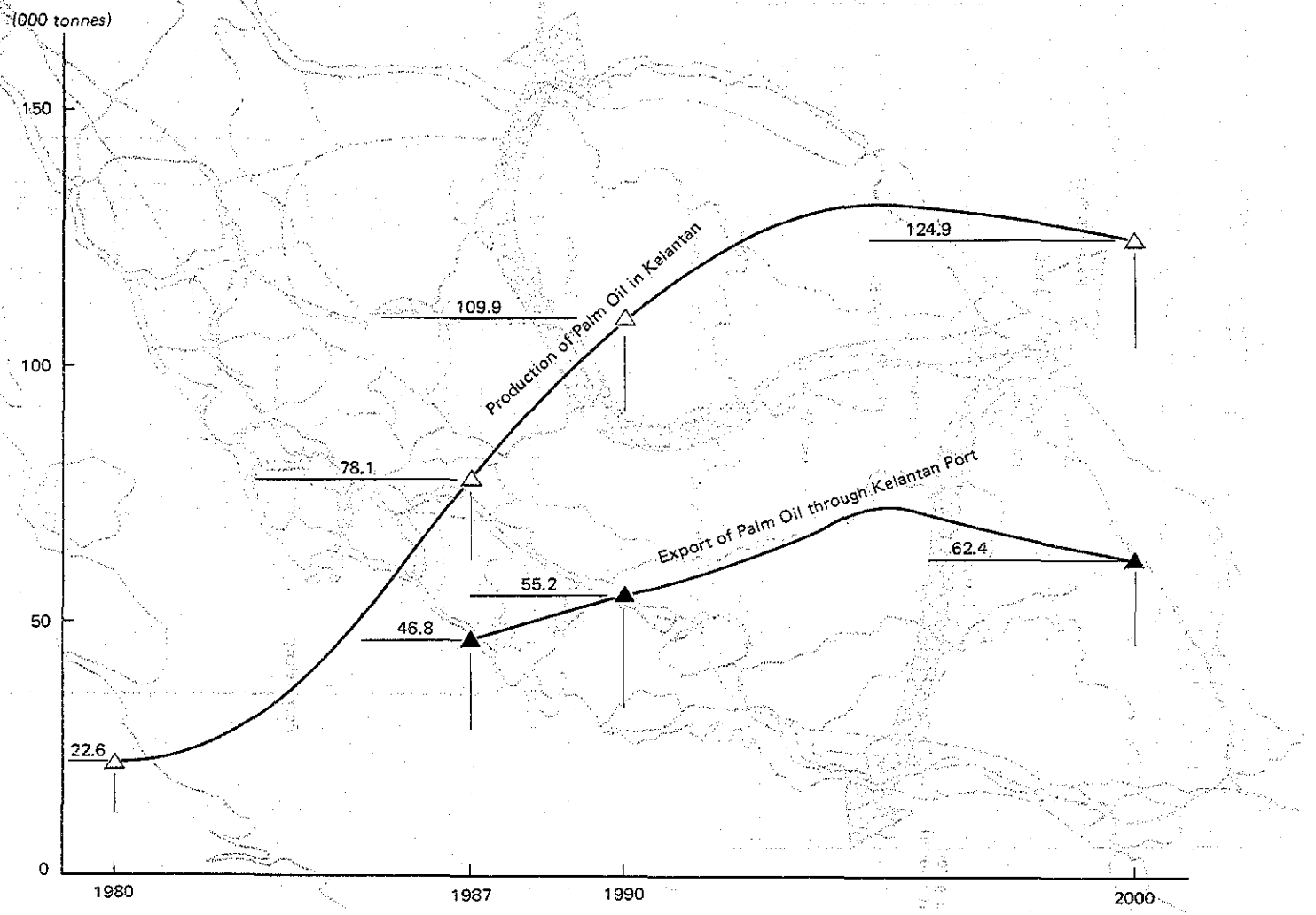


Fig. 5-12 Production of Palm Oil in Kelantan and Export from Kelantan Port



④ Fertilizer

At present, fertilizer is mainly used in padi, rubber, and oil palm cultivation in Kelantan. Compared with other states, fertilizer consumption is rather small because rubber and oil palm cultivation, which require large amounts of fertilizer and have not been widespread within Kelantan. In 1979, fertilizer of 27,400 tonnes was distributed to Kelantan by rail as shown in Table 5-23, which would be almost equivalent to the whole consumption of fertilizer.

Future consumption and import of fertilizer can be estimated, considering the present transported fertilizer into Kelantan by rail, developments of padi, rubber, oil palm cultivation, supply of fertilizer from CCM, etc.

According to the production estimates of padi, rubber, and palm oil in this study, each crop shows an increase of production at an average annual growth rate shown in Table 5-24. Palm oil production,which needs the highest application of fertilizer among the three crops by estimates of the CCM and CPCS, shows rapid growth of 17.1 percent between 1980 to 1990. On the contrary, it will increase at a low level of annual growth rate after 1990. Padi production will grow at an average annual growth rate of 6.4 percent between 1980 to 1990, and 2.4 percent between 1990 to 2000. And rubber production shows the most steady and increasing tendancy after 1980, that is, the average annual growth rates are 5.1 percent between 1980 to 1990, and 7.9 percent between 1990 to 2000.

An estimate of future consumption of fertilizer in Kelantan is made, considering the production increases mentioned above, on the assumption that the average annual growth rate of consumption will be 8 percent between 1980 to 1990, and 4 percent between 1990 to 2000. Therefore, the consumption will be 50,700 tonnes in 1987, and 94,600 tonnes in 2000, as shown in Table 5-25 and Fig. 5-14.

As present, fertilizer is distributed from Port Kelang, Johor Bahru, and Singapore by rail. Major exporting countries are West Germany, Netherlands, Japan, Korea, and Singapore. But in the future, with the development of Kelantan Port, the distribution pattern will change and fertilizer considered as port cargo will be distributed according to the pattern shown in Fig. 5-13.

Fertilizer import through Kelantan Port is estimated at 40,600 tonnes in 1987 and 75,700 tonnes in 2000, assuming that 80 percent of the fertilizer will bedistributed into Kelantan by ship.

Table 5-27 and Fig. 5-14 show annual fertilizer import.

Table 5-23 Main Distribution of Fertilizer into Kelantan by Railway (1979)

(tonnes)

Origin \ Destination	Ulu Kelantan Gua Musang Kuala Krai, etc.	Tanah Merah Machang	Pasir Mas	Tumpat A Wakaf Bahru Kota Bharu Tumpat, etc.	Total
Kelang	1,244	1,578	476	2,376	5,674
Port Kelang	1,185	761	–	2,754	4,700
Johore Bahru	627	870	753	2,833	5,083
Singapore	3,005	1,104	930	5,239	10,278
Total	6,061	4,313	2,159	13,202	25,735

Total distribution of fertilizer into Kelantan by Malayan Railway is 27,729 tonnes, including 331 tonnes of transportation within Kelantan.

Source: Origin and Destination, 1979, Malayan Railway

Table 5-24 Annual Average Growth Rates of Padi, Rubber and Palm Oil Productions in Kelantan

Year	Radi		Rubber		Palm Oil	
	Production (tonnes)	Growth Rate (%)	Production (tonnes)	Growth Rate (%)	Production (tonnes)	Growth Rate (%)
1980	205,725[1]	6.4	62,960	5.1	22,630	17.1
1990	405,000	2.4	103,560	7.9	109,930	1.3
2000	514,000		222,180		124,870	

Note 1. Production in 1979.

Table 5-25 Estimated Fertilizer Application Rate

(pounds/acre)

Padi		
	1980	30.2[1]
	1985	60[1]
	1990	60[1]
	2000	60
Oil Palm		
	1980	528[1]
	1985	558[1]
	1990	570[1]
	2000	600
Rubber		
Estate, State, and other public sector		
	1980	160[1]
	2000	160
Smallholder		
	1980	70.4[1]
	1985	91.9[1]
	1990	120.0[1]
	2000	160.0

Note: 1 , Source: CCM and CPCS

Table 5-26 Consumption of Fertilizer in Kelantan

(tonnes)

Year	Consumption	Year	Consumption
1979	27,400	1990	63,900
1980	29,600	1991	66,500
1981	32,000	1992	69,100
1982	34,500	1993	71,900
1983	37,300	1994	74,800
1984	40,300	1995	77,700
1985	43,500	1996	80,900
1986	47,000	1997	84,100
1987	50,700	1998	87,500
1988	54,800	1990	91,000
1989	59,200	2000	94,600

Table 5-27 Import of Fertilizer through Kelantan Port

(tons)

Year	Fertilizer Discharged at Kelantan Port
1987	40,600
1988	43,800
1989	47,400
1990	51,100
1991	53,200
1992	55,300
1993	57,500
1994	59,800
1995	62,200
1996	64,700
1997	67,300
1998	70,000
1999	72,800
2000	75,700

Fig. 5-13 Distribution Pattern of Port Cargo

– Fertilizer –

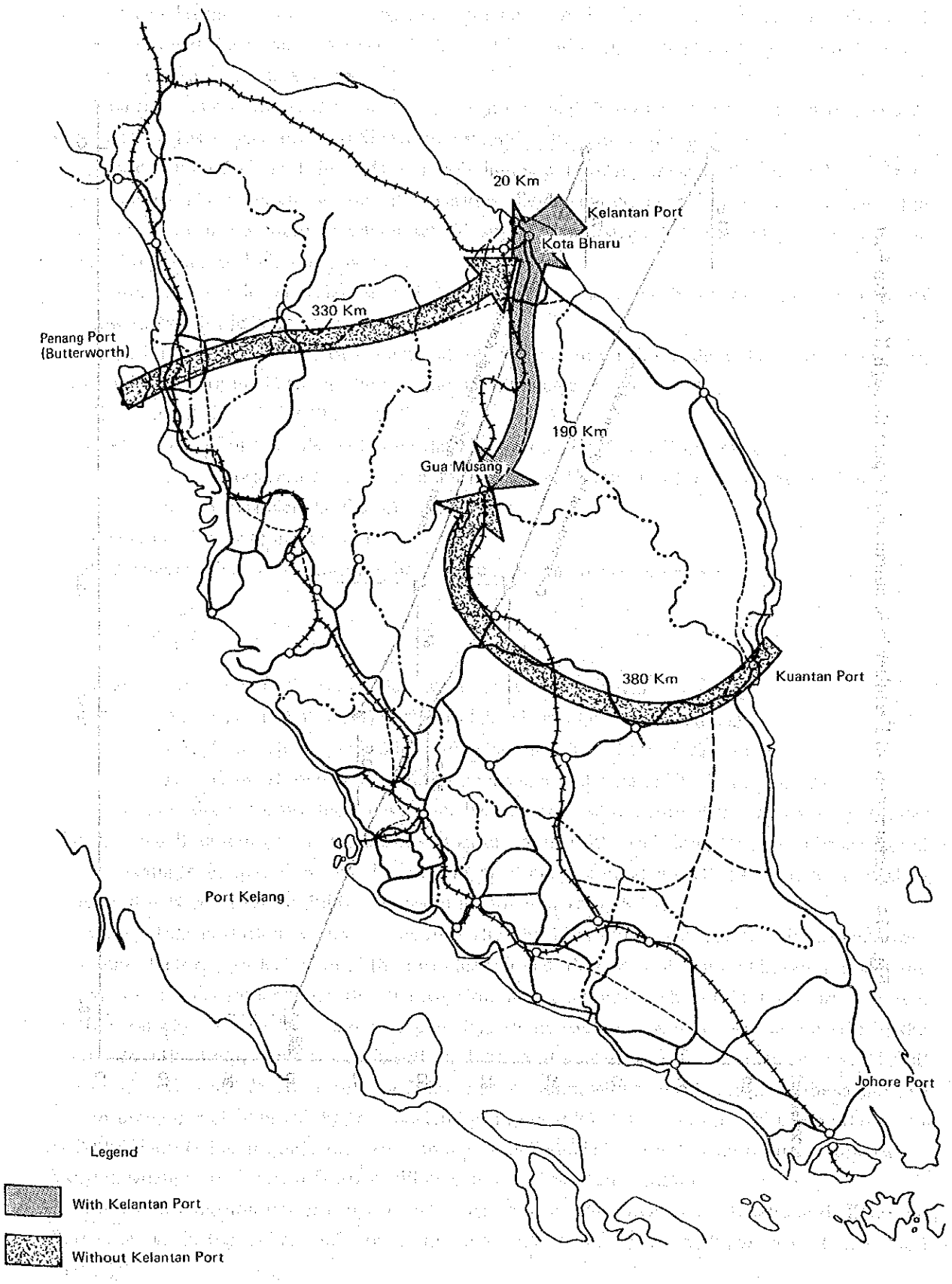
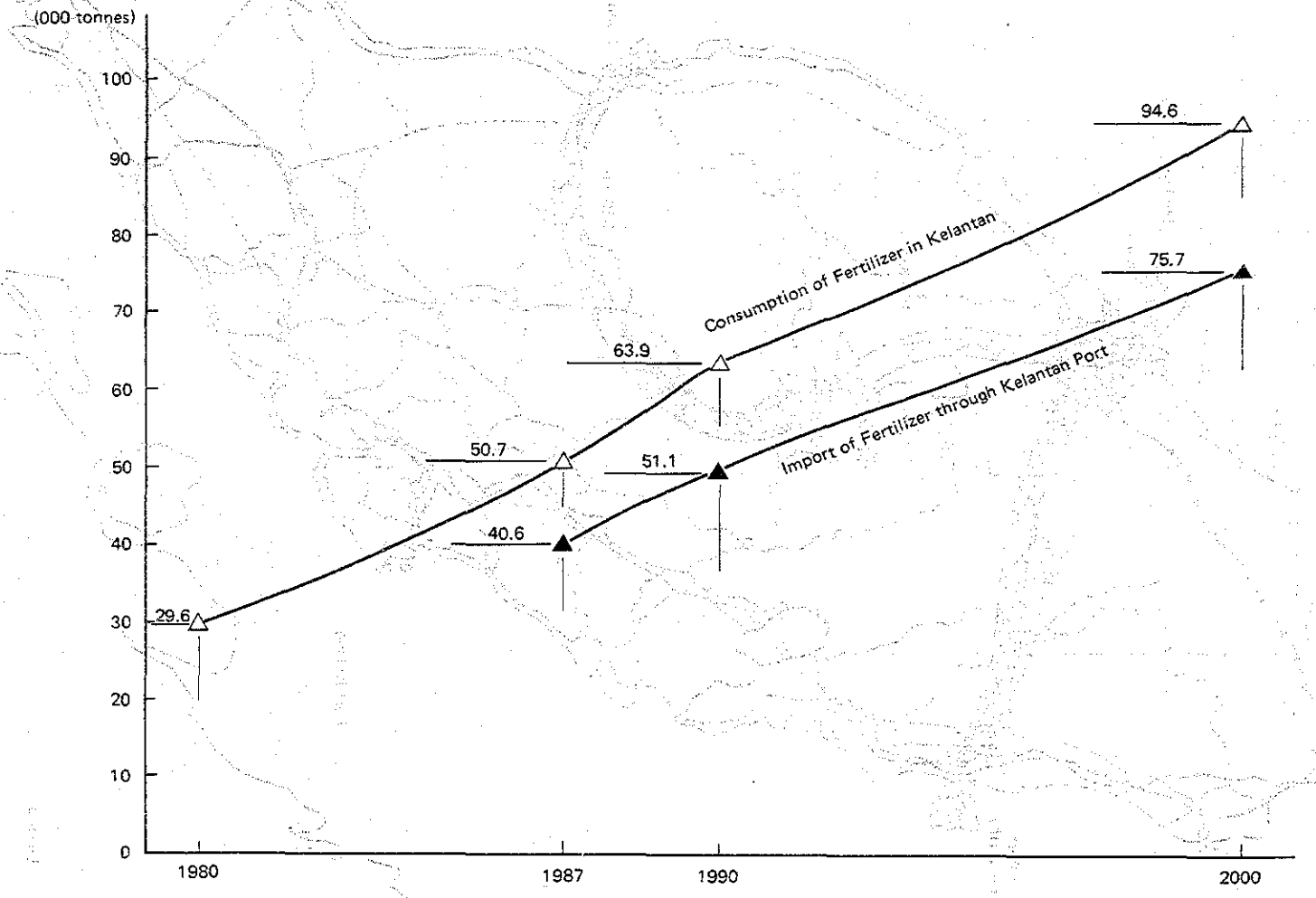


Fig. 5-14 Consumption of Fertilizer in Kelantan and Import through Kelantan Port



⑤ Cement

Cement production and sales have been increasing in line with the economic growth in Peninsular Malaysia as is often the case in developed countries. The average annual growth rate of cement sales was 9.8 percent between 1975 to 1978, and that of the gross domestic product was 8.3 percent during the same period.

Kelantan, having no cement factories, imported 78,600 tonnes of cement from factories in Bukit Keteri, Tasek, Rawang, and Singapore by rail in 1979, as shown in Table 5-28.

Future sales of cement in Kelantan will increase rapidly, because the Federal and State Governments place emphasis on the various fields of economic development, and the construction of infrastructures which would support industrial activities as well as raise the standard of living for Kelantan's people.

Future cement sales in Kelantan and the incoming cement can be estimated on the basis of the flow shown in Fig. 5-15.

Based on the past records of cement sales and gross domestic product shown in Table 5-29, the correlation formula between the two can be obtained as follows.

$Yi = 150.6 \times Xi - 747{,}800$ ($\gamma = 0.92$)

where, Yi: Cement Sales in Peninsular Malaysia in the Year i (tonnes)

Xi: Gross Domestic Products of Peninsular Malaysia in the Year i (M$ million)

γ: Coefficient of Correlation

Regression line is shown in Fig. 5-16.

And cement sales in Kelantan can be calculated by the following equation.

$$yi = Yi \times \frac{gi}{Gi}$$

where, yi: Cement Sales in Kelantan in The Year i (tonnes)

Yi: Cement Sales in Peninsular Malaysia in The Year i (tonnes)

gi: Gross Domestic Product of Kelantan in The Year i (M$ million)

Gi: Gross Domestic Product of Peninsular Malaysia in The Year i (M$ million)

Since gross domestic products have already been estimated, future cement sales in Peninsular Malaysia and Kelantan are estimated as shown in Table 5-30. And annual sales can be estimated on the assumption that they will increase at an average annual growth rate between 1980 to 1990, and between 1990 to 2000. The result is shown in Table 5-31.

Marine transportation would be theoretically the least expensive way to ship cement from producing factories to Kelantan if the distance is longer than several hundred kirometers and the volume of cargo is rather large. But the total volume of cement might not be transported by sea, existing railway or new highways will play important roles in cement distribution still in the future. In this study, cement which will be discharged at Kelantan Port is estimated at 71,800 tonnes in 1987, and 378,700 tonnes in 2000, on the assumption that 40 percent of the cement to be consumed in Kelantan will be transported by ship in 1987, 50 percent in 1990, and 60 percent in 2000, considering not only the situation mentioned above but the transportation cost between Pancing where a new cement factory will be completed and Gua Musang.

Future distribution pattern of cement which will be transported into Kelantan via Kelantan Port is shown in Fig. 5-17. And annual inbound quantity of cement is shown in Table 5-32, and Fig. 5-18.

Table 5-28 Main Distribution of Cement into Kelantan by Railway (1979)

(tonnes)

Destination / Origin	Ulu Kelantan Gua Musang Kuala Krai, etc.	Tanah Merah Machang	Pasir Mas	Tumpat A Wakaf Bahru Kota Bharu Tumpat, etc.	Tumpat B Rantan Panang Sungei Golok etc.	Total
State of Perlis	1,097	788	1,453	8,900	112	12,350
Kinta	3,436	5,606	4,755	41,175	240	55,212
Ulu Selangor	495	406	316	6,775	30	8,022
Singapore	339	210	225	2,182	60	3,016
Total	5,367	7,010	6,749	59,032	442	78,600

Total distribution of cement shipping into Kelantan by Malayan Railway is 78,760 tonnes, including 450 tonnes of movement within Kelantan.
Source: Origin and Destination 1979, Malayan Railway.

Table 5-29 Cement Sales and GDP in Peninsular Malaysia

Year	Production (tonnes)	Sales (tonnes)	GDP (M$ million in 1970 prices)
1974	1,363,921	1,362,332	14,767
1975	1,445,684	1,647,542	14,930
1976	1,739,338	1,726,269	16,335
1977	1,776,777	1,794,622	17,663
1978	2,196,496	2,179,606	18,976

Source: Monthly Statistical Bulletin, Peninsular Malaysia March 1980, Department of Statistics

Fig. 5-15 Estimate Flow of Cement Inbound / Import

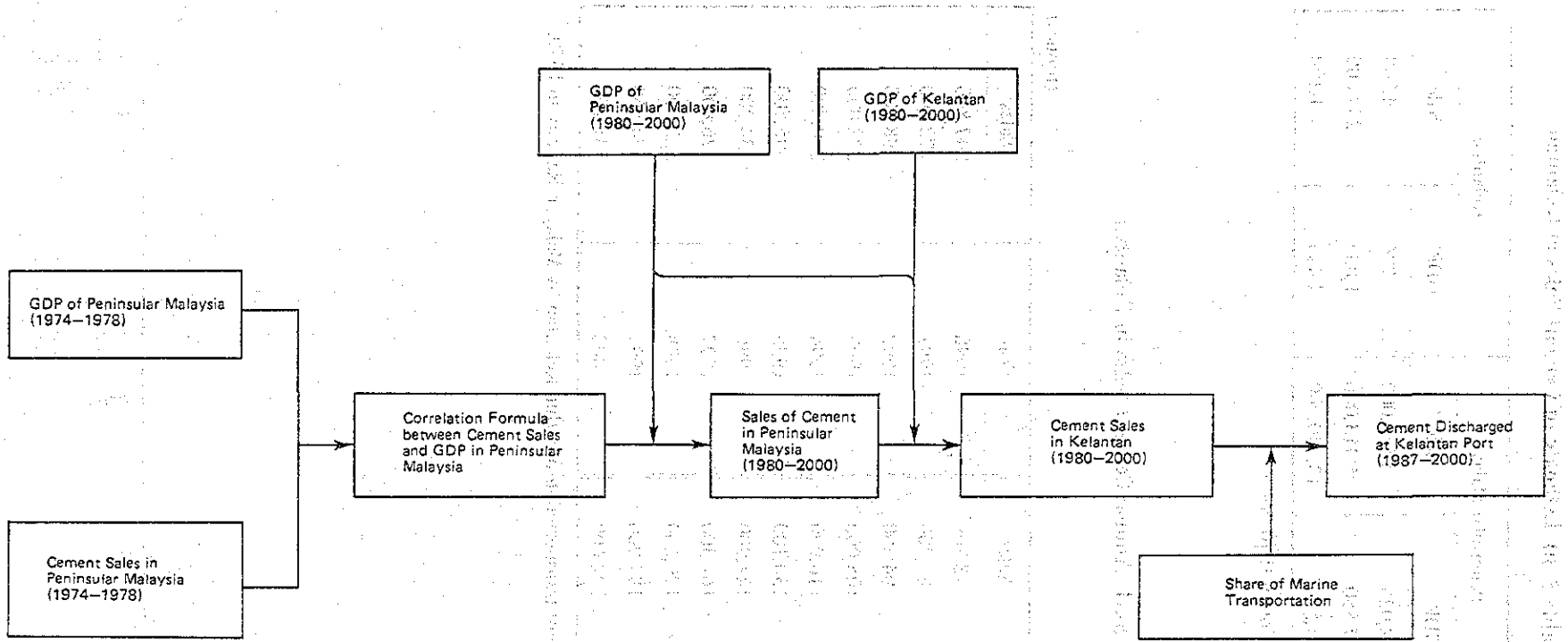


Table 5-30 Estimate of Cement Sales in Kelantan

Year	Peninsular Malaysia		Kelantan	
	GDP[1]	Sales[2]	GDP[1]	Sales[2]
1980	22,025	2,569,000	726	84,700
1990	47,550	6,413,000	1,837	247,800
2000	93,538	13,340,000	4,425	631,100

Note 1. M$ million in 1970 prices
2. tonnes

Table 5-31 Annual Cement Sales in Kelantan

(tonnes)

Year	Sales	Year	Sales
1979	78,769[1]	1990	247,800
1980	84,700	1991	272,100
1981	94,300	1992	298,700
1982	105,000	1993	328,000
1983	116,900	1994	360,200
1984	130,100	1995	395,500
1985	144,900	1996	434,200
1986	161,300	1997	476,800
1987	179,600	1998	523,500
1988	199,900	1999	574,800
1989	222,600	2000	631,100

Note 1. Cement transported into/within Kelantan by Malayan Railway in 1979.

Fig. 5-16 Cement Sales and GDP in Peninsular Malaysia

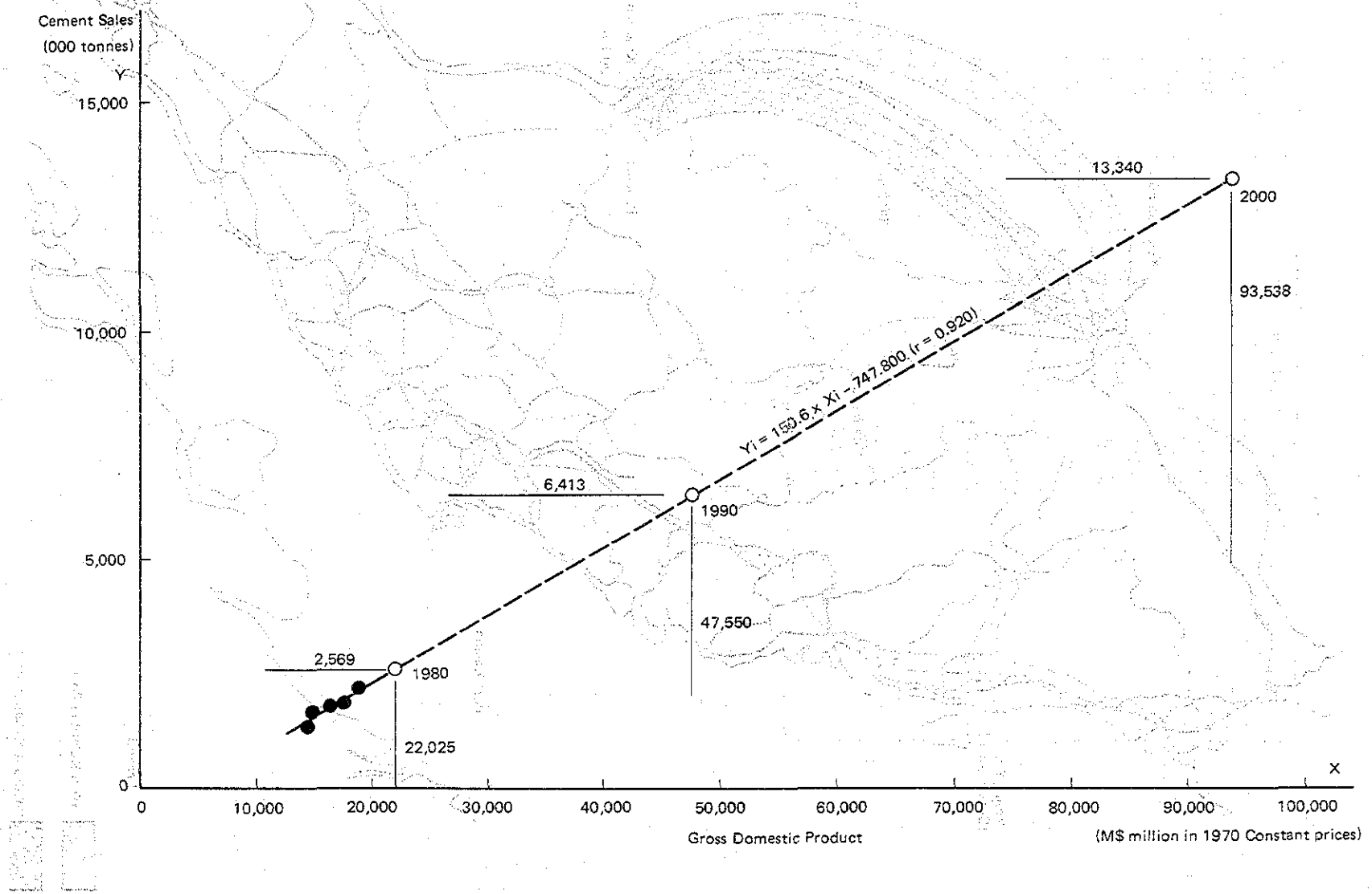


Fig. 5-17 Distribution Pattern of Port Cargo

— Cement —

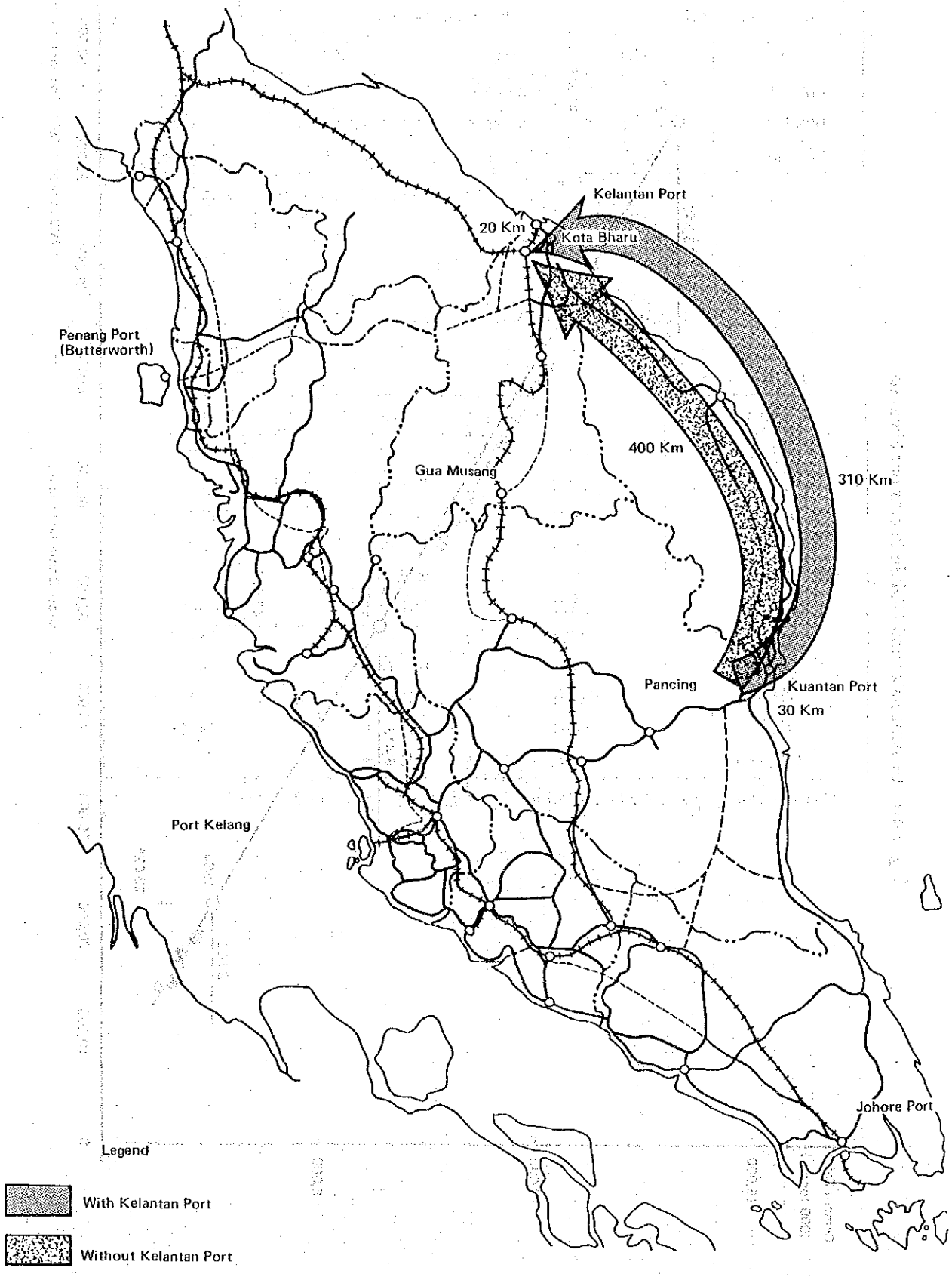
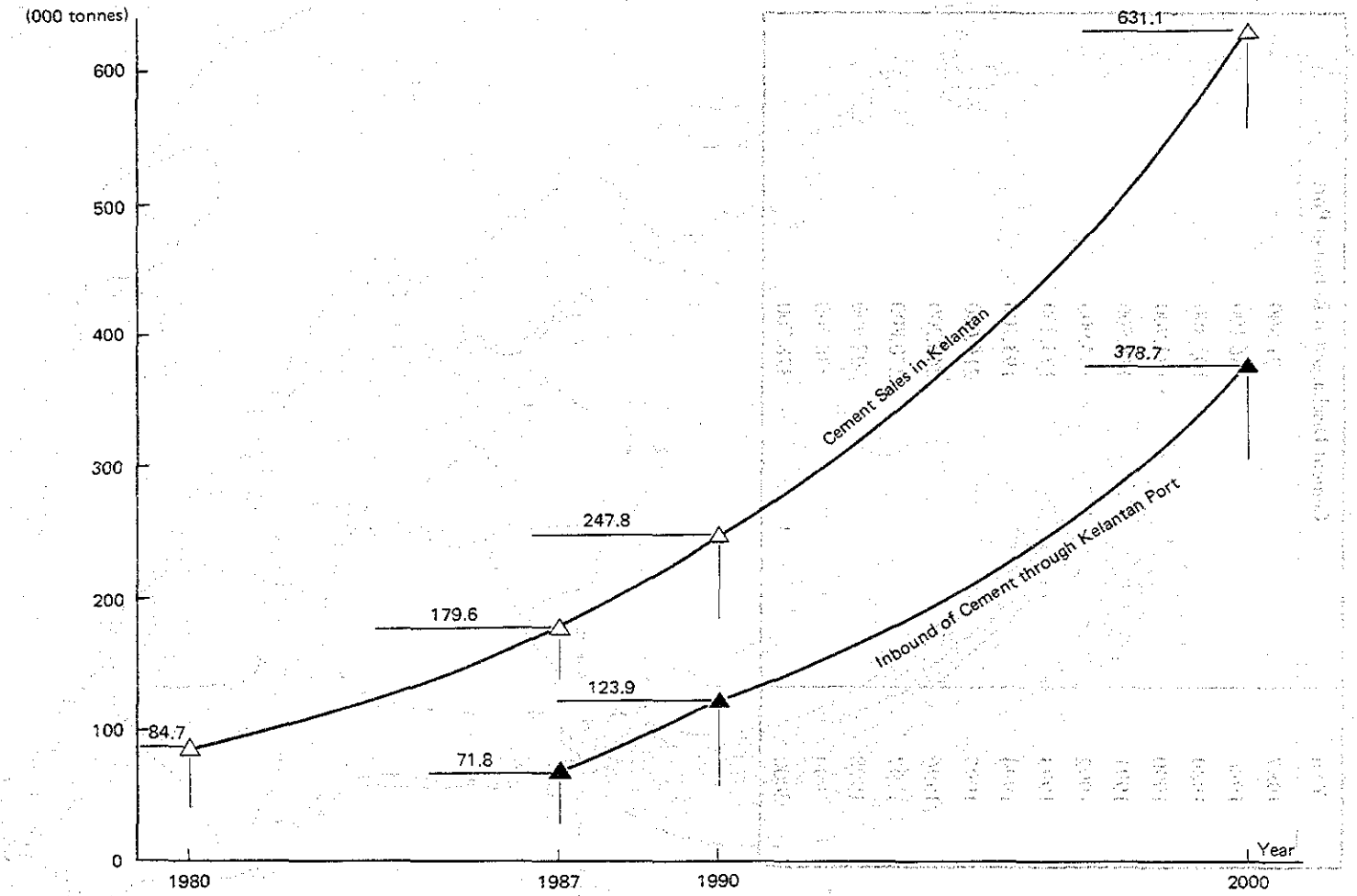


Table 5-32 Inbound of Cement through Kelantan Port

(tonnes)

Year	Cement Discharged at Kelantan Port
1987	71,800
1988	86,100
1989	103,300
1990	123,900
1991	138,500
1992	154,900
1993	173,200
1994	193,700
1995	216,600
1996	242,200
1997	270,800
1998	302,900
1999	338,700
2000	378,700

Fig. 5-18 Cement Sales in Kelantan and Inbound through Kelantan Port



⑥ Petroleum Products

Petroleum products which will be discharged at Kelantan Port consist of gasoline (petrol), kerosene, diesel (fuel) oil, aviation fuel, and LPG.

Almost all petroleum products are at present transported into Kelantan by the Malayan Railway, mainly from Port Dickson where the biggest petroleum refineries are installed in Malaysia. In 1979, petroleum products of 74,500 tonnes except for aviation fuel and LPG were supplied by rail due to the O-D survey by the Malayan Railway, shown in Table 5-33.

In general, consumption of these petroleum products will increase with the rise in the people's standard of living, accelerated industrial development, growth of the number of motor vehicles, etc. It is expected that the factors mentioned above will have a tendency to make consumption increase in Kelantan.

Future consumption of petroleum products can be estimated considering the conditions described below, which were applied to the projections in the General Transport/Railway Study for Peninsular Malaysia by CPCS in 1978.

Gasoline (Petrol), Kerosene and Diesel (Fuel) Oil

Period	Average Annual Growth Rate
1979 – 1985	19.4 percent
1986 – 1990	10.2 "
1991 – 2000	8.0 "

Aviation Fuel and LPG

Period	Average Annual Growth Rate
1980 – 1985	12.2 percent
1986 – 1990	11.9 "
1991 – 2000	10.0 "

Therefore the consumption of petroleum products is estimated at 278,300 tonnes in 1987, and 816,200 tonnes in 2000, as shown in Table 5-34.

Theoretically, marine transportation, possibly the least expensive transport mode for carrying bulky and large quantities of cargo, would be chosen to inbound petroleum products like cement. However the railway transportation of petroleum products will still exist in the future, despite the fact that the cost of transportation by rail would be slightly more expensive than by ship. The future distribution pattern of petroleum products to be discharged at the port is shown in Fig. 5-19.

In this study, petroleum products unloaded at Kelantan Port are estimated at 139,200 tonnes in 1987, and 653,000 tonnes in 2000 as shown in Table 5-35, and Fig. 5-20, assuming that half of the total consumption will be shipped by oil tanker in 1987, 60 percent in 1990, and 80 percent in 2000.

Table 5-33 Main Distribution of Petroleum Products into Kelantan by Railway (1979)

(tonnes)

Origin \ Destination	Ului Kelantan Gua Musang Kuala Krai, etc.	Tanah Merah Machang	Pasir Mas	Tumpat A Wakaf Bahru Kota Bharu Tumpat, etc.	Total
Diesel (Fuel) Oil					
Port Kelang	696	–	–	–	696
Port Dickson	3,582	880	5,012	6,531	16,005
Petrol					
Kuala Lipis	140	–	–	–	140
Port Dickson	2,560	2,074	53	44,424	49,111
Kerosene & Paraffin Oil					
Kuala Lipis	32	–	–	–	32
Port Dickson	983	601	–	6,924	8,508
Total	7,993	3,555	5,065	57,879	74,492

Total petroleum products distributed into and within Kelantan are 74,887 tonnes.
Source: Origin and Destination 1979, Malayan Railway.

Table 5-34 Consumption of Petroleum Products in Kelantan

(000 tonnes)

Year	Gasoline, Kerosene[1] Diesel (fuel) Oil	Aviation Fuels	Total
1979	74.5	6.5[2]	81.0
1980	89.0	7.2[2]	96.2
1981	106.2	8.1	114.3
1982	126.9	9.1	136.0
1982	151.5	10.2	161.7
1984	180.9	11.4	192.3
1985	216.0	12.8[2]	228.8
1986	238.0	14.3	252.3
1987	262.3	16.0	278.3
1988	289.1	18.0	307.1
1989	318.6	20.1	338.9
1990	351.0	22.5[2]	373.5
1991	379.1	24.8	403.9
1992	409.4	27.2	436.6
1993	442.2	29.9	472.1
1994	477.5	32.9	510.4
1995	515.7	36.2	551.9
1997	601.6	43.8	645.4
1998	649.7	48.2	697.9
1999	701.7	53.1	754.8
2000	757.8	58.4	816.2

Note 1. Growth Rate 1979 – 1985 19.4% (CPCS's Assumption)
1986 – 1990 10.2% (CPCS's Assumption)
1991 – 2000 8.0%

2. CPCS's Projection

Fig. 5-19 Distribution Pattern of Port Cargo
– Petroleum Products –

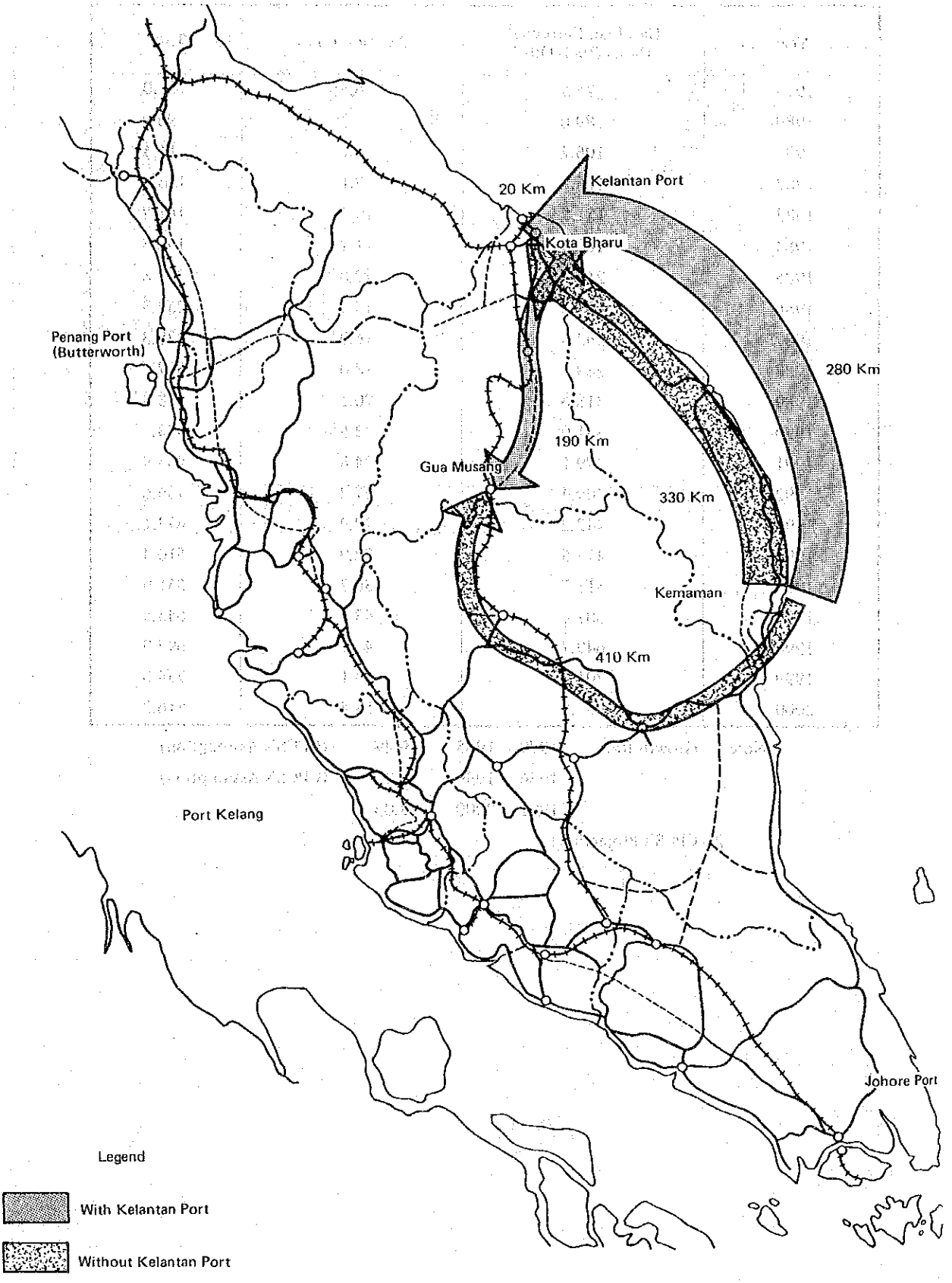
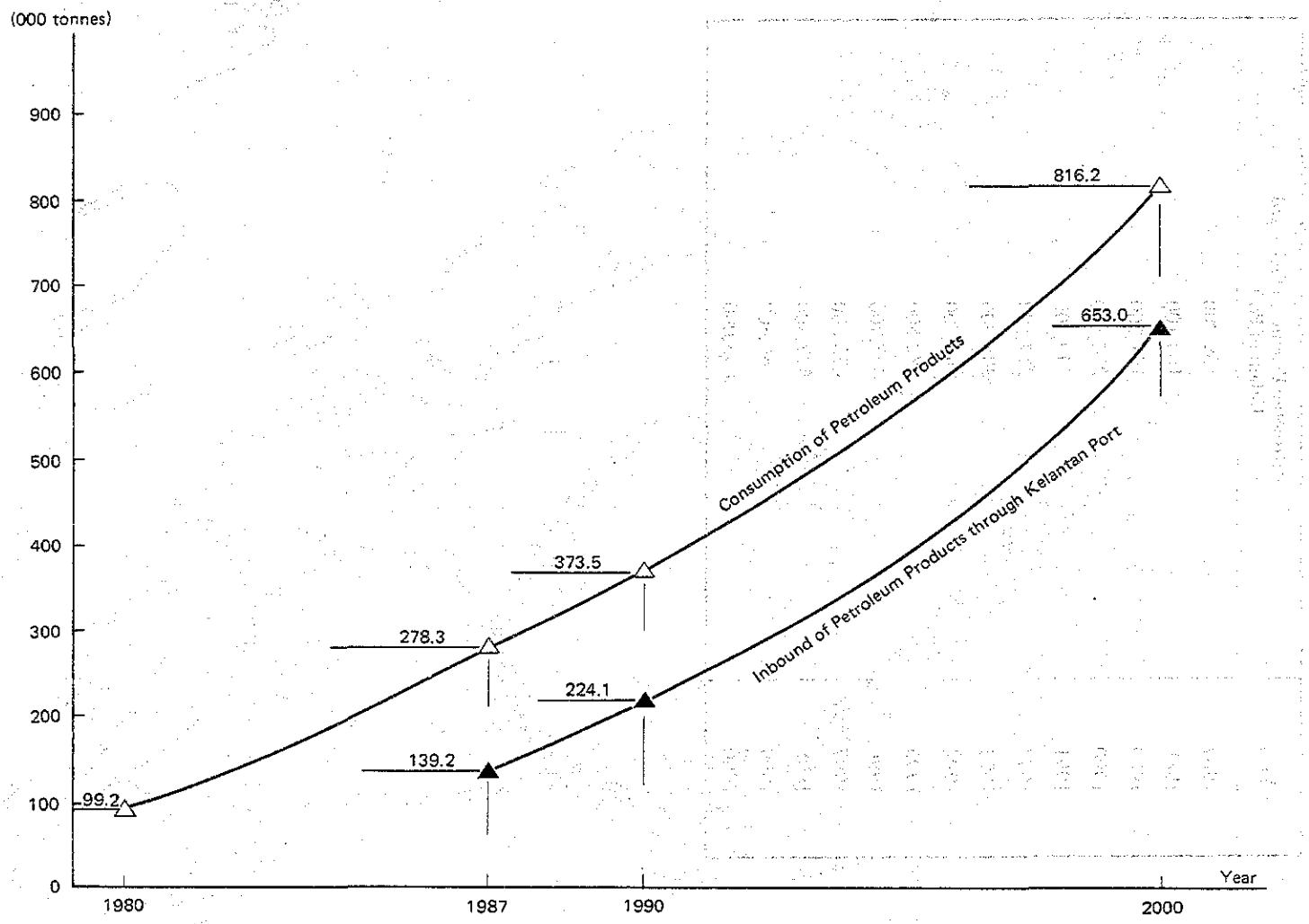


Table 5-35 Inbound of Petroleum Products through Kelantan Port

(tonnes)

Year	Petroleum Products Discharged Kelantan Port
1987	139,200
1988	163,100
1989	191,200
1990	224,100
1991	249,400
1992	277,500
1993	308,900
1994	343,700
1995	382,500
1996	425,700
1997	473,800
1998	527,300
1999	586,800
2000	653,000

Fig. 5-20 Consumption of Petroleum Products in Kelantan and Inbound through Kelantan Port



⑦ Rice

The production of rice cannot meet the demand in Peninsular Malaysia, accordingly rice is imported mainly from Thailand. Within Malaysia, Kelantan is a major producing and supplying state for rice, following Kedah and Perak. In 1978 – 1979 season, padi of 206,000 tonnes was produced. The surplus of rice was supplied by road or by rail to Trengganu, Pahang, Johore, etc. Railway transport of rice is shown in Table 5-36. At present padi is cultivated by smallholders, who constitute one of the major poverty groups in Kelantan, in the north plain area of Kelantan and by farmers in the Kemubu Agricultural Development Project area.

The Federal and State Governments have carried out policies to eradicate poverty among these poor smallholders as well as urban poverty groups with considerable efforts. And attainment of self-sufficiency for rice is one of the main agricultural development policies in Malaysia. Production of rice will increase in Kelantan, and the state will continue to be an important exporting area even in the future, with the progress of drainage and irrigation projects, the application of more fertilizer, utilization of high productive padi, mechanization of padi cultivation, etc. under the policies mentioned above.

Future production of padi and rice can be estimated, considering the growth of population, per capita consumption of rice, past productions of padi and rice in Peninsular Malaysia and Kelantan, self-sufficiency rate of rice, etc. Fig. 5-21 shows the process of estimate.

Future consumption of rice can be calculated by multiplying population by per capita consumption. The per capita consumption of rice in Peninsular Malaysia has recently decreased, and an average per capita consumption between 1974 and 1978 was 120 kg as shown in Table 5-37. In this study, the per capita consumption of 121 kg which was projected by FAO is employed. Future population has been already estimated at 13,474,000 in 1987, and 18,394,000 in 2000 in Peninsular Malaysia, and 995,800 in 1987 and 1,306,600 in 2000 in Kelantan.

Therefore the consumption of rice or the demand for rice, is calculated as follows:

	Peninsular Malaysia	Kelantan
1987	1,630,000	120,000
2000	2,226,000	158,000
		(tonnes)

Production of rice and padi in Peninsular Malaysia and Kelantan is obtained by the following expressions.

$Ri = Ci \times s$

$Pi = Ri \times 1/\alpha$

$pi = Pi \times k$

$ri = pi \times \alpha$

where, Ri: Production of Rice in Peninsular Malaysia (tonnes)
Pi: Production of Padi in Peninsular Malaysia (tonnes)
Ci: Consumption of Rice in Peninsular Malaysia (tonnes)
ri: Production of Rice in Kelantan (tonnes)
pi: Production of Padi in Kelantan (tonnes)
s: Self Sufficiency Ratio

α: Recovery Rate of Processing from Padi to Rice

k: Ratio of Padi Production of Kelantan

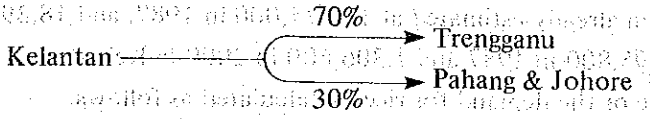
$$= \frac{\text{Padi Production in Kelantan}}{\text{Padi Production in Peninsular Malaysia}}$$

The target of self-sufficiency would be reached by 1990, according to the CPCS's study on transport of Peninsular Malaysia, so in this study this assumption is employed. The ratio of padi production in Kelantan to that of Peninsular Malaysia is assumed as 15 percent, considering past production records shown in Table 5-38. And the recovery rate of processing from padi to rice is 65 percent, which is given by the officials of the Agricultural Department, Kelantan, and also has been already applied in several feasibility studies or integrated development plans in Peninsular Malaysia.

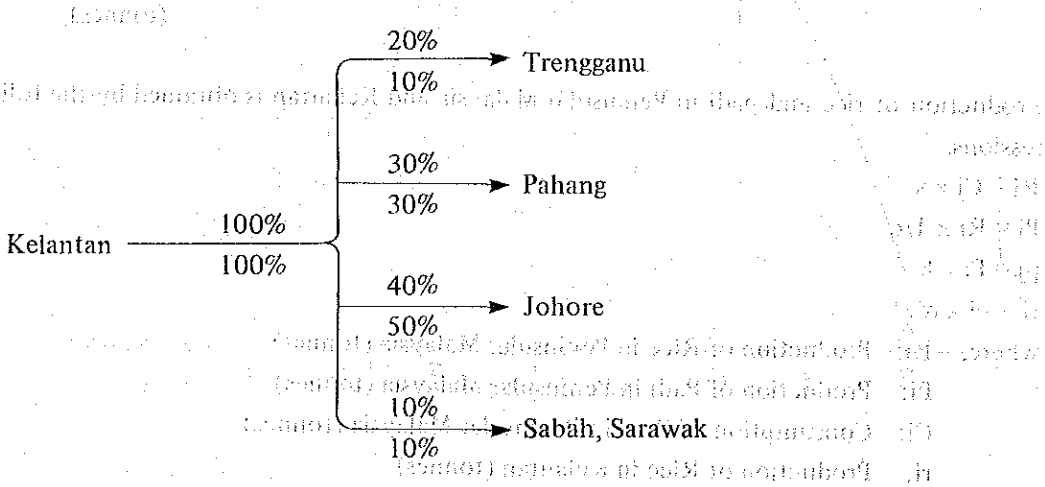
Therefore, future production and consumption of rice and padi in Peninsular Malaysia and Kelantan are estimated as shown in Table 5-39 and 5-40. As a result, the rice surplus of production over consumption in Kelantan is estimated at 117,000 tonnes in 1987, and 176,000 tonnes in 2000.

The estimated production of rice will certainly be assured by the future cultivated padi fields in the north plain and Kemubu area, introduction of double cropping, infrastructure developments for agriculture, etc.

According to the officials of the National Padi and Rice Board, main interstate movements of rice from Kelantan are presently assumed as follows.



The CPCS's study on transport/railway projected that there would be a shortage of rice in Pahang and Johore, but the production of rice could meet the demand in Trengganu by 1990. So the distribution share of rice surplus in Kelantan is assumed as follows.



Upper: 1987 – 1990

Lower: 1991 -- 2000

Marine transportation, probably the least expensive transportation mode, might be selected to ship rice from Kelantan to Pahang and Johore, considering the volume of cargo and the distance between the two states. But, as is the case of cement and petroleum products, existing land transportation by road and by rail will probably be used in the future. Therefore in the study, it is assumed that 50 percent of the rice surplus to be distributed into Pahang and Johor, and the total rice to be consumed in East Malaysia will be loaded at Kelantan Port and transported to those consuming areas by ship. Consequently, rice to be outbound from Kelantan Port is estimated at 52,700 tonnes in 1987, and 88,000 tonnes in 2000. The future distribution pattern of rice loaded at Kelantan Port is shown in Fig. 5-22.

Annual surplus of rice in Kelantan and outbound rice through Kelantan Port are shown in Table 5-41 and Fig. 5-23.

Table 5-36 Distribution of Rice from Kelantan by Railway (1979)

(tonnes)

Origin / Destination	Tumpat A Wakaf Bahru Kota Bharu Tumpat, etc.	Ulu Kelantan	Total
Kuala Lumpur (K.L.)	1,026		1,026
" (Ampang)	115		115
Seremban	311		311
Port Dickson	49		49
Tampin	53		53
Kluang	1,052		1,052
Johore Bharu	263	17	280
Temerlor	49		49
Kuala Lipis	619		619
Total	3,537	17	3,554

Total distribution of rice from Kelantan by Malayan Railway is 3,745 tonnes, including 191 tonnes of inter-districts transhipment in Kelantan.
Source: Origin and Destination, 1979, Malayan Railway.

Fig. 5-21 Estimate Flow of Rice Outbound

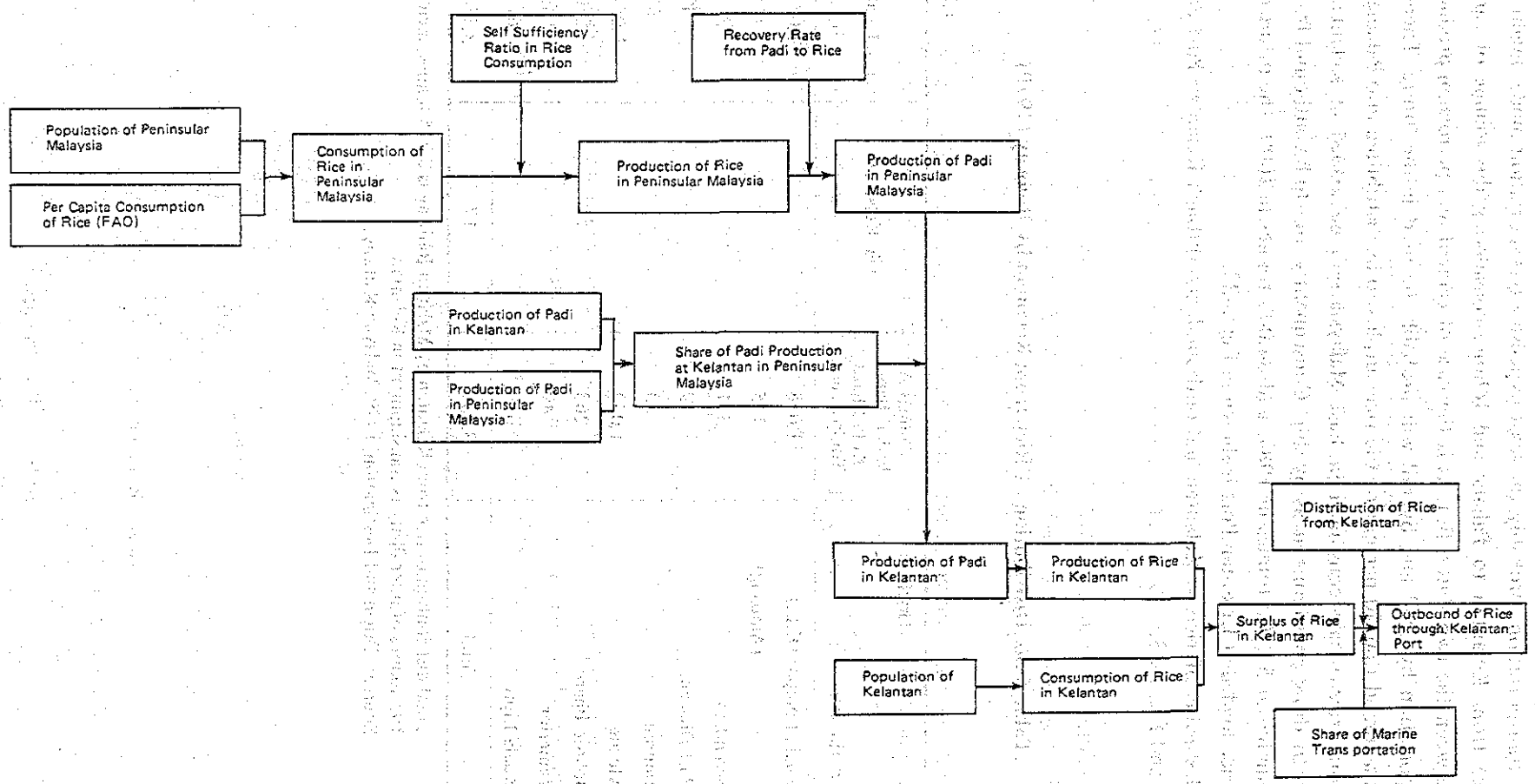


Table 5-37 Per Capita Consumption of Rice – Peninsular Malaysia –

Year	Production[1] (000 tonnes)	Imports[1] (000 tonnes)	Exports[1] (000 tonnes)	Consumption (000 tonnes)	Population[2]	Per Capita Consumption (kg)
1974	1,182.6	222.5 (16.0)	14.6	1,390.5	9,742,211	143
1975	1,116.2	87.0 (7.4)	25.5	1,177.7	9,998,252	119
1976	1,135.6	131.1 (10.5)	14.8	1,251.9	10,242,352	122
1977	1,060.0	162.5 (13.3)	–	1,222.5	10,510,095	116
1978	798.7	296.5 (27.3)	9.2	1,086.0	10,778,000	101

Source 1 & 2: Monthly Statistics Bulletin, Peninsular Malaysia, March, 1980
Department of Statistics

Table 5-38 Caltivated Area & Production of Padi

Season	Kelantan[1]		Peninsular Malaysia[2]		(A)/(B) (%)
	Cultivated Area (ha)	Padi Production (A) (tonnes)	Cultivated Area ('000 ha)	Padi Production (B) ('000 tonnes)	
1971–62 season	92,161	192,837	572	1,540	12.5
1972–72 "	93,651	210,965	592	1,700	12.4
1973–74 "	91,438	205,064	597	1,789	11.5
1974–75 "	98,841	196,748	595	1,689	11.7
1975–76 "	94,939	198,238	580	1,719	11.5
1976–77 "	91,124	224,888	567	1,604	14.0
1977–78 "	96,760	240,216	446	1,209	19.9
1978–79 "	96,170	205,727	na	na	–

Source 1. Agricultural Department, Kelantan
2. Monthyl Statistical Bulletin Peninsular Malaysia March 1980
Department of Statistics

Table 5-39 Production and Consumption of Rice in Peninsular Malaysia

Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Consumption														
Rice														
Population (000)	13,474	13,811	14,156	14,510	14,850	15,212	15,580	15,954	16,337	16,729	17,130	17,542	17,963	18,394
Per capita consumption (kg)[1]	121	121	121	121	121	121	121	121	121	121	121	121	121	121
Consumption (000 tonnes)	1,630	1,671	1,713	1,756	1,798	1,841	1,885	1,930	1,977	2,024	2,073	1,123	2,174	2,226
Production														
Rice														
Self sufficiency ratio (%)[2]	97	98	99	100	100	100	100	100	100	100	100	100	100	100
Local Production (000 tonnes)	1,581	1,638	1,696	1,756	1,798	1,841	1,885	1,930	1,977	2,024	2,073	2,123	2,174	2,226
Import (000 tonnes)	49	33	17	–	–	–	–	–	–	–	–	–	–	–
Padi (000 tonnes)[3]	2,432	2,520	2,609	2,702	2,766	2,832	2,900	2,969	3,042	3,114	3,189	3,266	3,345	3,425

Note: 1. FAO's estimation
2. Assuming that self sufficiency ratio will increase until the year 1990 when self sufficiency of rice is accomplished.
3. Recovery rate from padi to rice: 65%

Table 5-40 Production, Consumption and Surplus of Rice in Kelantan

Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Production														
Padi (000 tonnes)[1]	365	378	391	405	415	425	435	445	456	467	478	490	502	514
Rice (000 tonnes)	237	246	254	263	270	276	283	289	297	304	311	319	326	334
Consumption														
Rice														
Population (000)	995.8	1017.1	1039.1	1061.4	1083.7	1106.4	1129.7	1153.4	1177.6	1202.4	1227.6	1253.4	1279.7	1306.6
Per capita consumption (kg)	121	121	121	121	121	121	121	121	121	121	121	121	121	121
Consumption (000 tonnes)	120	123	126	128	131	134	137	139	143	145	149	152	155	158
Surplus (000 tonnes)	117	123	128	135	139	143	146	150	154	158	162	167	171	176

Note: 1. Padi production in Kelantan is assumed to be 15% of Peninsular Malaysia.

Fig. 5-22 Distribution Pattern of Port Cargo

— Rice —

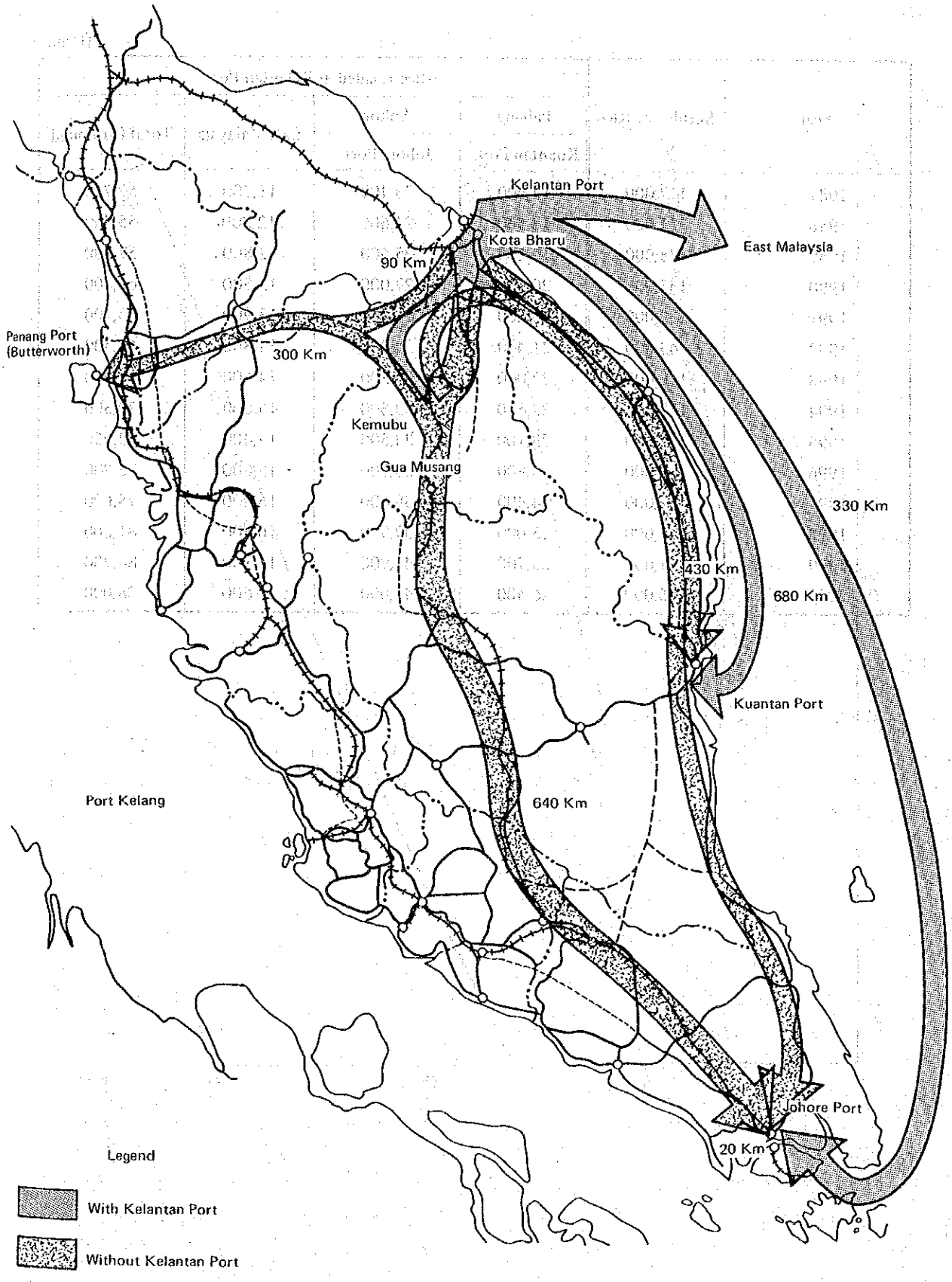


Table 5-41 Outbound of Rice through Kelantan Port

(tonnes)

Year	Surplus of Rice	Rice Loaded at Kelantan Port			
		Pahang	Sohor	East Malaysia	Total Outbound
		Kuantan Port	Johore Port		
1987	117,000	17,600	23,400	11,700	52,700
1988	123,000	18,500	24,600	12,300	55,400
1989	128,000	19,200	25,600	12,800	57,600
1990	135,000	20,300	27,000	13,500	60,800
1991	139,000	20,800	28,400	13,900	63,100
1992	143,000	21,400	29,800	14,300	65,500
1993	146,000	22,000	31,300	14,600	67,900
1994	150,000	22,500	32,800	15,000	70,300
1995	154,000	23,100	34,500	15,400	73,000
1996	158,000	23,800	36,200	15,800	75,800
1997	162,000	24,400	38,000	16,200	78,600
1998	167,000	25,000	39,900	16,700	81,600
1999	171,000	25,700	41,900	17,100	84,700
2000	176,000	26,400	44,000	17,600	88,000

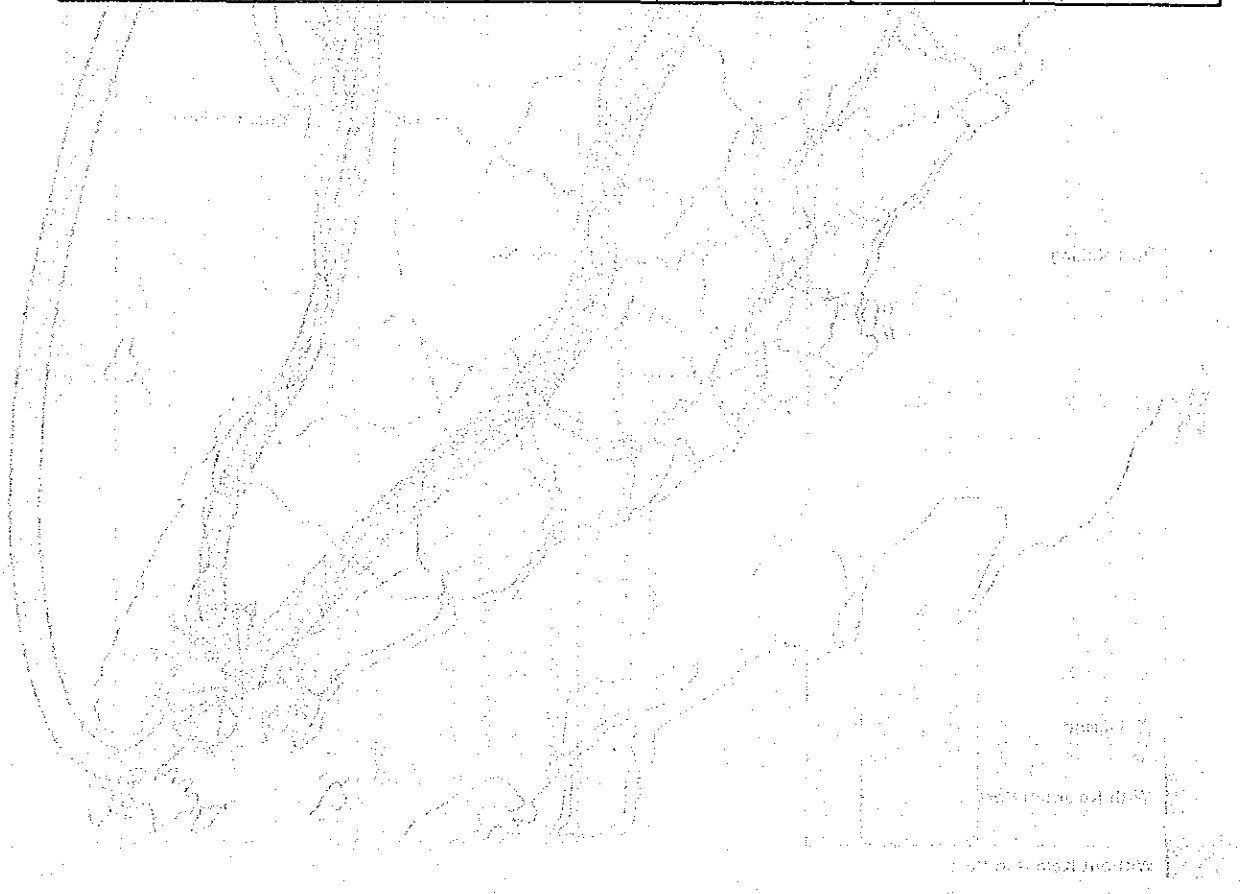
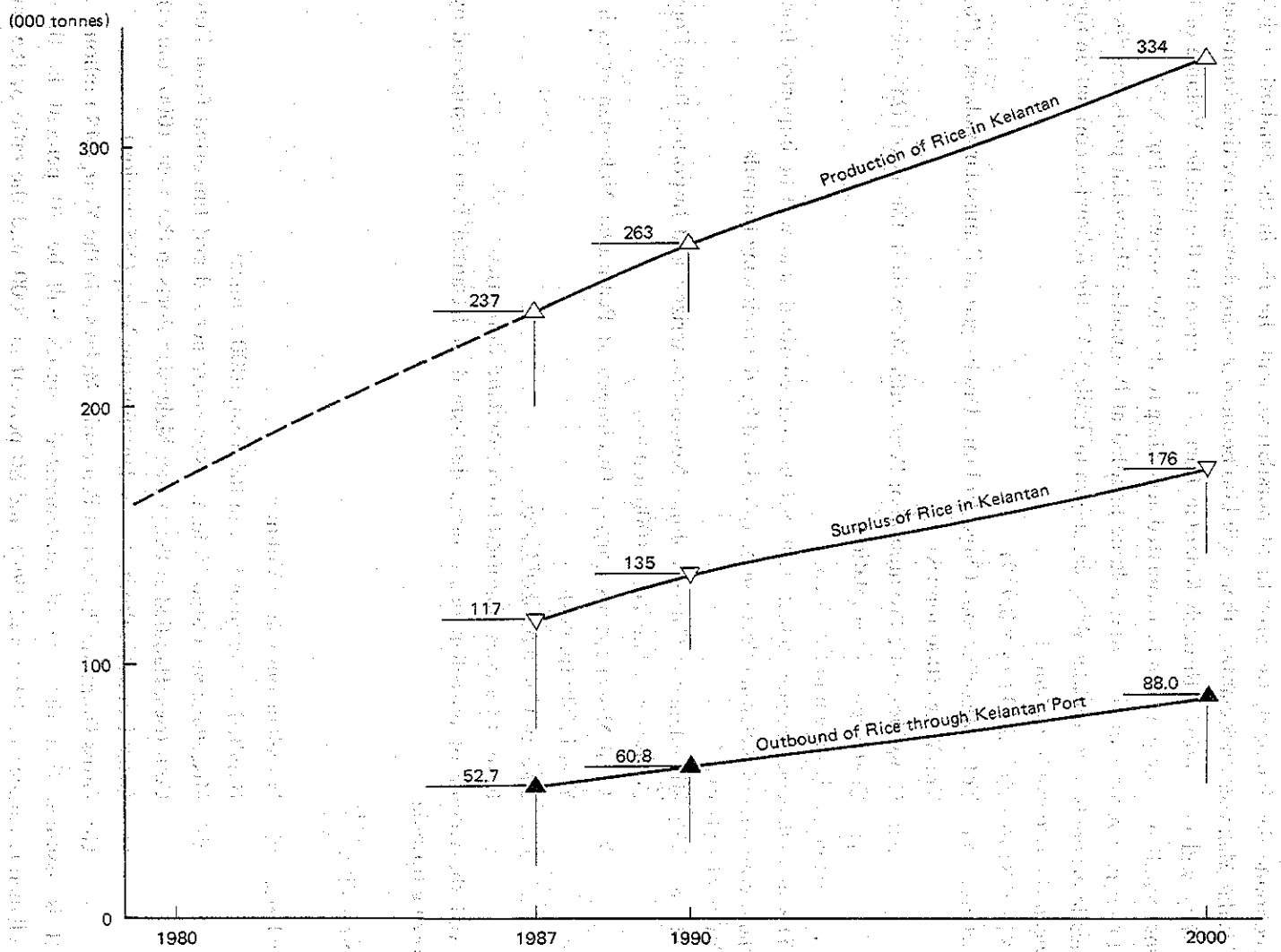


Fig. 5-23 Production and Surplus of Rice in Kelantan, and Outbound from Kelantan Port



⑧ Miscellaneous Cargo

Miscellaneous cargoes which will be imported via Kelantan Port comprise iron and steel, household goods, paper, machinery, etc. as shown in Table 5-42. Those commodities consisting of 3,587,000 tonnes were discharged at Peninsular Malaysian ports in 1979.

In the future these commodities will be increasingly imported in accordance with the progress of economic development, the growth of population, and the rise in the standard of living in Peninsular Malaysia. In Kelantan, there will also be an increasing demand for these commodities, and they will be imported through Kelantan Port if it is open to the public. Volume of those cargoes handled at the port can be estimated according to the flow shown in Fig. 5-24.

From past records of the cargo volume handled at Peninsular Malaysian ports and the gross domestic products of Peninsular Malaysia, shown in Table 5-42, the following correlation formula between the two can be obtained.

$Yi = 0.3156 \times Xi - 3{,}011$ ($\gamma = 0.955$)

where, Yi: Total Miscellaneous Cargo Volume Discharged at Peninsular Malaysian Ports in The Year i (000 tonnes)

Xi: Gross Domestic Production of Peninsular Malaysia in the Year i (M$ million)

γ: Coefficient of Correlation

The regression line is shown in Fig. 5-23.

The miscellaneous cargoes which will not be containerized, and will be imported from the foreland countries of Kelantan Port can be calculated by the following formula.

$Yi' = Yi \times (1-c) \times f$

where, Yi': Miscellaneous Cargo Volume Non-containerized and Imported from Foreland Countries in The Year i (000 tonnes)

Yi: Total Miscellaneous Cargoes Discharged at Peninsular Malaysian Ports in The Year i (000 tonnes)

c: Rate of Containerized Cargo

f: Rate of Cargoes Imported from Foreland Countries

And the volume of miscellaneous cargoes discharged at Kelantan Port is estimated by the following formula.

$$yi = Yi' \times \frac{gi}{Gi}$$

where, yi: Miscellaneous Cargo Volume Handled at Kelantan Port in the $Year_i$ (000 tonnes)

Yi': Miscellaneous Cargo Volume, Non-containerized and Imported from Foreland Countries, Handled at Peninsular Malaysian Ports in the $Year_i$ (000 tonnes)

gi: Gross Domestic Product of Kelantan in the $Year_i$ (M$ million)

Gi: Gross Domestic Product of Peninsular Malaysia in the $Year_i$ (M$ million)

It is assumed that the rate of containerized cargoes will be 70 percent in the total miscellaneous cargoes in 1987 and 1990, and 80 percent in 2000, and the ratio of the cargoes imported from foreland countries of Kelantan Port will be 50 percent, considering the present import ratio of 43 percent via Penang and Kelang Ports. Therefore, miscellaneous cargoes imported through Kelantan Port are estimated at 49,000 tonnes in 1987, and 125,000 tonnes in

2000 as shown in Table 5-43. And Table 5-44 and Fig. 5-26 show the annual miscellaneous cargoes handled at the port.

Future distribution pattern of miscellaneous cargoes via Kelantan Port is shown in Fig. 5-27.

Table 5-42 Miscellaneous Cargoes Discharged at Peninsular Malaysian Ports

(000 tonnes)

Commodity \ Year	1975	1976	1977	1978	1979
Milk	41	45	63	59	69
Machinery	112	91	89	103	133
Coale Coke	55	34	36	27	56
Beans	52	57	44	58	58
Canned Foodstuff	12	16	20	18	25
C.K.D. Vehicle Parts	48	62	66	73	78
Electric Goods and Parts	34	42	53	64	65
Paper	117	138	159	218	248
Plastic Goods	31	38	46	85	89
Rubber Goods	6	8	7	8	9
Hardware & Tools	16	20	28	45	41
Household Goods	108	192	238	336	329
Iron & Steel	315	369	385	625	768
Other Cargo	944	977	978	1,374	1,619
Total	1,891	2,089	2,212	3,093	3,587

Source: Monthly Statistical Bulletin, Peninsular Malaysia, March 1980
Department of Statistics

Fig. 5-24 Estimate Flow of Miscellaneous Cargoes

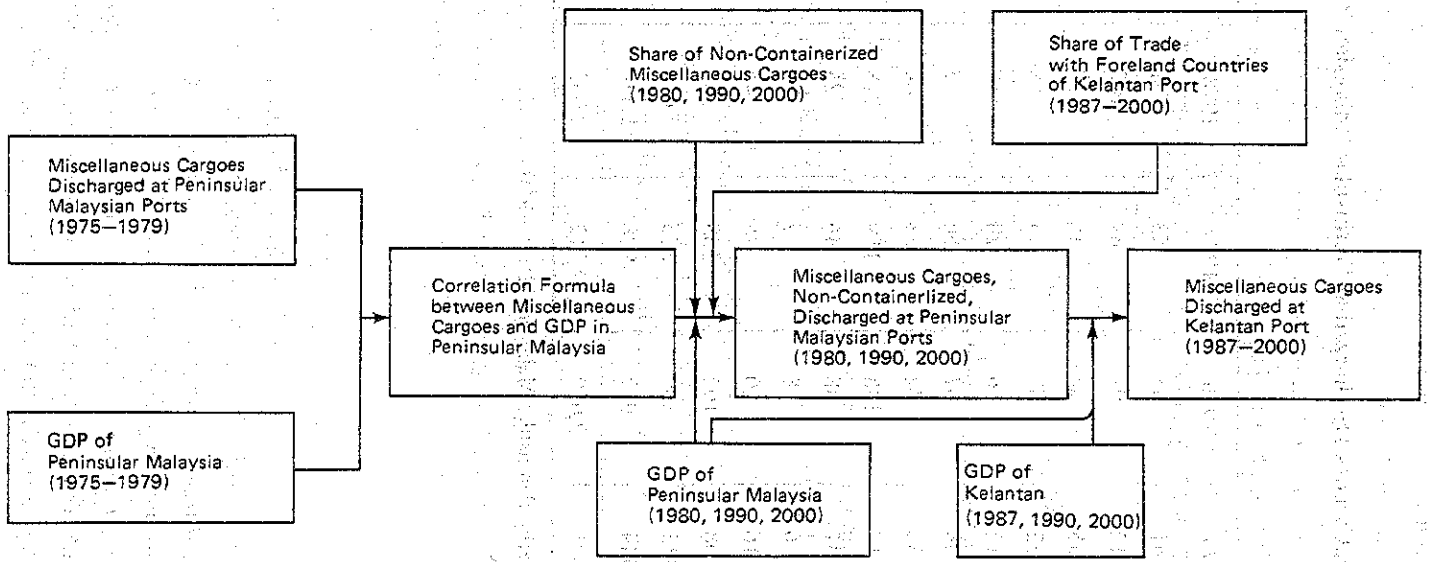


Fig. 5-25 Miscellaneous Cargoes and GDP in Peninsular Malaysia

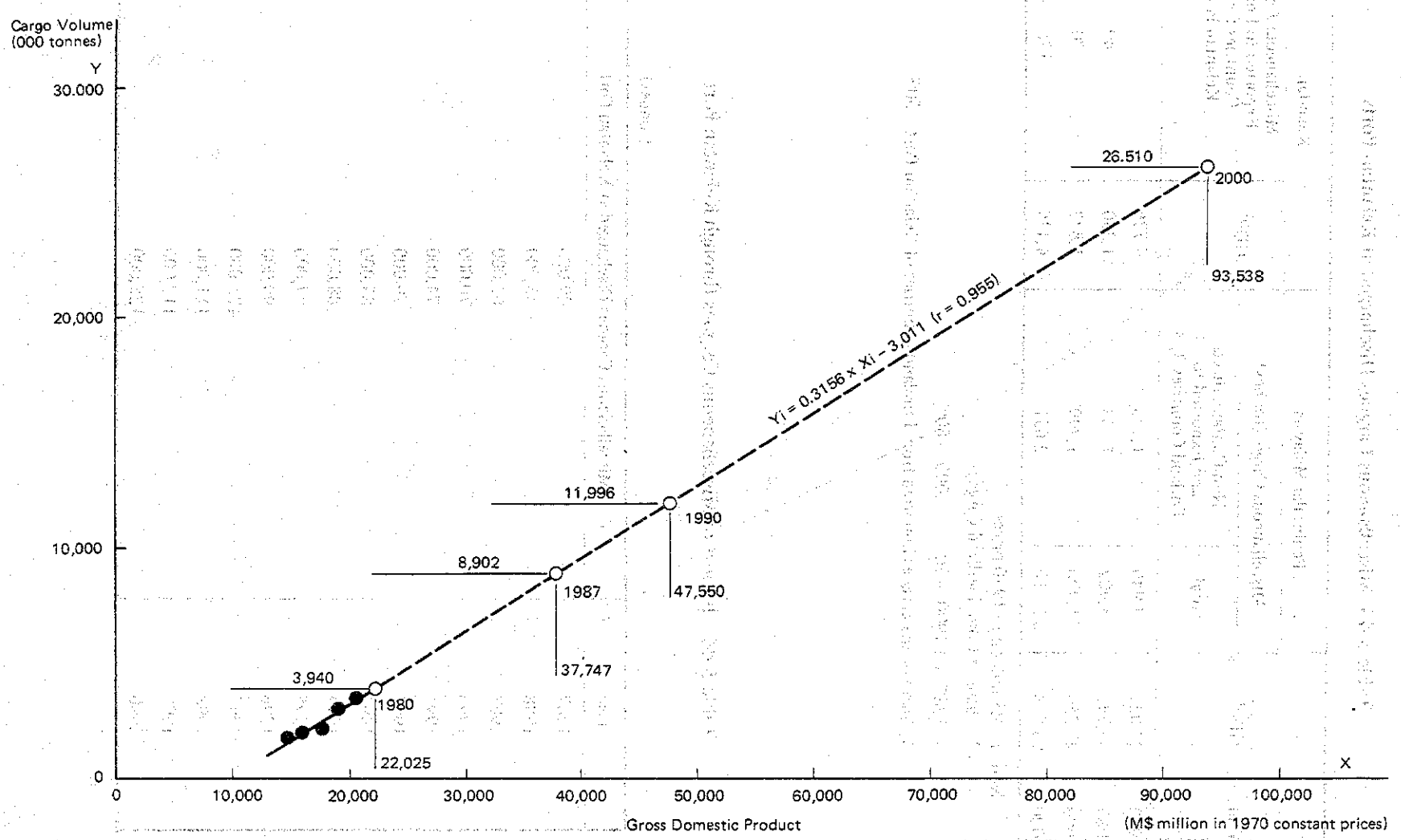


Table 5-43 Miscellaneous Cargoes Discharged at Kelantan Ports

Year	GDP[1]	Peninsular Malaysia		Kelantan	
		Miscellaneous Cargo (tonnes)		GDP[1]	Miscellaneous Cargoes Exported to Forland Countries from Kelantan Port (tonnes)
		Total	Non-Containerlized and Exported to Forland Countries 2, 3		
1980	22,025	3,940	1,478	726	–
1987	37,747	8,902	1,335	1,390	49
1990	47,550	11,996	1,799	1,837	70
2000	93,538	26,510	2,651	4,425	125

Note 1. M$ million in 1970 prices.
2. Share of Containerlized Cargoes
1987 and 1990 – 70% 2000 – 80%
3. Share of the cargoes imported from Foreland countries of Kelantan Port 50%

Table 5-44 Import of Miscellaneous Cargoes through Kelantan Port

(tonnes)

Year	Miscellaneous Cargoes Discharged at Kelantan Port
1987	49,000
1988	55,000
1989	62,000
1990	70,000
1991	74,000
1992	79,000
1993	83,000
1994	88,000
1995	94,000
1996	99,000
1997	105,000
1998	111,000
1999	117,000
2000	125,000

Fig. 5-26 Import of Miscellaneous Cargoes through Kelantan Port

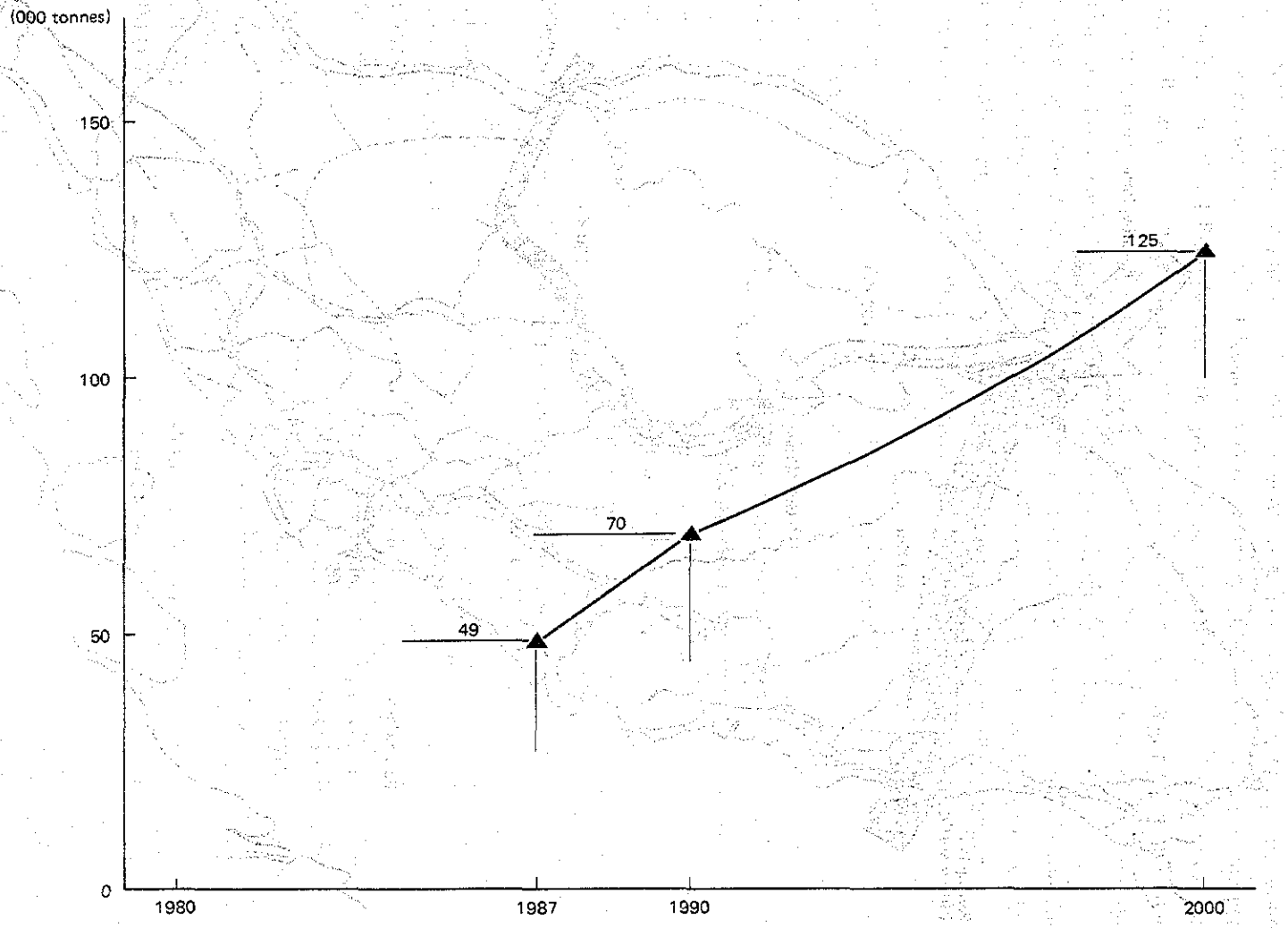
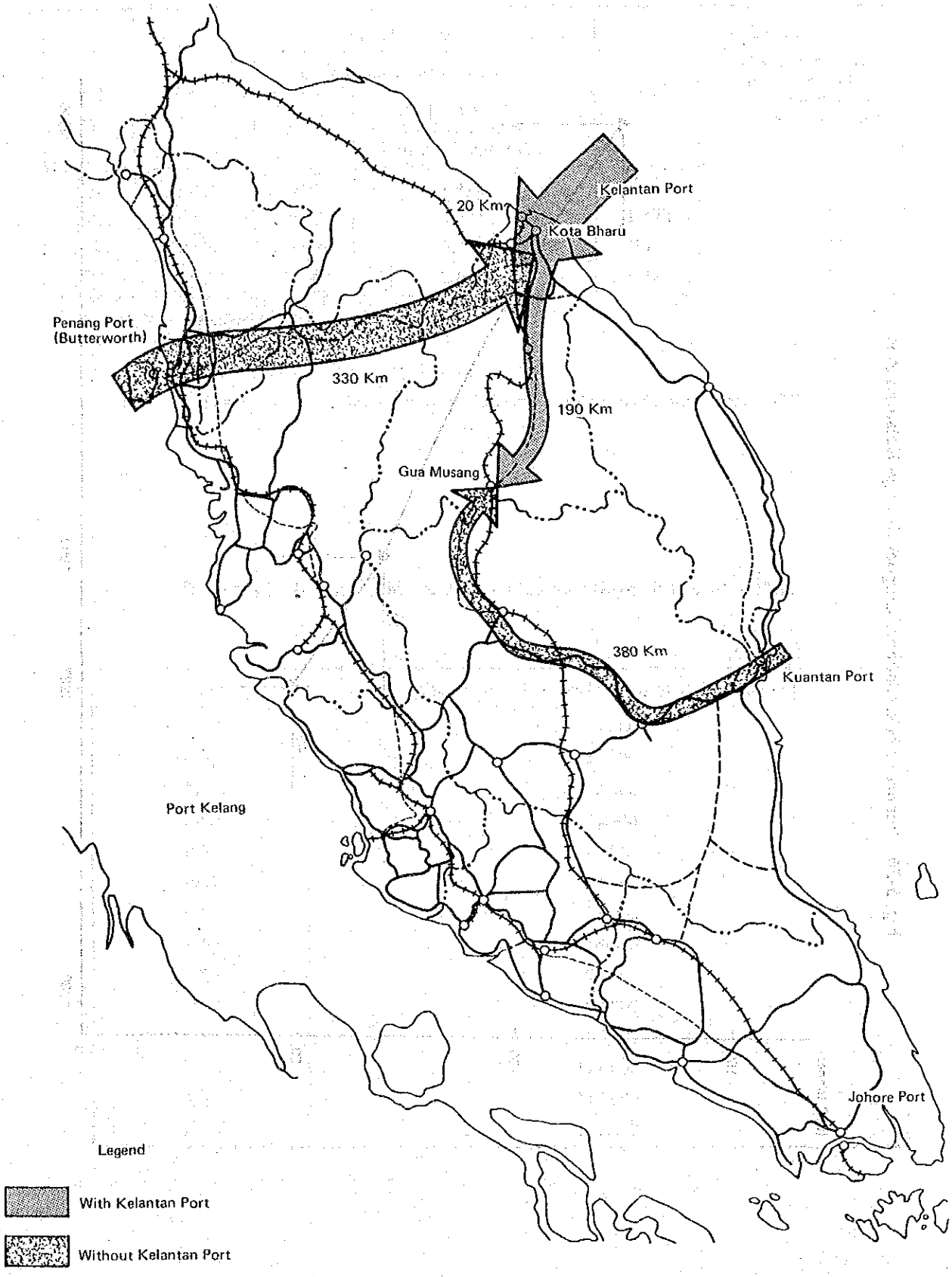


Fig. 5-27 Distribution Pattern of Port Cargo

– Miscellaneous –



5-2-2 Estimate of Ship Traffic

(1) Type and Size of Planned Ship

In general, type of ships calling at a port depends on quality and quantity of discharged or loaded commodities, existing port facilities, etc.

Wood products, rubber, fertilizer, palm oil, cement, rice, petroleum products, and other miscellaneous cargoes will be handed at Kelantan Port. Quantity of cargoes loaded or discharged will not be enough to attract liners to call at the port. Therefore ships calling at Kelantan Port in the early stage will comprise conventional cargo vessels and oil tankers under tramper shipping. The former will ship dry cargoes such as wood products, rubber, fertilizer, cement, rice, and the latter will transport liquid cargoes such as palm oil, and petroleum products.

Size of the vessels should be planned, considering the present ships sailing between Peninsular Malaysia and the foreland of Kelantan Port, the future trend of enlarging ship size in marine transportation, existing ships owned by the Malaysian International Shipping corporation, etc.

In the First Phase Development Plan, the planned ship sizes are considered as follows.

Type and Size	Commodity
Conventional Cargo Vessel	
1,000 DWT	Cement, Rice
5,000 DWT	Wood Products, Rubber
	Fertilizer, Miscellaneous Cargo
Oil Tanker	
1,000 DWT	Petroleum Products
2,000 – 3,000 DWT	Palm Oil

And the planned ship sizes in 2000 will be assumed as shown below.

Type and Size	Commodity
Conventional Cargo Vessel	
1,000 DWT	Cement, Rice
5,000 DWT	Wood Products, Rubber, Fertilizer
	Cement, Rice, Miscellaneous Cargo
10,000 DWT	Wood Products, Rubber, Fertilizer
	Cement, Miscellaneous Cargo
Oil Tankers	
1,000 DWT	Petroleum Products
5,000 DWT	Palm Oil

(2) Number of Calling Ships

Number of calling ships can be obtained by the following formula.

$$N = \frac{V}{U}$$

where, N: Annual Number of Calling Ships
V: Annual Cargo Traffic by Type of Ship (tons)
U: Cargo Loaded or Discharged per Ship
= Planned Ship Size(S) x Cargo Occupancy Ratio (α)

According to the estimated cargo traffic volume in 1987, number of vessels can be calculated as follows.

① Conventional Cargo Vessels of 5,000 DWT Class

Given,

V = 178,000 tons

Wood Products	49,000 tons
Rubber	41,000 tons
Fertilizer	39,000 tons
Miscellaneous	49,000 tons

S = 5,000 DWT, α = 0.80

Therefore, N = 45

② Conventional Cargo Vessels of 1,000 DWT Class

Given,

V = 125,000 tons

Cement	72,000 tons
Rice	53,000 tons

S = 1,000 DWT, α = 0.80

Therefore, N = 157

③ Oil Tankers of 2,000 – 3,000 DWT Class

Given,

V = 47,000 tons (Palm Oil)

S = 2,000 – 3,000 DWT

α = 0.80

Therefore, N = 24

④ Oil Tankers of 1,000 DWT Class

Given,

V = 139,000 tons (Petroleum Products)

S = 1,000 DWT

α = 0.80

Therefore, N = 174

Accordingly, the number of ships by type and by size calling at Kelantan Port in 1987 is summarized as shown below.

Type and Size	Annual Number of Calling Ships
Conventional Cargo Vessels	
5,000 DWT	45
1,000 DWT	157
Oil Tankers	
2,000 – 3,000 DWT	24
1,000 DWT	174

Number of vessels calling at Kelantan Port in 200 can be calculated in the same way as applied in the estimate to that of 1987, by using the projected cargo traffic volume in Table 5-6. The result of estimate is shown below.

Type and Size	Annual Number of Calling Ships
Conventional Cargo Vessels	
10,000 DWT	75
5,000 DWT	34
1,000 DWT	125
Oil Tankers	
2,000 – 3,000 DWT	31
1,000 DWT	817

5-3 Fish Landings, and Number of Fishing Boats and Fishermen

5-3-1 Fish Landings

Future marine fish landings in Kelantan and at Kelantan Port can be calculated according to the estimate flow shown in Fig. 5-28.

(1) Fish Landings in Kelantan

Marine fish landings in Kelantan have gradually increased except for 1977, when fishing operation suffered considerable difficulty due to rough weather at sea, as shown in Table 5-45. But at present marine fish catches can meet only forty percent of the demand of Kelantan's people, and the deficit of sixty percent is supposed to be imported from Thailand and the neighbouring state, Trengganu.

In the future, the demand for fish, main protein source for Kelantanese, will increase by degrees in order to improve their diets, which will need further development of ocean fisheries and new fishing port facilities. By improving existing fish landing facilities, the present level of self sufficiency might be maintained even though fish consumption increases. But, with the development of fishing port facilities in Kelantan Port, a much higher level of self sufficiency should be expected.

The target of marine fish landings in Kelantan can be estimated by the following formula.

$$L = \frac{P \times C \times 10^{-3} \times S}{(1 - t) \times (1 - e)}$$

where, L: Marine Fish Landings (tonnes/year)
P: Population
C: Per Capita Consumption (kg/year)
S: Self-Sufficiency Ratio
t: Trashfish Ratio
e: Export Ratio

Kelantan's population has already been estimated at 855,000 in 1980, 1,061,400 in 1990, and 1,306,000 in 2000, as shown in Table 5-1.

Per capita consumption can be obtained, considering present fish consumption in Peninsular Malaysia, Kelantan, and foreign countries. In 1978, the annual per capita consumption in Kelantan was 28.6 kg under the following conditions.

i) Marine Fish Landings: 14,493 tonnes/year
ii) 95 percent of edible fish was consumed in Kelantan, and the remaining 5 percent, valuable fish, was exported to Kuala Lumpur and Singapore.
iii) 30 percent of demanded edible fish was supplied from Kuala Trengganu and Kuala Buset, and another 30 percent was imported from Thailand.
iv) Freshwater fish was very small in quantity and negligible.
v) Trashfish composed 30 percent of the total marine fish catch.

And, in Peninsular Malaysia, the annual per capita consumption was 41.3 kg in 1978, indicating an increase by 22 percent compared with that of 1977, 33.8 kg, as shown in Table

5-46. In Hong Kong, Japan, and Singapore, people eat fish of about 40 kg a head per annum. Therefore, the annual per capita consumption in Kelantan assumed is to be 30 kg in 1980, 35 kg in 1990, and 40 kg in 2000, in the study.

It is assumed that the self sufficiency rate will be kept at 40 percent until 2000 even if Kelantan Port is not constructed, but with the Port, the rates shall be increased 40 percent in 1980, 55 percent in 1990, and 70 percent in 2000.

And trashfish ratio and export ratio are assumed not to change from the present levels, 30 percent and 5 percent, respectively.

The calculation is shown in Table 5-47. From the table, the landings in 1987 can be obtained as 24,960 tonnes with the Port, and 19,960 tonnes without the Port if those landings increase at an average growth rate between 1980 to 1990, they are 55,000 tonnes and 31,400 tonnes in 2000, respectively.

Table 5-48, and Fig. 5-29 show the annual landings.

(2) Fish Landing at Kelantan Port

Target of fish landings at Kelantan Port is determine to be 13,000 tonnes in 1987 and 28,000 tonnes in 2000, on the assumption that fifty percent of the total marine fish landings in Kelantan will be handled.

Annual landings are shown in Table 5-49 and in Fig. 5-29.

(3) Fish Resources

It is necessary to check whether there are enough fish resources in the fishing grounds to cope with the fish landings estimated in the previous section.

Fish have been caught rather indiscriminately be Thai fishermen in the Gulf of Siam, which includes the off-sea of Kelantan, one of the fishing grounds for Kelantan's fishermen. According to the demersal fish resource survey carried out in the limited water area in 1974, it is hard to say that resources are sufficient, as officials of the Fisheries Department pointed out. Until now no survey for pelagic fish resources was done by the government, therefore, it is not clear whether the resources are adequate. However, the study on the pelagic and demersal fish resources by FAO/UNDP in 1973 shows that potential resources of fish, 500,000 tonnes, are almost six times the catch in the Middle and South Sunda Continental Shelves of the South China Sea, which will be the major fishing grounds for the east coast fishermen of Peninsular Malaysia.

Therefore, it may be said that the fish resources could meet the future estimated fish landings at Kelantan Port.

Fig. 5-30 shows the present fish catch and potential resources studies by FAO/UNDP in 1973.

Fig. 5-28 Estimate Flow of Marine Fish Landings

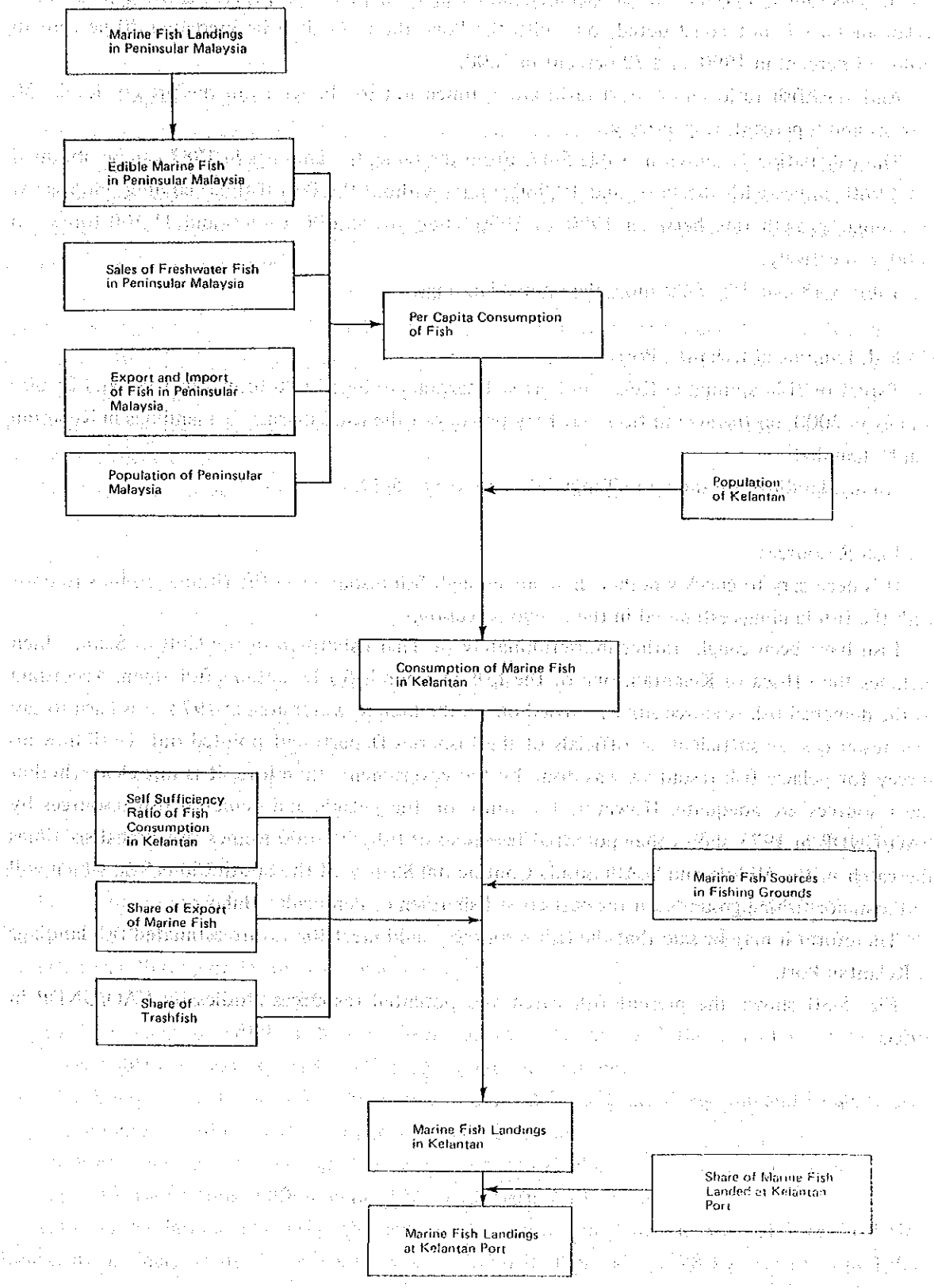


Table 5-45 Landings of Marine Fish

(tonnes)

Year	Landings
1965	5,252
1966	6,800
1967	6,800
1968	6,800
1969	6,200
1970	6,200
1971	6,200
1972	11,170
1973	12,715
1974	12,519
1975	12,519
1976	13,127
1977	6,383
1978	14,519
1979	15,465

Source: Data Data Mengenai Negeri Kelantan 1978,
Lapuran Tahunan Negeri Kelantan 1978~1979

Table 5-46 Fish Consumption in Peninsular Malaysia

Year	Landings of Marine Fish (tonnes)	Trashfish (tonnes)	Sales of Freshwater Fish (tonnes)	Export (tonnes)	Import (tonnes)	Consumption tion (tonnes)	Population	Per Capita Consumption (kg)
1974	439,547	131,872[1]	2,009	108,891	76,368	277,161	9,742,211	28.4
1975	375,235	112,571[1]	1,380	94,514	94,871	264,401	9,997,252	26.4
1976	410,952	123,290[1]	1,288	109,049	115,885	295,802	10,242,352	28.9
1977	497,952	154,995	1,196	108,032	118,636	354,757	10,510,095	33.8
1978	564,898	146,561	934	124,112	149,964	445,123	10,778,000	41.3

Source: Annual Fisheries Statistics 1974–1978, Fisheries Department.
Note 1. Transhfish is assumed 30% of total marine fish landings.

Table 5-47 Marine Fish Landings in Kelantan

Year	Population	Per capita consumption (kg/year)	Total consumption (tonnes)	Self sufficiency ratio (%)		Landings (tonnes)	
				Case 1	Case 2	Case 1	Case 2
1978	844,000	28.6	24,100	40	40	14,493	14,493
1980	855,000	30	25,650	40	40	15,400	15,400
1990	1,061,400	35	37,100	40	55	22,300	30,700
2000	1,306,000	40	52,300	40	70	31,400	55,000

Case 1 Without Kelantan Port
Case 2 With Kelantan Port

Table 5-48 Annual Marine Fish Landings in Kelantan

(tonnes)

Year	Case 1	Case 2
1978	14,493	14,493
1979	14,940	14,940
1980	15,400	(15,400)
1981	15,980	(16,500)
1982	16,580	(17,680)
1983	17,210	(18,940)
1984	17,860	(20,290)
1985	18,530	(21,740)
1986	19,230	(23,300)
1987	19,960	24,960
1988	20,710	26,740
1989	21,490	28,650
1990	22,300	30,700
1991	23,080	32,540
1992	23,880	34,500
1993	24,710	36,570
1994	25,570	38,760
1995	26,460	41,090
1996	27,380	43,560
1997	28,340	46,170
1998	29,320	48,950
1999	30,340	51,880
2000	31,400	55,000

Case 1: Without Kelantan Port
Case 2: With Kelantan Port

Table 5-49 Annual Fish Landings at Kelantan Port

(tonnes)

Year	Fish Landings
1987	13,000
1988	13,800
1989	14,600
1990	15,500
1991	16,500
1992	17,500
1993	18,500
1994	19,700
1995	20,800
1996	22,100
1997	23,500
1998	24,900
1999	26,400
2000	28,000

Fig. 5-29 Fish Landings in Kelantan and Kelantan Port

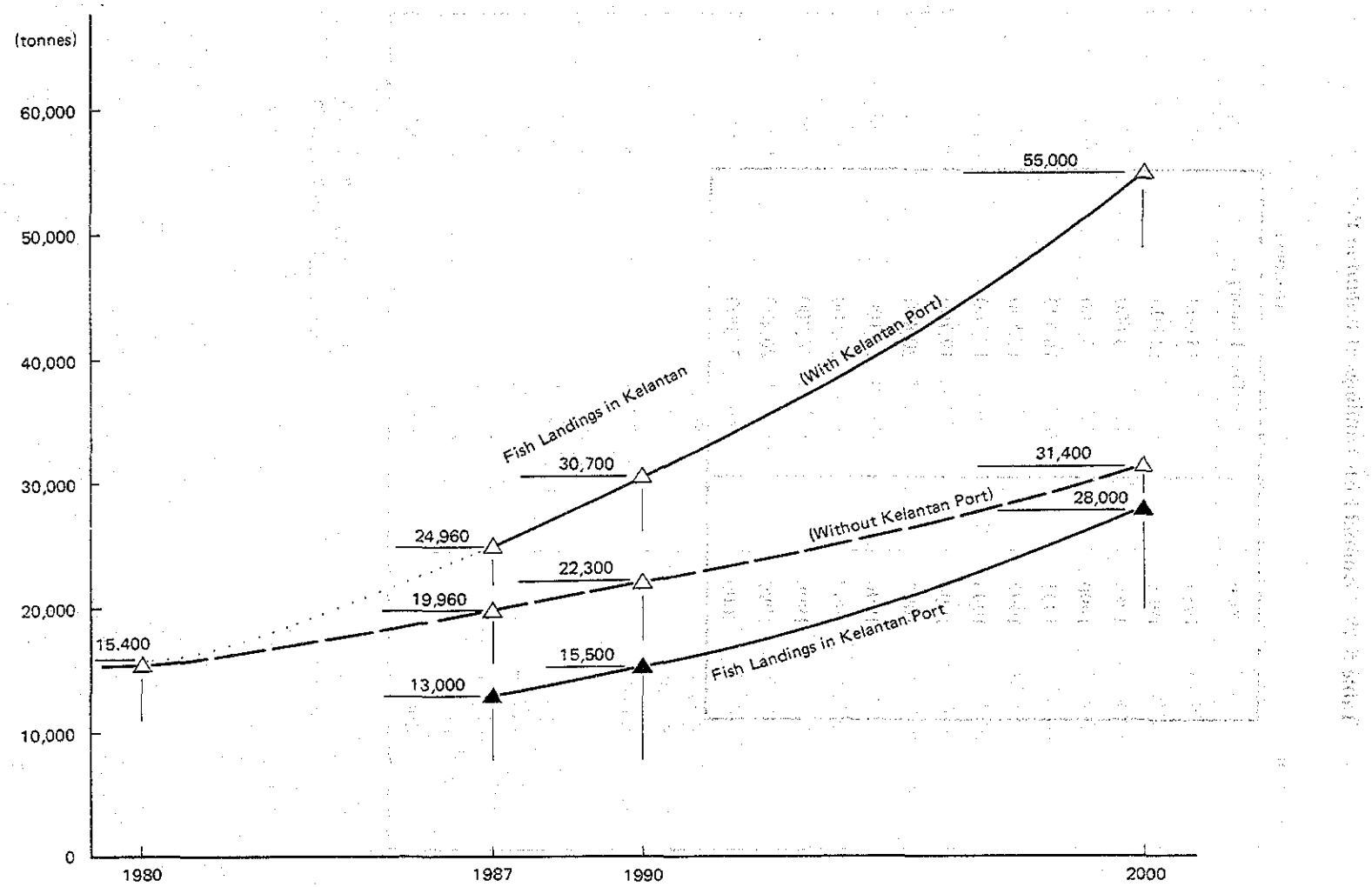
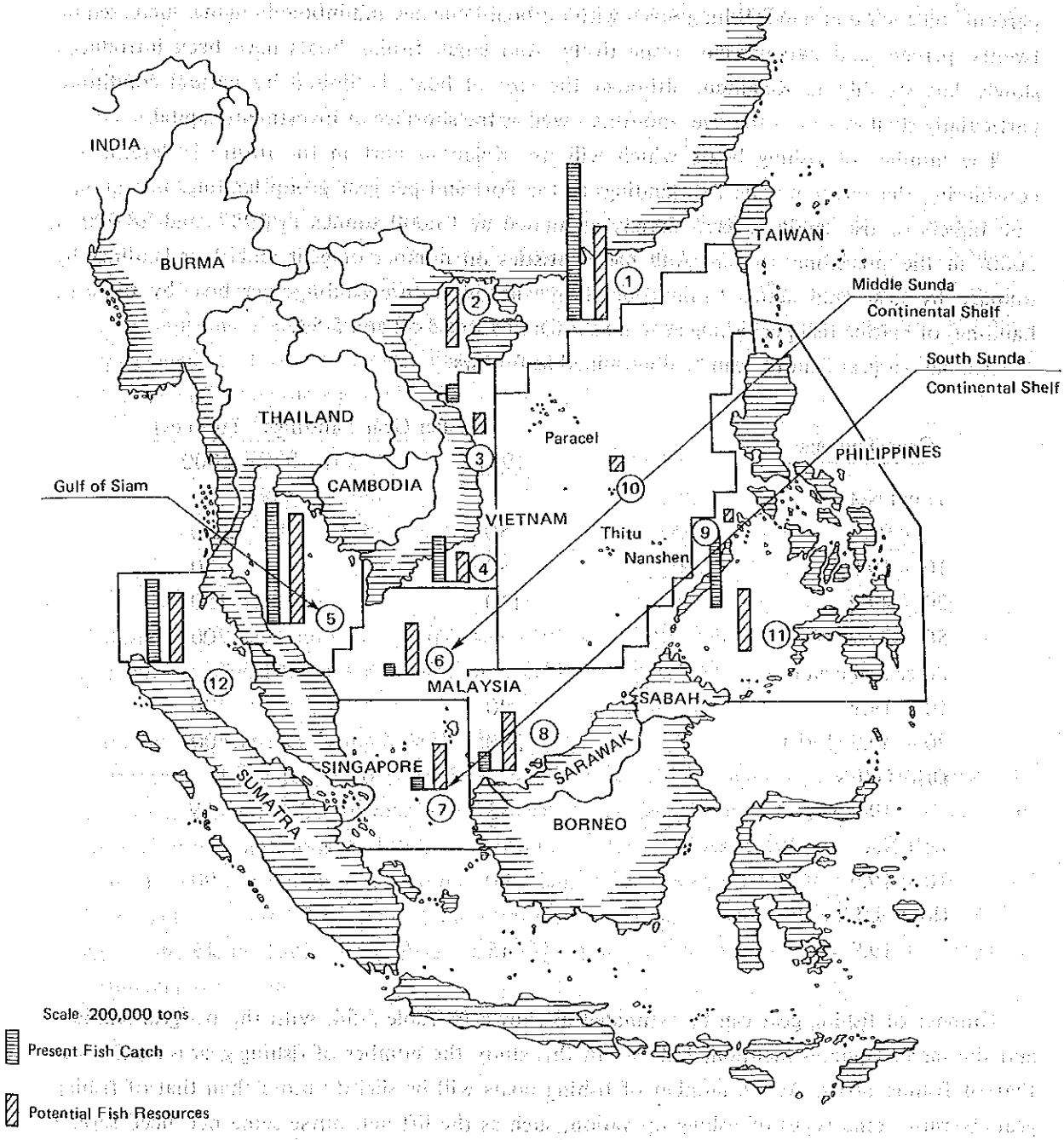


Fig. 5-30 Present Fish Catch and Potential Resources of Demersal and Pelagic Fish



Source: The South China Sea Fisheries,
A Proposal for Accelarated Development
FAO / UNDP 1973.1

5-3-2 Number of Fishing Boats Using Kelantan Port

Numbers of fishing boats by fishery district, and those with inboard engines by tonnage in Kelantan in 1979 are shown in Table 5-50 and 5-51.

Compared with those of 1978, non powered boats decreased remarkably by almost thirty percent, on the other hand, fishing boats with outboard engines and inboard engines increased by twenty percent and two percent, respectively. And larger fishing boats have been introduced slowly but steadily in Kelantan, although the size of boats is limited by natural conditons, particularly shallowness of the river mouth, as well as the shortage of investment capital.

The number of fishing boats which will use Kelantan Port in the future is determined, considering the target marine fish landings at the Port and per gear group landings per annum. The targets of fish landings have already estimated at 13,000 tonnes in 1987, and 28,000 in 2000, in the preceding section. And past statistics on number of gear and their landings by tonnage by gear, and actual fishing operation will give future landings per boat by tonnage. Landings of marine fish per fishing gear are shown in Table 5-52 and 5-53.

Annual per gear landings can be determined as follows:

Gear/Tonnage	Per Gear Landings (tonnes)	
	1987	2000
Trawl Net		
– 9.9	50	50
10 – 19.9	80	80
20 – 49.9	110	150
50 – 99.9		200
Purse Seine Net		
10 – 19.9	20	20
20 – 49.9 (Fish)	360	400
Drift Gill Net		
– 19.9	15	15
Left Net		
10 – 19.9	90	90
Hook & Line		
– 19.9	15	15

Number of fishing gear can be estimated as shown in Table 5-54, with the per gear landings and the target landings mentioned above. In this study the number of fishing gear is regarded as that of fishing boats. Actual number of fishing boats will be slightly more than that of fishing gear, because some types of fishing operation, such as the lift net, purse seine net, need several small boats to assist a main fishing boat.

5-3-3 Number of Fishermen

(1) Number of Fishermen in Kelantan

Number of fishermen in Kelantan was 6,646 in 1979, as shown in Table 5-55, until then it had increased at an average growth rate of about 10 percent. And ratios of Kelantan's fishermen

to the total number of Peninsular Malaysia were in the range of 6.6 percent to 7.7 percent from 1973 to 1978.

Estimate of the number of Kelantan's fishermen is made on the following assumptions.

i) Number of fishermen in Peninsular Malaysia will increase gradually, following the past trend of growth. The number is obtained by the following regression equation between number and year.

$N = 2,169 \times Y - 4,210,268$ ($\gamma = 0.91$)

where, N: Number of Fishermen in Peninsular Malaysia
Y: Year
γ: Coefficient of Correlation

ii) The share of 7.7 percent will be constant until 2000, if fishermen, one of the major poverty groups, are not displaced into other productive sectors of industry, such as traders, tobacco industries other manufacturing. But the number of fishermen, calculated on the basis of the above assumptions, should be adjusted because the State Government will emphasize the policy of displacement of those fishermen. Fishermen, who will change their occupations, are assumed as follows, considering the state scheme.

1980 – 1985	1,300
1986 – 1990	700
1991 – 1995	500
1996 – 2000	500

Estimates of the number of fishermen of Peninsular Malaysia, and Kelantan before adjustment and after adjustment are shown in Table 5-56 and 5-57.

(2) Number of Fishermen Using Kelantan Port

Number of fishermen, who will use Kelantan Port, will be determined by multiplying the number of fishing boats by the number of fishermen per fishing boat. This is given by the present fishing operation conditions, and that is determined in the previous sector.

Therefore, the number of fishermen at Kelantan Port is estimated at 1,290 in 1987, and 2,150 in 2000, about 20 percent of the total Kelantan's fishermen in 1987, and 30 percent in 2000, as shown in Table 5-58. And Fig. 5-31 shows the estimated number of fishermen in Kelantan and at the Port.

Table 5-50 Number of Fishing Boats by Fishery District (1979)

	Non Powered	Outboard Engine	Inboard Engine	Total
Kota Bharu				
Kedai Buloh	1	4	93	98
Kuala Besar	38	12	109	159
Sabak	26	85	7	118
Sub-total	65	101	209	375
Tumpat				
Tumpat	2	12	411	425
Pengkalan Kubor	–	45	46	91
Geting	11	35	121	167
Sub-total	13	92	578	683
Bachok				
Senok	3	69	13	85
Tawang	14	1	25	40
Perupok	37	3	126	166
Bachok	32	1	42	75
Melawi	14	1	18	33
Kandis	15	–	2	17
Sub-total	115	75	226	416
Pasir Putih				
Semerak	20	–	56	76
Sub-total	20	–	56	76
Grand Total	213	268	1,069	1,550

Source: Lapuran Tahunan Negeri Kelantan 1979

Table 5-51 Number of Fishing Boats with Inboard Engine by Tonnage (1979)

	Kota Bharu/Tumpt	Bachok/Pasir Putih	Total
0 – 4.9 tons	282	206	488
5 – 9.9 "	200	40	240
10 – 14.9 "	138	13	151
15 – 19.9 "	81	10	91
20 – 24.9 "	20	6	26
25 – 49.9 "	56	5	61
50 – 99.9 "	7	2	9
100 and above	3	–	3
Total	787	282	1,069

Source: Ibid

Table 5-52 Landings of Marine Fish per Fishing Gear Group

Year	Gear Group	West Coast			East Coast			Kelantan		
		No. of Gears (A)	Landings (B) (tonnes)	(B)/(A) (tonnes/ year)	No. of Gears (A)	Landings (B) (tonnes)	(B)/(A) (tonnes/ year)	No. of Gears (A)	Landings (B) (tonnes)	(B)/(A) (tonnes/ year)
1978	Trawl Nets	4,463	235,346	53	929	49,672	53	84	1,462	17
	Since Nets (Fish)	195	54,334	279	178	58,300	328	24	8,687	362
	Since Nets (others)	1,199	13,958	12	134	607	5	16	52	3
	Drift/Gill Nets	6,968	19,983	3	900	11,525	13	248	945	4
	Lift Nets	40	154	4	169	10,256	61	32	1,861	58
	Hooks & Lines	843	4,407	5	1,465	10,779	7	291	209	1
1977	Trawl Nets	4,195	226,521	54	984	34,603	35	117	1,055	9
	Sine Nets (Fish) Sine Nets (Others)	1,024	53,030	44	324	44,436	137	60	2,195	37
	Drift/GillNets	5,951	16,107	3	713	8,397	12	220	1,297	6
	Lift Nets	36	137	4	189	11,126	59	54	1,196	22
	Hooks & Lines	788	4,098	5	1,170	13,236	11	321	482	2
1976	Trawl Nets	4,008	175,595	44	1,059	45,084	43	152	1,388	9
	Seine Nets (Fish) Seine Nets (Others)	1,425	45,310	32	262	30,572	117	27	5,473	213
	Drift/Gill Nets	5,092	13,700	3	660	7,833	12	184	1,946	11
	Lift Nets	30	57	2	168	12,606	75	40	2,221	56
	Hooks & Lines	863	5,505	5	994	9,370	9	258	1,475	6

Source: Annual Fisheries Statistics 1976–1978
Fisheries Department

Table 5-53 Landings of Marine Fish Per Trawler

Tonnage	West Coast			East Coast			Kelantan		
	No. of Units (A)	Land-ings (B) (tonnes)	(B)/(A) (tonnes/ year)	No. of Units (A)	Land-ings (B) (tonnes)	(B)/(A) (tonnes/ year)	No. of Units (A)	Land-ings (B) (tonnes)	(B)/(A) (tonnes/ year)
– 4.9	332	13,955	42	48	605	13	2	24	12
5 – 9.9	1,086	49,502	46	363	9,605	26	46	330	7
10 – 14.9	522	51,512	76	179	11,833	47	45	389	7
15 – 19.9	160			73			13		
20 – 24.9	60	109,130	113	56	12,561	48	2	312	16
25 – 49.9	905			206			18		
50 – 99.9	33	2,423	73	14	?	?	–		

Source: Annual Fisheries Statistics 1977
Fisheries Department

Table 5-54 Number of Gears and Landings in Kelantan Port in 1987 and 2000

Gear: Tonnage	1987			2000		
	Number of Gears	Per Gear Landings (tonnes)	Landings (tonnes)	Number of Gears	Per Gear Landings (tonnes)	Landings (tonnes)
Trawl Nets						
– 9.9	10	50	500	10	50	500
10 – 19.9	20	80	1,600	20	80	1,600
20 – 49.9	24	110	2,640	40	150	6,000
50 – 99.9				15	200	3,000
Purse Seine Nets (Fish)						
20 – 49.9	15	360	5,400	35	400	14,000
Purse Seine Nets (Others)						
10 – 19.9	10	20	200	10	20	200
Drift/Gill Nets						
– 19.9	30	15	450	30	15	450
Lift Nets						
10 – 19.9	20	90	1,800	20	90	1,800
Hook & Lines						
– 19.9	30	15	450	30	15	450
	159		13,000	210		28,000

Table 5-55 Number of Fishermen by Fishery District (1979)

Kota Bharu:	Kedai Buloh	831
	Kuala Besar	469
	Sabak	399
	Sub-total	1,699
Tumpat:	Tumpat	1,467
	Pengkalan Kubor	598
	Geting	977
	Sub-total	3,042
Bachok:	Senok	353
	Tawang	142
	Perupok	589
	Bachok	313
	Melawi	114
	Kandis	55
	Sub-total	1,566
Pasir Putih;	Semerak	339
	Sub-total	339
Grand Total		6,646

Source: Lapuran Tahunan Negeri Kelantan 1979.

Table 5-56 Number of Fishermen in Kelantan (Before Adjustment)

Year	Peninsular Malaysia (A)	Kelantan (B)	(A)/(B) (%)
1972	69,252		
1973	68,308	5,148	7.5
1974	70,805	5,522	7.8
1975	73,304	4,932	6.7
1976	73,536	4,834	6.6
1977	75,645	5,374	7.1
1978	83,694	6,475	7.7
1979	na	6,646	
1980	84,350[3]	6,500	
1985	95,200[3]	7,300	
1990	106,040[3]	8,200	7.7
1995	116,890[3]	9,000	
2000	127,730[3]	9,800	

Note
1. State Economic Planning Unit, Kelantan
2. The growth rate of number of fishermen of Kelantan from 1990 to 2000 is assumed to be same as that from 1980 to 1990.
3. Projections are made by using the regression curve obtained from the data between 1972 and 1978.
   (No. of fishermen in Peninsular Malaysia) $_i$ = 2,169 x (Year) $_i$ – 4,210,268 (r=0.91)
4. Assuming that the share of Kelantan's fishermen is 7.7 percent of Peninsular Malaysia in number.

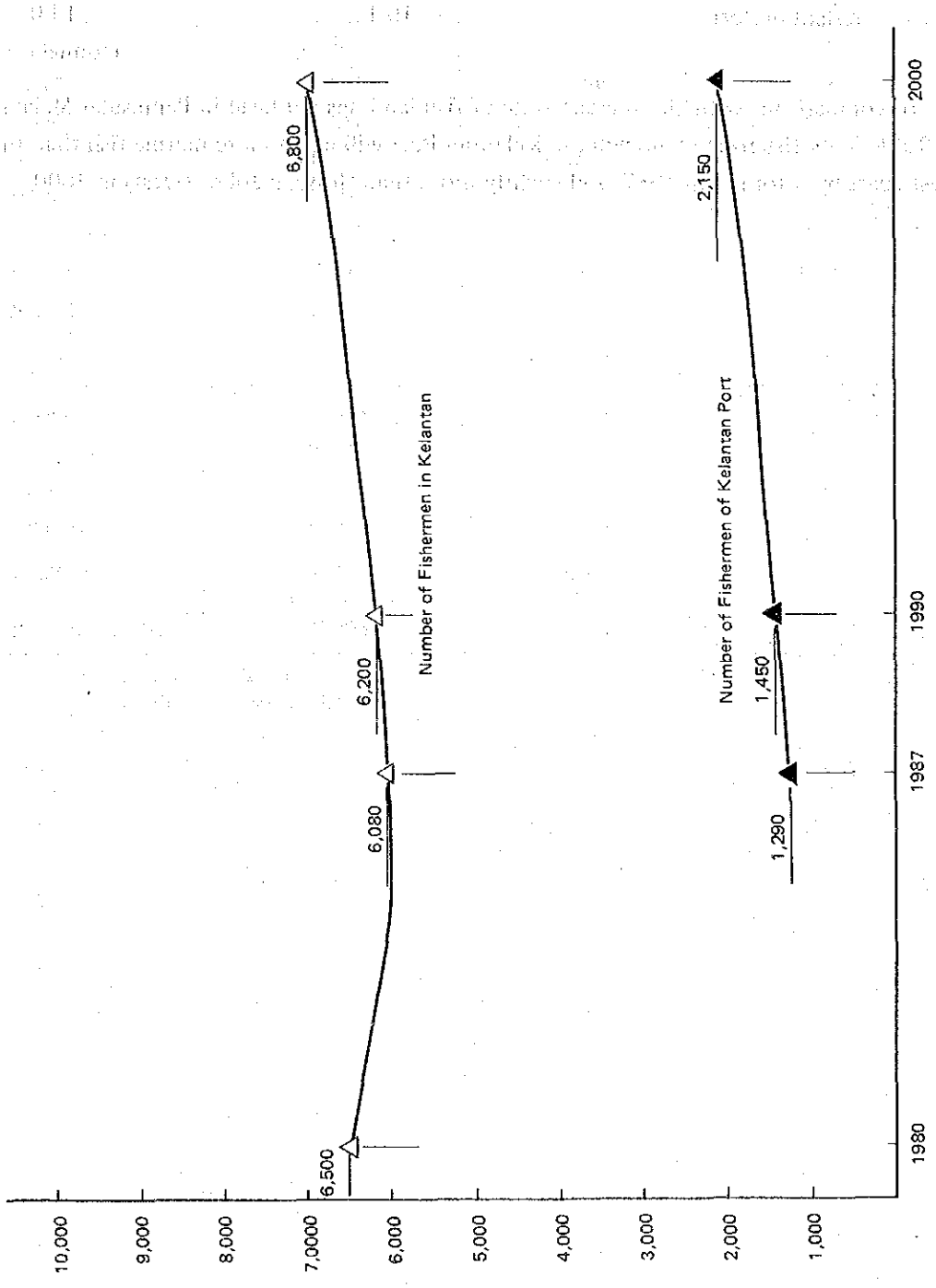
Table 5-57 Number of Fishermen in Kelantan

Year	Before Adjustment	Displacement	After Adjustment
1980	6,500		6,500
1981			6,400
1982			6,300
1983			6,200
1984		1,300	6,100
1985	7,300		6,000
1986			6,040
1987			6,080
1988			6,120
1989			6,160
1990	8,200	2,000	6,200
1991			6,260
1992			6,320
1993			6,380
1994			6,440
1995	9,000	2,500	6,500
1996			6,560
1997			6,620
1998			6,680
1999			6,740
2000	9,800	3,000	6,800

Table 5-58 Number of Fishermen at Kelantan Port

Gear · Tonnage	1987			2000		
	Number of Gears	Per Gear Number	Number	Number of Gears	Per Gear Number	Number
Trawl Nets						
– 9.9	10	5	50	10	5	50
10 – 19.9	20	5	100	20	5	100
20 – 49.9	24	10	240	40	10	400
50 – 99.9				15	20	320
Purse Seine Nets (Fish)						
20 – 49.9	15	20	300	35	20	700
Purse Seine Nets (Others)						
10 – 19.9	10	20	200	10	20	200
Drift Nets						
– 19.9	30	5	150	30	5	150
Lift Nets						
10 – 19.9	20	5	100	20	5	100
Hook & Lines						
– 19.9	30	5	150	30	5	150
Total	159		1,290	210		2,150

Fig. 5-31 Number of Fishermen of Kelantan and Kelantan Port



As the estimates of fish landings and the number of fishermen have already been obtained, per fisherman landings can be calculated as follows.

	1987	2000
Kelantan	4.1	8.1
Kelantan Port	10.1	13.0
		(tonnes)

In comparison, with the present state of fish landings per head in Peninsular Malaysia, shown in Table 5-59, fishermen who will use Kelantan Port will catch more marine fish than those in the west coast by 3 tonnes in 1987, and slightly more than those in Johor (west) in 2000.

Table 5-59 Marine Fish Landings Per Fisherman (1978)

State	Landings of Marine Fish (tonnes)	Number of Fishermen	Per Fisherman Landings (tonnes/year)
Perlis	14,544	2,403	6.1
Kedah	66,491	9,606	6.9
Penang	22,522	6,783	3.3
Perah	186,645	15,284	12.2
Selangor	104,705	7,276	14.4
N. Sembilan	422	524	8.1
Malacca	2,441	2,040	12.0
Johor (West)	13,004	10,175	12.8
West Coast	410,774	54,091	7.6
Kelantan	14,493	6,475	2.2
Trengganu	75,349	13,090	5.8
Pahang	16,317	3,999	4.1
Johor (East)	47,965	6,039	7.9
East Coast	154,124	29,603	5.2
Peninsular Malaysia	564,898	83,694	6.7

Source: Annual Fisheries Statistics 1978
Fisheries Department