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UNITED NATIONS INDUSTRIAL
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# SUBMISSION OF THE SELECTED MACHINERY INDUSTRIES FOR THE MALAYSIAN INDUSTRIAL PLAN

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## LIST OF NOTATIONS AND ABBREVIATIONS USED IN THE TEXT

| | | |
|---|---|---|
| ASET | = | Annual Statistics Of External |
| DS | = | Department Of Statistics |
| EPR | = | Effective Protection Rate |
| GDCF | = | Gross Domestic Capital Formation |
| GDP | = | Gross Domestic Product |
| L | = | Labour |
| LDC | = | Less Developed Countries |
| MIC | = | Malaysian Industrial Classification |
| MIDA | = | Malaysia Industrial Development Authority |
| MTR-FMP | = | Mid Term Review Of Fourth Malaysia Plan |
| NEC | = | Not Elsewhere Classified |
| NECs | = | Newly Rapidly Industralising Countries |
| NEM | = | Non Electrical Machinery |
| NES | = | Not Elsewhere Specified |
| NICs | = | Newly Industralised Countries |
| PA | = | Per Annum |
| VA | = | Value Added |
| VY | = | Various Years |

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Submission of Selected Machinery Industries
for the Malaysian Industrial Plan, January 1985

**Errata**

**Page I.1, paragraph 2, line 1:**

"For instance, the machinery industry plays an indispensable role in the choice and diffusion of effective technologies which generally lead to a significant increase in employment for the developing countries."

**Page III.315, paragraph 3, line 1:**

"Only 1% of the total capital investment granted Pioneer Status in the manufacturing sector is allocated to the machinery sector."

February 4, 1985

# NOTATIONS AND ABBREVIATIONS USED IN THE TEXT

# PART I INTRODUCTION

# PART I INTRODUCTION

## 1.1 Significance of the Machinery Industry in the Economic Development of Malaysia

The development of the machinery industry is a necessary prerequisite for successful industrialisation. No matter which path or which model a developing country selects for industrialisation, that country cannot industrialised without some degree of maturity in its machinery industry. It acts as a springboard for further industrialisation. This is proven by the track record of both developed economies and other NICs.

For instance, the machinery industry plays an indispensable role in the choice and diffusion of effective technologies generally lend to a significant increase in employment for the developing countries. Furthermore, dynamic linkage effects accruing from the machinery industry will act as a catalyst for other industries. For example, the improvement in lathe operations eventually led to the appearance of bicycles and sewing machines (Rosenberg, 1976).

Besides these linkage effects, the machinery industry is also a medium for diffusion and accumulation of engineering skills, and mechanical knowledge and the upgrading of engineering capabilities in the economy.

## 1.2 Definition of Industry

This study of the machinery and engineering industry covers the industry groups classified according to the following Revised Malaysian Industrial Classification :

TABLE 1.2.1

REVISED MALAYSIAN INDUSTRIAL CALSSIFICATION

| Industry | Description |
|---|---|
| 38210 | Manufacture of engines and turbines |
| 38220 | Manufacture of agricultural machinery and equipment |
| 38230 | Manufacture of metal and wood working machinery |
| 38299 | Machinery and equipment n.e.c. (Specifically material handling equipment). |

For a detailed description of the individual 5-digit industry classification, refer to Appendix 1.2.1 and for the detailed listing of commodities by industry as identified by the Department of Statistics, refer to Appendix 1.2.2.

To facilitate analysis and research efforts, attempts have been made to reconcile products for each industry by MIC classification and by SITC classification. The products are shown in Appendix 1.2.3.

Needless to say, this has proved a rather difficult task as the SITC codes were adjusted in 1973 and 1978.

## 1.3 Limitation of Data

Severe limitation of data has hampered our evaluation. Nevertheless, this study provides insight and perspective into the future development of the machinery industry.

Although the study of industry group 38299 is restricted to material handling equipment only, statistical data on material handling equipment cannot be separated from the group data. This is because of the non-existence of disaggregated statistical data, and the large number of products included in the industry group 38299. (See Appendix 1.2.1)

A similar problem is encountered in industry group 38220, which aggregates metal and woodworking machinery as a single industry. The aggregated statistical data of this industry group do not disaggregate between woodworking machinery and metal working machinery. Whenever possible, attempts are made to distinguish between them at the industry subgroup level.

Although it is necessary to study selected product categories specified by UNIDO/MIDA such as soil preparation and harvesting for agricultural machinery, the task is almost impossible because the data are undertaken at a highly aggregated level.

For instance, rubber coagulating tube, bailing press as well as the agricultural tractor is included under industry group 38220. On the other hand, the SITC grouping for industry group "Agricultural Machinery and Parts there of NES" i.e. Group 721, does not include tractors which are classified under 722. Thus wherever possible, these products are reconciled with the relevant MIC groupings to provide consistency.

A comprehensive study of the 4-industry groups should ideally include both Peninsular and East Malaysia. However this is not always possible as there is no integrated and standardised manufacturing census covering Peninsular and East Malaysia before 1981. To maintain a set of consistent and comparable time-series data, only data from Peninsular Malaysia are used for this purpose.

With 96% of establishments and employment of the 4-industry groups concentrated in Peninsular Malaysia (See Table 1.3.1), representative analysis of the industry's structural characteristics and production trend can be obtained from using time-series data from Peninsular Malaysia alone. In the manufacture of engines and turbines, and manufacture of agricultural machinery and equipment, Peninsular

TABLE 1.3.1

DISTRIBUTION OF MANUFACTURE OF MACHINERY BETWEEN
PENINSULAR MALAYSIA AND EAST MALAYSIA, 1981.

| INDUSTRY | NO OF ESTABLISHMENT | | EMPLOYMENT | | % PENINSULAR M'SIA | |
|---|---|---|---|---|---|---|
| | M'SIA | P.M'SIA | M'SIA | P.M'SIA | EMPLOYMENT | EST |
| Manufacture of Engines and Turbines | 37 | 37 | 307 | 307 | 100.00% | 100.00% |
| Manufacture of Agricultural machining equipment. | 55 | 55 | 1,545 | 1,535 | 100.00% | 100.00% |
| Manufacture of Metal and Wood Working Machinery | 62 | 47 | 850 | 715 | 84.12% | 75.81% |
| Machinery & Equipment | 1.139 | 1.103 | 13,770 | 13,358 | 97.01% | 96.84% |
| ALL | 1,293 | 1,242 | 16,472 | 15,915 | 96.68% | 96.06% |

SOURCE: DEPARTMENT OF STATISTICS

Malaysia dominates these industries completely. It is only in the manufacture of metal and woodworking machinery that East Malaysia's share in these industry groups is the highest at 15.9%. The omission of East Malaysia from this study is therefore not a serious one from the view point of analysis.

In the 1968 Census, the manufacture of the various types of machinery and engines under this study were classified under the following categories based on the Federation of Malaya Industrial Classification (1963) :-

Manufacture of Agricultural Machinery and Implements

Manufacture of Industrial Machinery and Parts

General Engineering and Machinery Repair Shops

The breakdown of activities as described under the classification for "Manufacture of Industrial Machinery and Parts" appeared more comprehensive and relevant to the 4 sub-sectors under the study and data from this classification are used to give a fuller perspective to the analysis. For this reason, this category was regarded as representative of the sector under study and used in the analysis of the principal statistics.

The classification and definition of the census data were changed after 1968, the output for industrial machinery was taken as a whole category before 1968. This was subsequently divided into 4 sub-categories, comprising engines and turbines, agricultural machinery, metal and woodworking machinery as well as machinery and equipment n.e.c. Thus, the sub-category Manufacturing Industrial Census data for post 1973 period are not directly comparable to that for pre-1968 period due to the absence of sub-categorisation of the later.

Similar limitations are found in the SITC data. The classification and definition of SITC data were different for pre 1977 period and post 1978 periods. Moreover, the classification and definition of SITC and MIC are grossly different. As a result, there are also difficulties in cross checking MIC data with SITC data. For example, the SITC import/export data for agricultural machinery do not include the cost of tractors. This cost is however included in the MIC data for this category. As such, in order to compare SITC data for agricultural machinery and that for MIC data of the same category, the cost of tractors imported has to be added to the SITC data.

Comparison of SITC data itself is also hampered as seen from the data for machinery and parts n.e.c. For the pre-1977 period, the cost of machinery and parts n.e.c. was lumped together. The post 1978 data have been further classified and categorised due to the rising significance of some of the machinery and parts n.e.c. As such, a direct comparison of this pre-1977 data and post 1978 data is not possible.

Survey data from the 1978 survey have also been used. However, this source is not as comprehensive as the 1973 census in the coverage of establishments.

Data from this survey have been included to give an indication of the trend between the 2 Census years i.e. 1973 to 1981.

# PART II DEVELOPMENT OBJECTIVES

## PART II DEVELOPMENT OBJECTIVES

### 2.1.1 Introduction

This section establishes targets or "development objectives" for the machinery industry up to 1995. The following issues form the basis for the formulation of these objectives. The specific qualitative plan targets for the industries under study will be discussed in the later portion of this section. As for the rationale and justification for these objectives, they are dealt with in other sections of this report (Sections III - VII)

### 2.1.2 The Industry In The Context Of Overall National Development

The objectives of th NEP are incorporated in the Outline Perspective Plan (OPP), 1971-1990. the primary objectives of the NEP are :-

1. Eradication of poverty among all Malaysians

2. Restructuring of society towards equitable income distribution and to eliminate racial identification with economic functions

Malaysia has ample resources to provide a base for the expansion of the economy. However the growth rates of production of commodities like petroleum, rubber and oil palm are expected to be lower than in the past. If the targets of the NEP are to be achieved, the economy has to grow at least 8% each year.

The manufacturing sector is regarded as a very important strategic tool in the achievement of the NEP. It has the greatest potential contributor to employment and redistribution of wealth and economic functions.

2.1.3 <u>Major Objectives for Industrial Development under the Fourth Malaysia Plan - Mid-Term Review (FMP-MTR)</u>

The following objectives are outlined in the FMP-MTR for the industrial development of the economy.

A) to achieve the NEP objectives particularly in respect of greater Bumiputra participation in the sector in terms of equity, employment, marketing and professional services;

B) to disperse industries away from the urban centres to the less developed areas through the development of industrial estates and related infrastructural facilities with the aim of achieving a balanced industrial growth among regions;

C) to expand and diversify the manufacturing base so as to generate high value added and to increase foreign exchange earnings through the development of agro-and other resource-based industries in which the country has comparative advantage;

D) to gradually promote the establishment of high technology precision-based industries with the view of upgrading the associated technical skill of Malaysian workers in such industries;

E) to stimulate the growth of small-scale industries by providing financial and technical assistance as well as training and marketing facilities; and

F) to establish heavy industries with a view to reducing the dependence on foreign countries for the supply of machinery and intermediate inputs, exploiting forward and backward linkages in industrial development, creating spin-off effects for the growth of small and medium-scale industries and developing the technological capability of the manufacturing sector.

G) further to these broad objectives, the MTR has also adopted the "outward-looking industrialisation strategy whereby the pace of industrialisation is to be accelerated through manufactured export promotion.

The specific objectives for the machinery industry are developed along the broad guidelines as provided in the industrial development objectives above. However, the policies are also for the overall machinery industry as a whole and are formulated based on a detailed analysis and understanding of the industry as discussed in Sections III and IV.

Based on the detailed analysis of the current status and potential for the industry, the following implications and conclusions can be drawn vis a vis the role the machinery industry can play to meet the broad industrial objectives in that :-

- Small and large scale size firms often exist side by side within the industry. This heterogenity encourages specialisation among the smaller firms resulting in an expansion and diversification of the manufacturing base. (Objective C & E)

- Specialisation among these firms like the manufacture of component parts are often for higher value-added products. (Objective C)

- Other spin-off effects of specialisation are greater opportunities for greater Bumiputra equity and employment participation, diffusion of knowledge as well as providing training opportunities for employees. (Objective A)

- Greater inter-industry linkages are fostered as the smaller firms provide the ancillary support for other industries e.g. the transport equipment and other industry. (Objective F)

- The expansion of the industry also creates demand for new services like forging, die-casting and precision grinding and thus help to increase and diversify the manufacturing base. (Objective C)

- Being a knowledge and skill intensive industry, its growth and development provide opportunities and training facilities for upgrading skills of Malaysian workers. (Objective D)

- Though no longer a forerunner in technology, the transfer of new technology into this industry will inevitably raise quality control standards, level of technology and form the base for greater technology transfer. (Objective D)

- Finally, this industry provides opportunities for greater. Capital formation and capital intensive technology. (Objective F)

### 2.1.4 Development Objectives for the Machinery Sector

In light of the above potential roles that can be played by the machinery sector in the current context of industrial development in Malaysia, the following objectives can thus be proposed :-

$D_1$ To stimulate the development of the machinery sector by encouraging a greater degree of manufacturing activity for machinery. This is in line with the overall industrialisation effort towards a relatively more independent industrialisation.

D2 To develop stronger backward linkages by stimulating the development of the supporting or ancillary industries and activities so as to provide the necessary backup to the machinery sector.

D3 To formulate and maintain quality control standards for the machinery industry.

D4 To modernise and upgrade the level of technology utilised by the industry.

D5 To facilitate the dissemination of skill, mechanical knowledge, technology information and expertise in the industry among Bumiputras and other races.

D6 To facilitate greater and faster technology transfer and to complement the development of the engineering sectors so as to provide the principal thrust to the industralisation process.

D7 To upgrade productivity, competitiveness and efficiency in the industry.

D8 To encourage smaller firms to specialise in component products so that the industry can reap the benefits of economies of scale.

D9 To encourage production of higher value added products.

$D_{10}$ To encourage greater Bumiputra participation in terms of equity and employment.

$D_{11}$ To create a larger domestic market for the manufactured products of the machinery sector. This is related to attempt at increasing the forward linkages of the sector whereby there is a greater utilisation of local machinery as investment goods by local manufacturing firms.

# PART III THE INDUSTRY'S CURRENT POSITION AND DEVELOPMENT ISSUES

## PART III THE INDUSTRY'S CURRENT POSITION AND DEVELOPMENT ISSUES

### 3.1.1 Sector's Overall Position In The Malaysian Manufacturing Industry

Although the machinery and engineering sector has long been established in Malaysia, its overall impact on the Malaysian economy, especially in relation to the various vital economic parameters like employment, output, fixed asset formation is small. However, its relative importance to the manufacturing sector though small, has nevertheless been growing in the 13-year period between the manufacturing census years 1968 and 1981 covered in this study.

The machinery sector output value in real terms has tripled in the last 15 years (see Table 3.1.1) However, as in 1981, the output of the industry accounted for only about 4.2% of GDP or 1.42% of total manufacturing output. Its contribution to the value added was 2.2% of the total manufacturing sector. Production index for the machinery sector achieved an average growth rate of 8.8% p.a during this period. This rate was higher than that achieved by the non-metallic industry which was 8.1% (see ORSB, Building Material Report for Industrial Master Plan, 1984). However, the NEM growth rate was lower than that of the manufacturing sector which was 10.1%. The sectoral growth rate has been uneven over this 15 year period (See Table 3.1.1 and Figure 3.1.1). For the period 1968-1975, the sector lagged behind all

TABLE 3.1.1

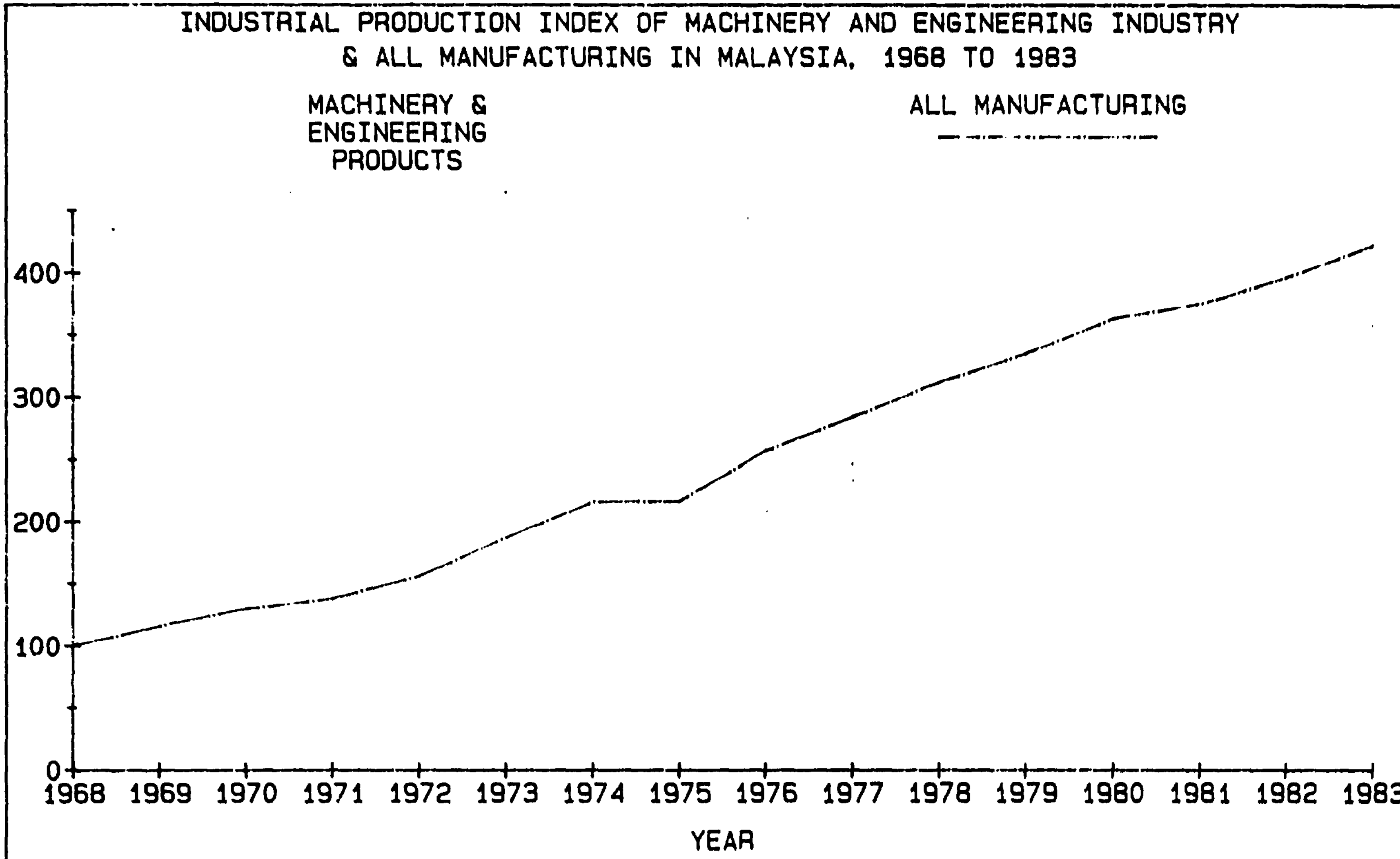
INDUSTRIAL PRODUCTION INDEX OF MACHINERY AND ENGINEERING INDUSTRY & ALL MANUFACTURING IN MALAYSIA, 1968 TO 1983

| YEAR | MACHINERY & ENGINEERING PRODUCTS | ALL MANUF. |
|---|---|---|
| 1968 | 100.0 | 100.0 |
| 1969 | 141.1 | 115.6 |
| 1970 | 131.4 | 129.8 |
| 1971 | 141.3 | 137.8 |
| 1972 | 171.7 | 156.1 |
| 1973 | 242.8 | 187.1 |
| 1974 | 267.5 | 215.8 |
| 1975 | 186.0 | 216.0 |
| 1976 | 207.9 | 256.9 |
| 1977 | 233.0 | 284.0 |
| 1978 | 291.5 | 311.9 |
| 1979 | 296.4 | 334.7 |
| 1980 | 322.9 | 362.6 |
| 1981 | 381.7 | 374.6 |
| 1982* | 373.6 | 395.6 |
| 1983* | 356.8 | 421.8 |

| GROWTH RATE P.A. | | |
|---|---|---|
| 1968-1975 | 9.3% | 11.6% |
| 1975-1980 | 11.7% | 10.9% |
| 1980-1983 | 3.4% | 5.2% |
| 1968-1983 | 8.8% | 10.1% |

NOTE : 1982 & 1983 FIGURES ARE BASED ON REVISED WEIGHTAGE

SOURCE : DEPARTMENT OF STATISTICS




SOURCE: DERIVED FROM TABLE 3.1.1

manufacturing by 2.3%, but during the period 1975-1980 its average growth rate of 11.7% exceeded that for the manufacturing sector by 0.8%. Since 1980, growth has again trailed behind the manufacturing sector. This is probably due to the effects of world recession.

### 3.1.2 Employment Structure of the Industry

Table 3.1.2 shows that in terms of the number of establishments, the sector grew from 224 in 1968 to 1,242 by 1981, representing an increase of more than five-folds or an average annual growth rate of 14%. This compares very well with the manufacturing sector as a whole which saw the number of establishments increasing two-folds from 9,013 in 1968 to 17,780 by 1981 at an average annual growth rate of 5%. This phenomenon has been confirmed by findings in the field survey which indicated that many small firms have sprouted in the last two decades. Former employees in the industry have started their own businesses after having developed their own contacts and working experience. However, the number of establishments in the sector as a percentage of that in the manufacturing sector was relatively small, although it had risen significantly from 2.5% in 1968 to 7.0% by 1981.

Table 3.1.2 also shows the number of employees engaged in the sector for selected years. The rate of employment generated by firms in the sector falls slightly behind manufacturing sector. Employment in the sector had grown at an average

TABLE 3.1.2

PRINCIPAL CHARACTERISTICS FOR SELECTED INDUSTRIES IN THE NEM SECTOR, PEN. MALAYSIA, 1968, 1973, 1978, AND 1981
INDUSTRIES : 38210, 38220, 38230, 38299

| | 1968 | | | 1973 | | | 1978 | | | 1981 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IND. * | TOTAL MFG. | IND./ MFG. | IND. | TOTAL MFG. | IND./ MFG. | IND. | TOTAL MFG. | IND./ MFG. | IND. | TOTAL MFG. | IND./ MFG. |
| NO. OF ESTABLISHMENTS | 224 | 9,013 | 2.49% | 689 | 11,060 | 6.23% | 255 | 4,499 | 5.67% | 1,242 | 17,780 | 6.99% |
| TOTAL EMPLOYMENT | 4,271 | 130,257 | 3.28% | 10,229 | 297,934 | 3.43% | 7,781 | 377,718 | 2.06% | 15,915 | 534,145 | 2.98% |
| FIXED ASSETS ($'000) | 5,489 | 890,356 | 0.62% | 35,378 | 2,294,646 | 1.54% | 47,434 | 5,195,265 | 0.91% | 142,869 | 9,730,327 | 1.47% |
| OUTPUT ($'000) | 34,939 | 3,078,523 | 1.13% | 131,552 | 7,677,687 | 1.71% | 198,854 | 18,548,583 | 1.07% | 491,210 | 34,486,493 | 1.42% |
| VALUE ADDED ($'000) | 15,420 | 873,851 | 1.76% | 59,753 | 2,326,929 | 2.57% | 79,417 | 5,302,336 | 1.50% | 194,850 | 8,895,302 | 2.19% |
| SALARIES & WAGES ($'000) | 8,086 | 266,957 | 3.03% | 20,200 | 586,995 | 3.44% | 29,346 | 1,359,195 | 2.16% | 76,610 | 2,614,142 | 2.93% |
| VALUE ADDED/LABOUR | $3,610.4 | $6,708.7 | 0.54 | $5,841.5 | $7,810.2 | 0.75 | $10,206.5 | $14,037.8 | 0.73 | $12,243.2 | $16,653.3 | 0.74 |
| FIXED ASSETS/LABOUR | $1,285.2 | $6,835.4 | 0.19 | $3,458.6 | $7,701.9 | 0.45 | $6,096.1 | $13,754.3 | 0.44 | $8,977.0 | $18,216.6 | 0.49 |
| SALARIES & WAGES/TOTAL EMPLOYMENT | $1,893.2 | $2,049.5 | 0.92 | $1,974.8 | $1,970.2 | 1.00 | $3,771.5 | $3,598.4 | 1.05 | $4,813.7 | $4,894.1 | 0.98 |

* NOTE : DATA IS FOR NEM INDUSTRY
SOURCE : CENSUS OF MANUFACTURING INDUSTRIES, VARIOUS YEARS AND SURVEY OF MANUF. INDUSTRIES, 1978

annual rate of 10.6% (from 4271 workers in 1968 to 15,915 workers in 1981) as compared to 12% for the manufacturing sector.

While the rate of employment generation is lower than that of the manufacturing sector, the total employment absorption relative to the manufacturing sector is also very low, constituting only 3% in 1981. This 3% employment contribution when viewed with the corresponding 7% in terms of number of establishment in 1981, as analysed earlier, implies that the firms in this sector are relatively small in terms of employment sizes.

Thus, while the machinery sector is positioned as an important and vital vehicle to successful industrialisation, its contribution to total manufacturing output, employment and value added is insignificant than in the case for reference countries.

The mean size of establishment for the sector is only 13 while that of the manufacturing sector is 30. The fact is that the majority of the establishments generally produces for a small domestic market and manufactures various simple machinery and parts. Companies like Howard Alat Pertanian Sdn Bhd (agricultural machinery), Mah Cheok Pui Foundry (MCP) (woodworking machinery), Malaysian Gauge and Tool Bhd (MGT) (metalworking machinery), Yanmar (M) Sdn Bhd (diesel engines), Solar Mechanical Engineering (plastic moulding) are either leaders or amongst the top firms in their respective industries . Yet their average employment size do not exceed 50 workers.

The low level of employment in this sector is also a reflection of the inability of the sector to attract labour. This is due to various reasons including the generally poor working conditions and environment and not least, the lower wages. As evident from Table 3.1.2, the average wage per employee is $4,814 per annum compared to the manufacturing sector's $4,894. Although the difference is not very significant, the nature of the job in this sector adds to the unattractiveness of the industry caused by uncompetitive wages. The owners of firms interviewed concurred with this opinion.

Table 3.1.3 summarises the employment structure of the sector by ethnic groups in 1980. Traditionally, the machinery sector has been a "Chinese forte" where the majority of local manufacturers are Chinese artisans who picked up their skills and knowledge over the years. Traditionally, these workmen have handed on these skills to their apprentices who are often part of the family. It is for these reasons that Chinese workers accounted for 77% of employment which was even higher than that for all manufacturing which is at 57%. Bumiputras' participation accounted for only 13% due partly to more opportunities in other industries.

The employment structure in MIDA approved firms shows the same pattern of ethnic worker distributions. However Bumiputra and Indian workers are better represented.

TABLE 3.1.3

EMPLOYMENT STRUCTURE, MACHINERY MANUFACTURING, PEN. MALAYSIA, 1980

A)

| | NO. EMPLOYMENT | | % EMPLOYMENT | |
|---|---|---|---|---|
| | MACHINERY | ALL MANUF. | MACHINERY | ALL MANUF. |
| BUMIPUTRA | 1,256 | 96,817 | 15.30 | 31.79 |
| CHINESE | 6,347 | 172,599 | 77.29 | 56.66 |
| INDIAN | 558 | 33,421 | 6.79 | 10.97 |
| OTHERS | 51 | 1,753 | 0.62 | 0.58 |
| FOREIGN | - | - | (N.A.) | (N.A.) |
| ALL | 8,212 | 304,590 | 100.00 | 100.00 |

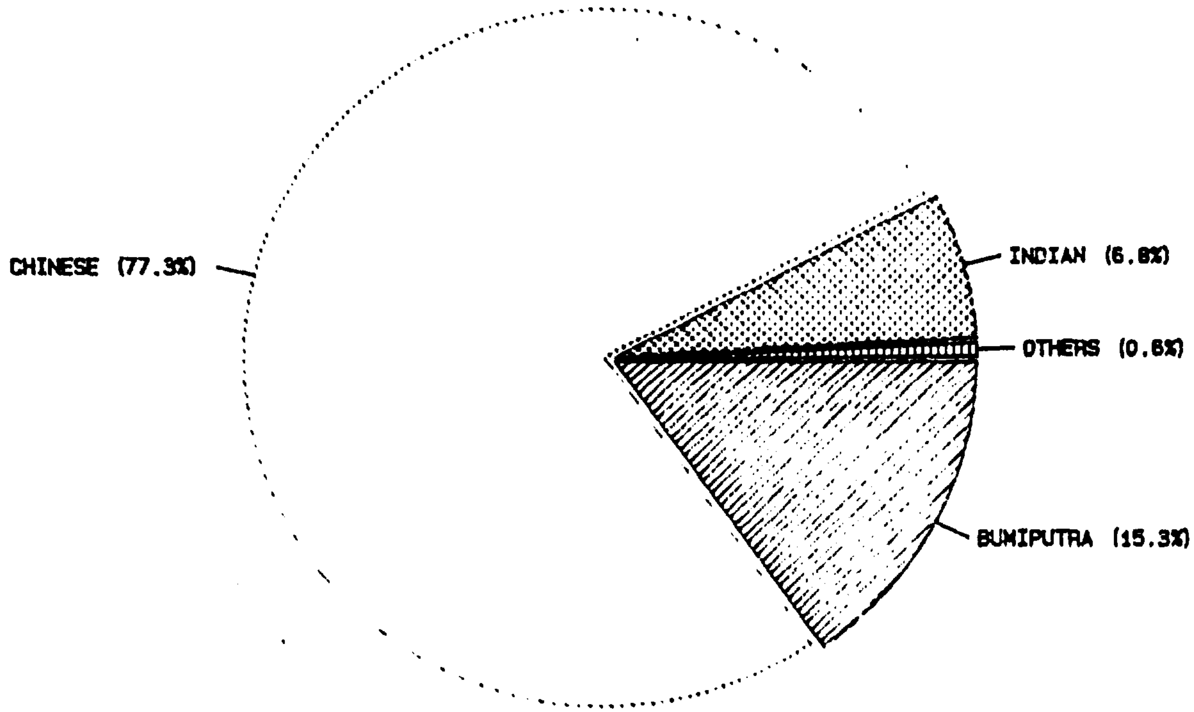
B)

| | NO. EMPLOYMENT IN MIDA-APPROVED MACHINERY FIRMS, 1980 | % |
|---|---|---|
| BUMIPUTRA | 2,641 | 37.60 |
| CHINESE | 3,356 | 47.78 |
| INDIAN | 907 | 12.91 |
| OTHERS | 87 | 1.24 |
| FOREIGN | 33 | 0.47 |
| ALL | 7,024 | 100.00 |

SOURCE : A) CALCULATED FROM 1980 POPULATION CENSUS
B) MIDA, ANNUAL REPORT, 1981. TABLE V. FIRMS HAVE $250,000 PAID UP CAPITAL & MORE THAN 25 WORKERS

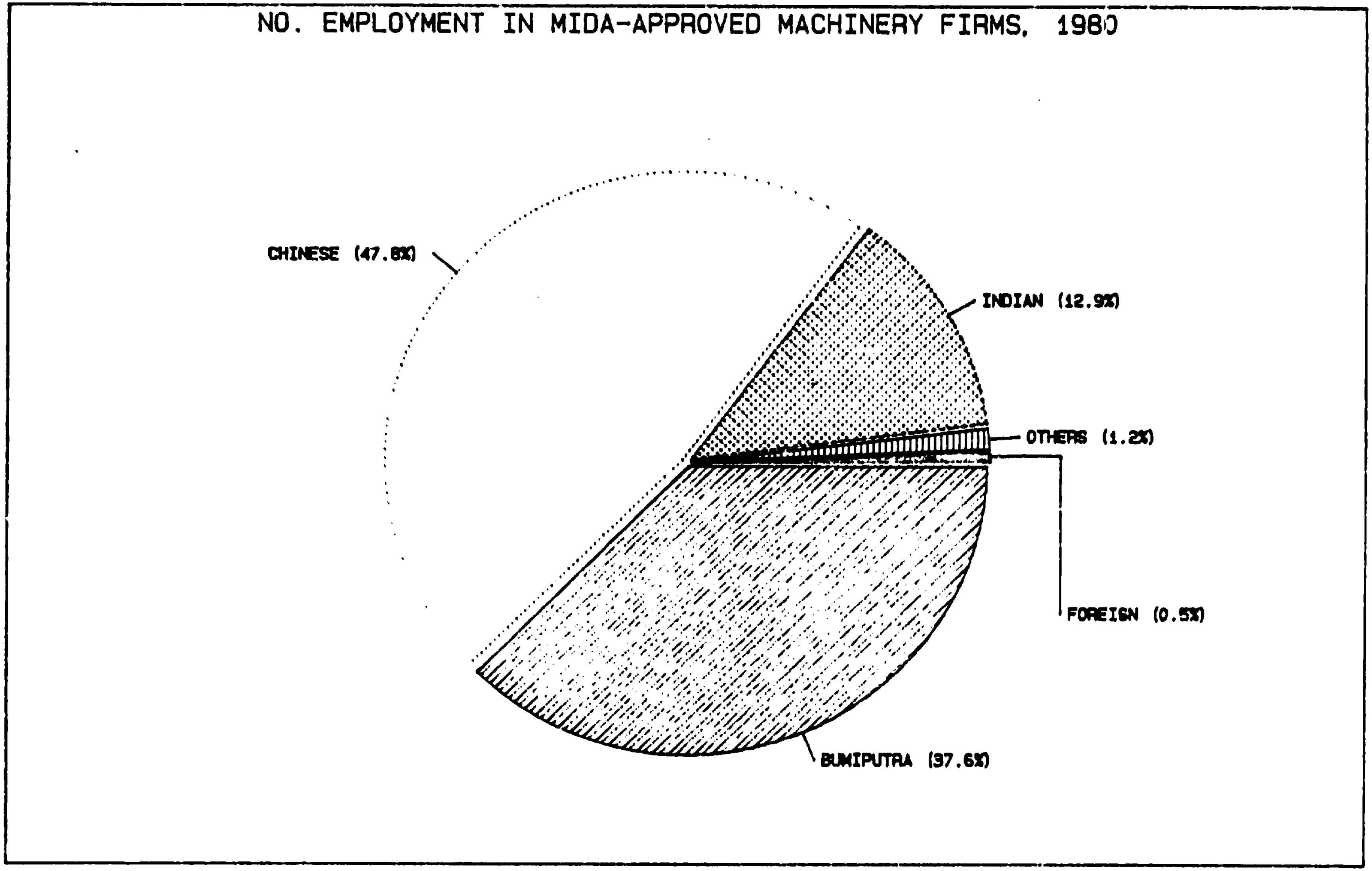
FIGURE 3.1.2

EMPLOYMENT STRUCTURE, MACHINERY MANUFACTURING, PENINSULAR MALAYSIA, 1980



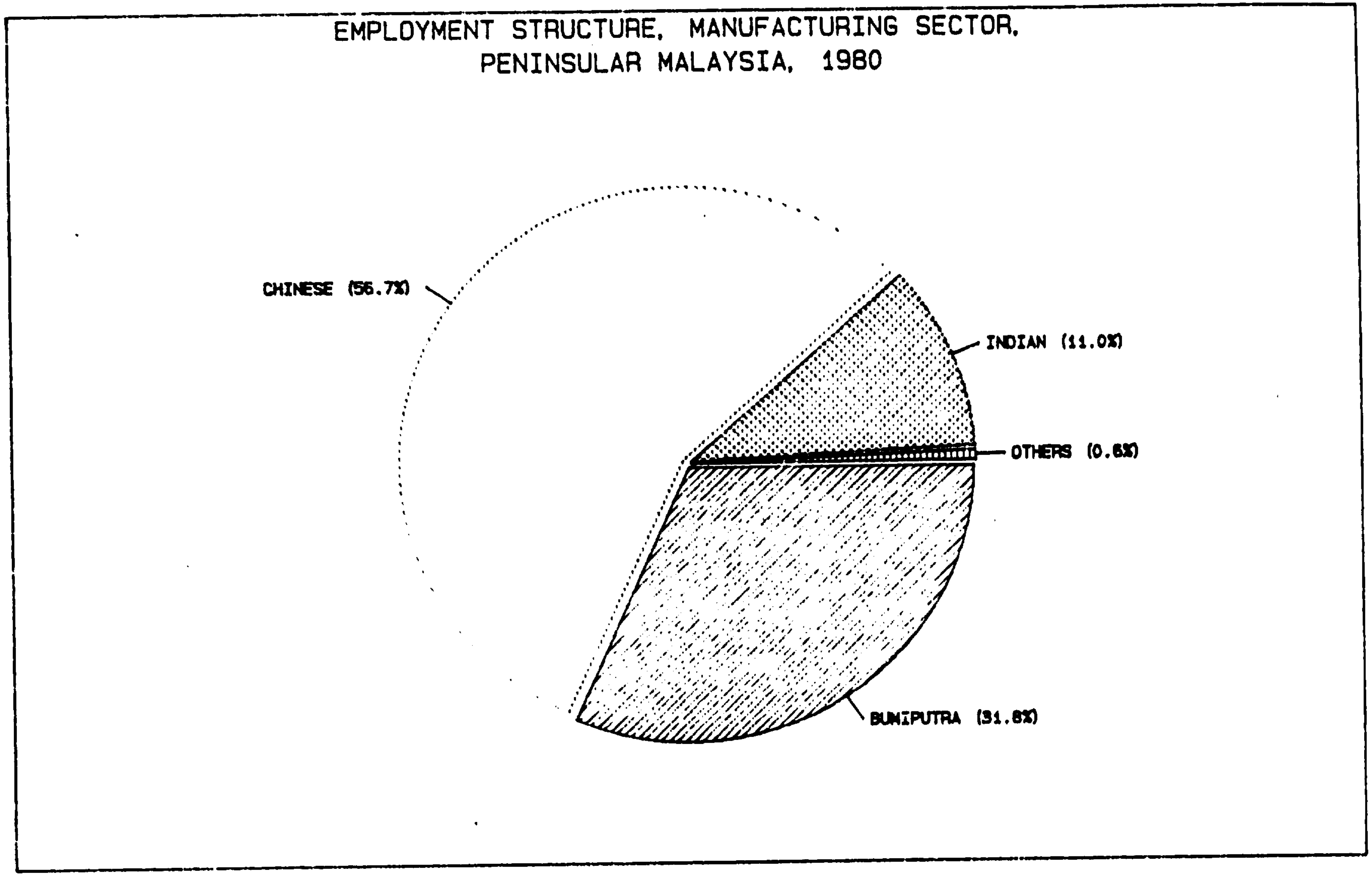

SOURCE: DERIVED FROM TABLE 3.1.3

FIGURE 3.1.3




SOURCE: DERIVED FROM TABLE 3.1.3

FIGURE 3.1.4




SOURCE: DERIVED FROM TABLE 3.1.3

III.11

### 3.1.3 Spatial Distribution of Firms In Machinery Sector

In terms of geographical distribution, the majority of the firms are located mainly in urban areas. The States of Wilayah, Selangor, Perak and Johor have the highest concentrations of these establishments which account for 3 quartersof the total in 1981. About 45% of the firms were located in Wilayah and Selangor while 30% were located in Wilayah alone as shown in Table 3.1.4. The next two states with the highest concentration of firms in this sector are Johore and Perak, accounting for 13.5% and 16% of the firms respectively. It is not surprising that the firms are concentrated in these areas because as an ancillary industry sector, they are located where industrialisation is most concentrated and well served with infrastructure.

### 3.1.4 Investment Characteristics of the Machinery Sector

The rate of fixed asset formation in the sector (Table 3.1.2.) is also very significant. From a total fixed asset amount of $5.5 million in 1968, it has grown more than 24 folds to reach $142.9 million by 1981. This rate of investment in fixed assets is significantly higher than that of the manufacturing sector which saw fixed asset formation increasing 10-folds from $890.4 million in 1968 to $9.7 billion in 1981. Again despite the significant rate of fixed asset formation, the total fixed assets in the sector contributed only 1.5% of the total fixed assets employed by the manufacturing sector.

TABLE 3.1.4

SPATIAL DISTRIBUTION OF INDUSTRIES 38210, 38220, 38230, 38299, PEN. MALAYSIA, 1981

| | NO. OF ESTB. | % | REVENUE ('000) | % | EMPLOYMENT | % |
|---|---|---|---|---|---|---|
| WILAYAH | 361 | 29.18 | 125,461,353 | 24.33 | 3,905 | 24.54 |
| SELANGOR | 201 | 16.25 | 197,919,141 | 38.38 | 4,030 | 25.32 |
| JOHORE | 172 | 13.50 | 40,459,692 | 7.84 | 1,941 | 12.19 |
| PERAK | 202 | 16.33 | 62,788,837 | 12.17 | 2,387 | 15.00 |
| OTHERS | 306 | 24.74 | 89,118,659 | 17.28 | 3,652 | 22.95 |
| TOTAL | 1,242 | 100.00 | 515,747,682 | 100.00 | 15,915 | 100.00 |

SOURCE : CENSUS OF MANUFACTURING INDUSTRIES, 1981

There is further evidence of the earlier analysis which suggests that the firms in the sector are relatively small in relation to the manufacturing sector. This is in accordance with the views presented by knowledgeable sources in the sector who indicated that many small firms, with a few workers and only a few pieces of basic machinery and equipment, mushroomed on a prolific scale during the last two decades. Thus fixed assets are scattered thinly among many small firms which do not enjoy economies of scale.

The technology employed by firms in this industry is mainly outdated foreign technology. The majority of the workmen had no formal training in both engineering and technology. They acquired and adopted their know-how and experience through working over the years. Consequently, most of these establishments face a host of technical, management and financial problems.

The relative small contribution by the sector in terms of fixed assets investment to the manufacturing sector is an indicator of the relatively simple, low-level, plant and machinery utilised in the industry. Field findings have confirmed this as characteristic of the sector where the technology used by Malaysian firms is relatively simple and traditional when compared to that of developed and NICs.

The poor labour productivity of the industry compared to the manufacturing sector as a whole is not surprising considering the difficulty of obtaining skilled labour for the sector. Case studies of firms engaged in industries in this sector have revealed that this skilled labour shortage is a very real problem. Nearly all the firms interviewed including the most established and organised ones like Howard Alat Pertanian Sdn Bhd and Malaysia Gauge and Tools Bhd have expressed this as a perennial problem faced by them.

The relatively low labour productivity of the sector is an indication of the relatively low level of technology and capital intensity in the industry.

The capital intensity of the sector as measured by the ratio of fixed assets to labour, although increasing over the period, is much lower than that for the manufacturing sector. In 1981, the ratio for the sector was $8,977 while that of the manufacturing sector was $18,217. This lower capital utilisation is a reflection of the lower fixed assets investment incurred by the sector compared to the manufacturing sector.

### 3.1.5 Output Performance of the Machinery Sector

The output contribution by the sector like the other parameters analysed earlier, again exhibited phenomenal growth compared to the manufacturing sector as a whole. Output grew at an average annual rate of 23% from $35 million in 1968 to $491.2 million by 1981 compared to the manufacturing sector's growth from $3.1 billion in 1968 at an average annual growth rate of 20% to $34.5 billion in 1981. However, again as a percentage of total manufacturing output despite the phenomenal growth, the sector's output contributed only 1.4% in 1981 (Table 3.1.2.).

The sector's annual output growth rate of 23% for the period, despite being significant, is not very encouraging since the sector's employment growth rate is much less; at 10.6%. The implication that can be drawn from the comparison of these two growth rates is that the productivity for the sector has not been growing significantly. A further analysis of the sector's productivity reveals that the labour productivity is relatively low. The ratio, VA/L which is a proxy measure of labour productivity, has been increasing at a rate of 9.8% from $3,610 in 1968 to $12,243 in 1981. This commendable performance is highlighted further when compared to the manufacturing sector which saw labour productivity increased at a slower rate of 7% per annum from $6,709 to $16,653 in 1981.

## 3.1.6 Trade Performance

Tables 3.1.5 and 3.1.6 show the trend of export and imports of machinery equipment at the 7 digit level over 1978-1983.

It may be noted that Malaysia's trade pattern for machinery equipment has traditionally been unfavourable. Beginning with a trade deficit of $370.2 million in 1978, it further deteriorated to $522.3 million (Table 3.1.7). Imports increased at only 8.2% per annum while exports increased at

TABLE 3.1.5

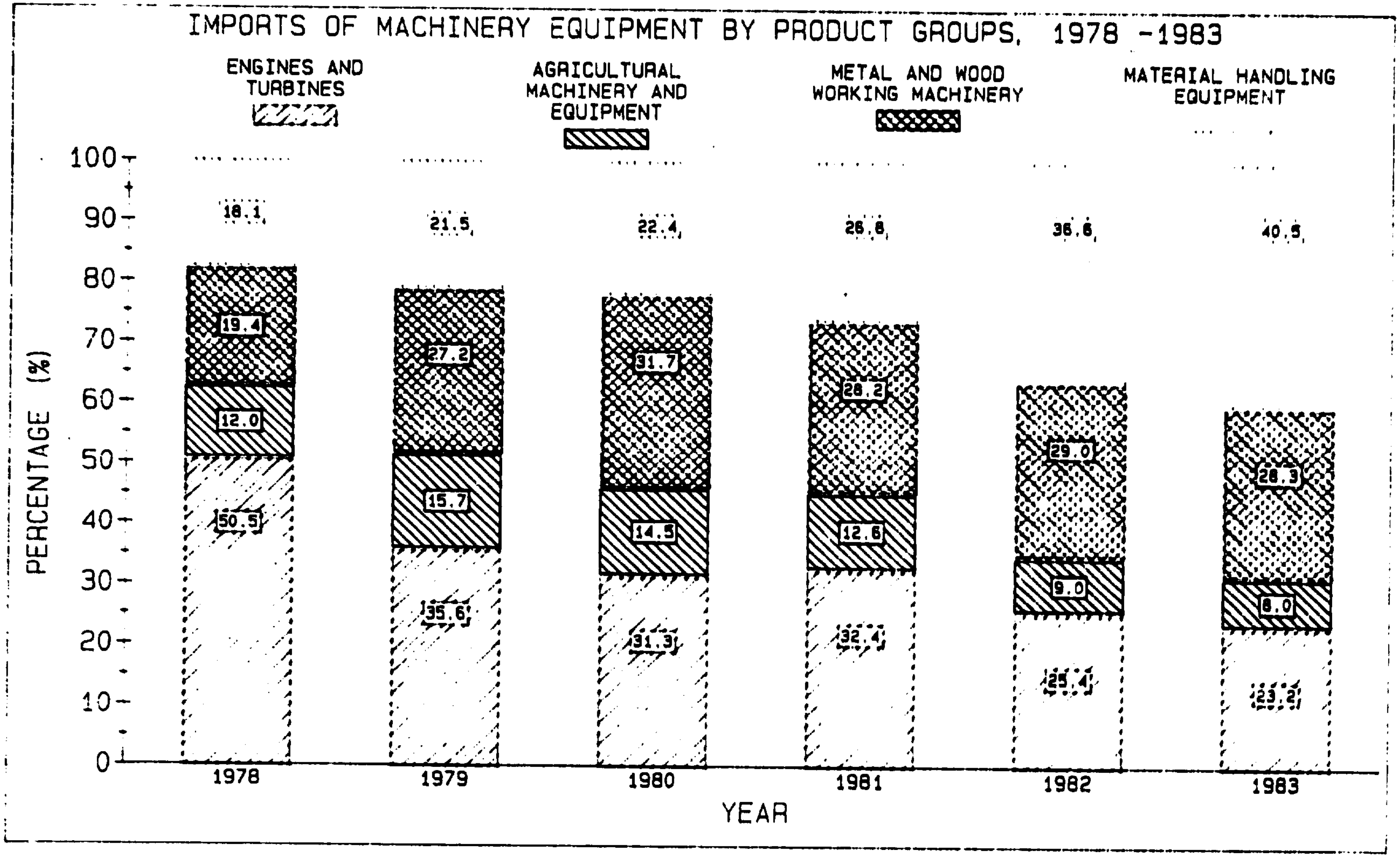
IMPORTS OF MACHINERY EQUIPMENT BY PRODUCT GROUPS, 1978 - 1983

| DESCRIPTION | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|
| ENGINES AND TURBINES | 50.5 | 35.6 | 31.3 | 32.4 | 25.4 | 23.2 |
| AGRICULTURAL MACHINERY AND EQUIPMENT | 12.0 | 15.7 | 14.5 | 12.7 | 9.0 | 8.0 |
| METAL AND WOODWORKING MACHINERY | 19.4 | 27.2 | 31.7 | 28.2 | 29.0 | 28.3 |
| MATERIAL HANDLING EQUIPMENT | 18.1 | 21.5 | 22.4 | 26.8 | 36.6 | 40.5 |
| TOTAL | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| ($ MILLION) | 386.5 | 397.6 | 529.9 | 617.6 | 616.5 | 572.4 |

NOTE : DATA FOR 1983 IS FOR PENINSULAR MALAYSIA

SOURCE : DERIVED FROM TABLES 3.2.6, 3.3.12, 3.4.8, 3.5.1

FIGURE 3.1.5




SOURCE: DERIVED FROM TABLE 3.1.5

TABLE 3.1.6

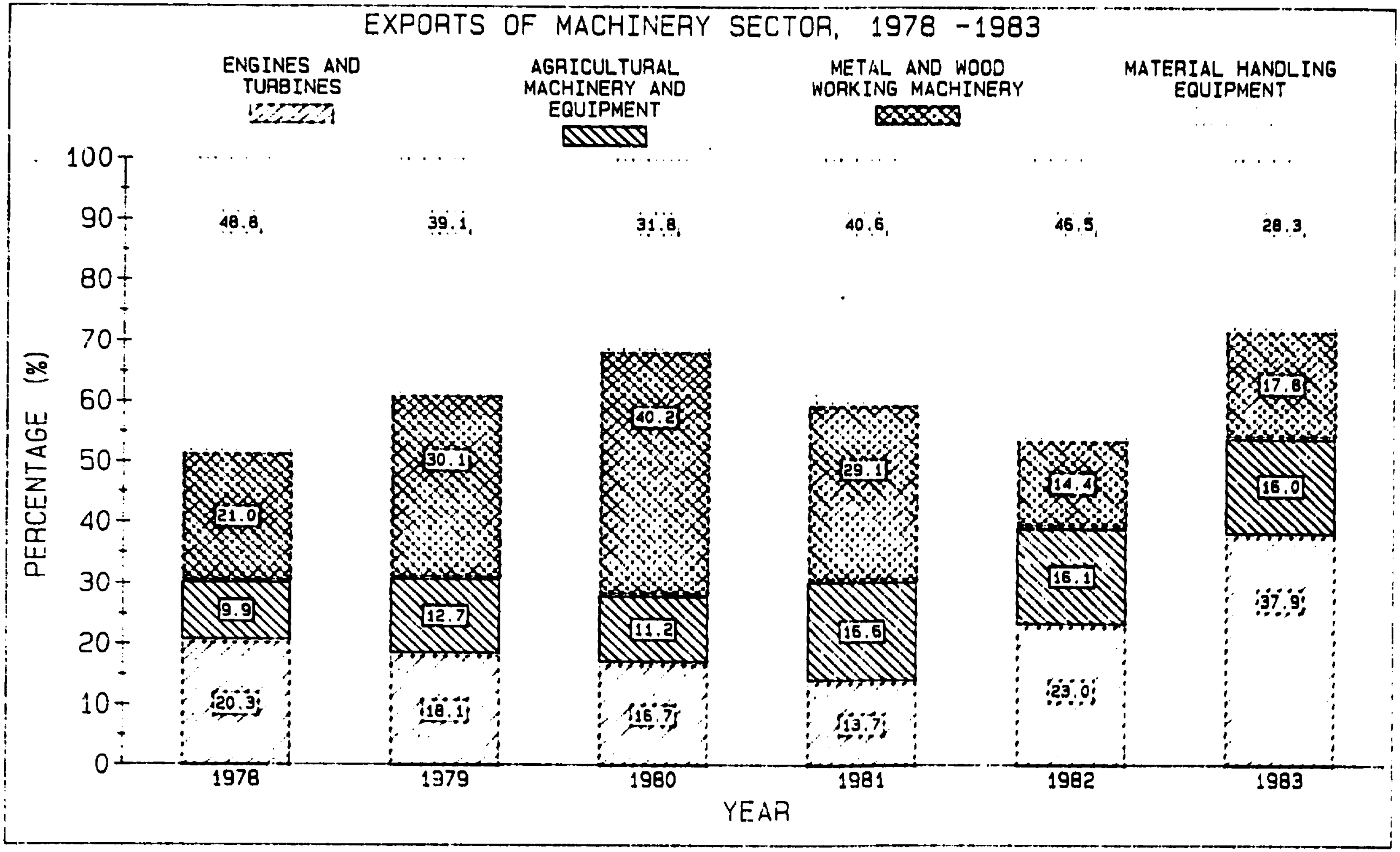
EXPORTS OF MACHINERY SECTOR, 1978 - 1983

| DESCRIPTION | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|
| ENGINES AND TURBINES | 20.4 | 18.1 | 16.7 | 13.7 | 23.0 | 37.9 |
| AGRICULTURAL MACHINERY AND EQUIPMENT | 9.9 | 12.7 | 11.2 | 16.6 | 16.1 | 16.0 |
| METAL AND WOODWORKING MACHINERY | 21.0 | 30.1 | 40.2 | 29.1 | 14.4 | 17.8 |
| MATERIAL HANDLING EQUIPMENT | 48.8 | 39.1 | 31.8 | 40.6 | 46.5 | 28.3 |
| TOTAL | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| ($ MILLION) | 16.3 | 16.6 | 17.9 | 17.5 | 17.4 | 50.1 |

NOTE : DATA FOR 1983 IS FOR PENINSULAR MALAYSIA

SOURCE : DERIVED FROM TABLES 3.2.6, 3.3.12, 3.4.8, 3.5.1

FIGURE 3.1.6




SOURCE: DERIVED FROM TABLE 3.1.6

III.20

25% per annum. However, this increase could not keep pace with imports as the absolute value imported was excessively large.

Engines and turbines enjoyed a fairly high proportion of total exports in 1978 but subsequently its performance weakened against metal and woodworking machinery during the period 1979 - 1981. However, by 1982 engines and turbines again accounted for a significant portion of exports, exceeded the export performance of metal and woodworking tools as shown in Table 3.1.6.

Prior to 1980, the emphasis was on imports of engines and turbines as seen in Table 3.1.5. Subsequent to this period, imports of material handling equipment, metal and woodworking equipment became more important. Imports of material handling equipment doubled from 18.1% in 1978 to 40.5% in 1983. This reflects the extent assembly activities had increased over this period.

### 3.1.7 Intra-Industry Trade Analysis

The intra-industry trade coefficient is used to estimate the importance of the intra-industry trade of a country or economy in relation to the rest of the world. It is also an approximate measure of the degree of industrialisation or industrial specialisation the country has achieved.

The intra-industry trade comprises of trading by industries engaged in horizontal and vertical specialisation. In horizontal specialisation, the

TABLE 3.1.7

TRADE BALANCE OF MACHINERY SECTOR, 1978 - 1983 ( MILLION $ )

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | % GROWTH |
|---|---|---|---|---|---|---|---|
| IMPORTS | 386.5 | 397.6 | 529.9 | 617.6 | 616.5 | 572.4 | 8.2 |
| EXPORTS | 16.3 | 16.6 | 17.9 | 17.5 | 17.4 | 50.1 | 2.5 |
| TRADE BALANCE/(DEFICIT) | (370.2) | (379.0) | (512.0) | (600.1) | (599.1) | (522.3) | |

SOURCE: DERIVED FROM TABLES 3.1.5. & 3.1.6

variety of machinery and equipment products manufactured by firms are reduced. The gains from reduction in product variety which are obtained through the lenghtening of production runs that contribute to productivity improvements, permits the use of special purpose machinery, and lowers the cost involved in moving from one operation to another. In the case of vertical specialisation, it involves the manufacturing of parts, components and accessories for assembly in different countries. The gains are reaped through the exploitation of economies of scale in the manufacture of individual input at various levels of fabrication.

Table 3.1.8 shows the intra-industry trade coefficient for the machinery sector. If we may delineate the intra trade index of 0.50 and above as an indication of a high degree of overall specialisation, then the machinery sector in Malaysia has a rather low degree of specialisation. Between 1978 and 1983, the average intra trade coefficient of the machinery sector was 0.08. Nonetheless, in recent years, the sector is moving towards greater specialisation in production. The index had decreased from 0.08 in 1978 to 0.05 in 1982 before increasing to 0.16 in 1983.

A detailed analysis suggests that the intra trade was most extensive for agricultural machinery while metal and woodworking had the lowest intra trade index in 1983.

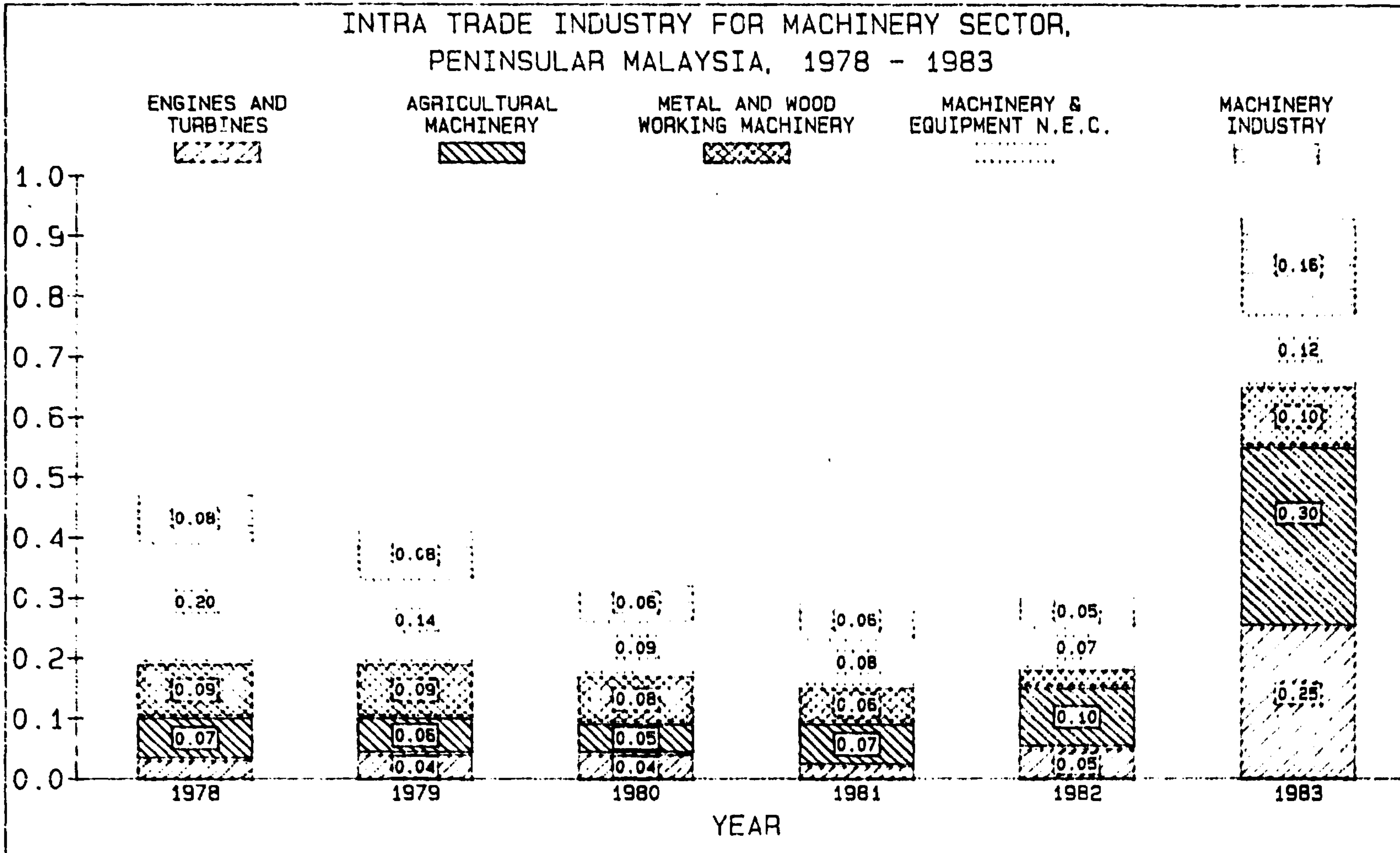
TABLE 3.1.8

INTRA TRADE INDUSTRY FOR MACHINERY SECTOR, PENINSULAR MALAYSIA, 1978 - 1983

| YEAR | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|
| ENGINES & TURBINES | 0.03 | 0.04 | 0.04 | 0.02 | 0.05 | 0.25 |
| AGRICULTURAL MACHINERY | 0.07 | 0.06 | 0.05 | 0.07 | 0.10 | 0.30 |
| METAL & WOODWORKING MACHINERY | 0.09 | 0.09 | 0.08 | 0.06 | 0.03 | 0.10 |
| MACHINERY & EQUIPMENT N.E.C. | 0.20 | 0.14 | 0.09 | 0.08 | 0.07 | 0.12 |
| MACHINERY INDUSTRY | 0.08 | 0.08 | 0.06 | 0.06 | 0.05 | 0.16 |

SOURCE : DERIVED FROM TABLE 3.2.6, 3.3.12, 3.4.8, 3.5.1

FIGURE 3.1.7




SOURCE: DERIVED FROM TABLE 3.1.8

The comparative study of intra-industry trade of the machinery sector for selected reference countries is given in Table 3.1.9 . However, to ensure a comparable and consistent cross-country comparison, definition of machinery used in this subsequent analysis had been slightly altered. It is constrained by the availability of data. The list of machinery products used is given in Appendix 3.1.2. Nonetheless, it will still provide an indicative picture of intra trade and degree of specialisation of the machinery sector in Malaysia as compared to other countries.

Comparatively, the machinery sector in Malaysia has the most extensive intra trade activity as compared to the other ASEAN countries. However, all the other reference countries had much higher intra-industry trade coefficients. There is a difference between countries in Categories 2 and 3 and the developed countries in Category 4. While the high intra trade activities of countries in Categories 2 and 3 were due to the high net imports to their respective total trade in machinery, the extensiveness of the developed countries' intra trade owed much to its large net exports (see Table 3.1.10). Among the developed countries, Japan had the lowest intra-industry trade coefficient. This need not imply that it had a lesser degree of specialisation. Rather, this was the outcome of 2 factors i.e. concerted export market expansion and a high degree of protection for its domestic machinery market.

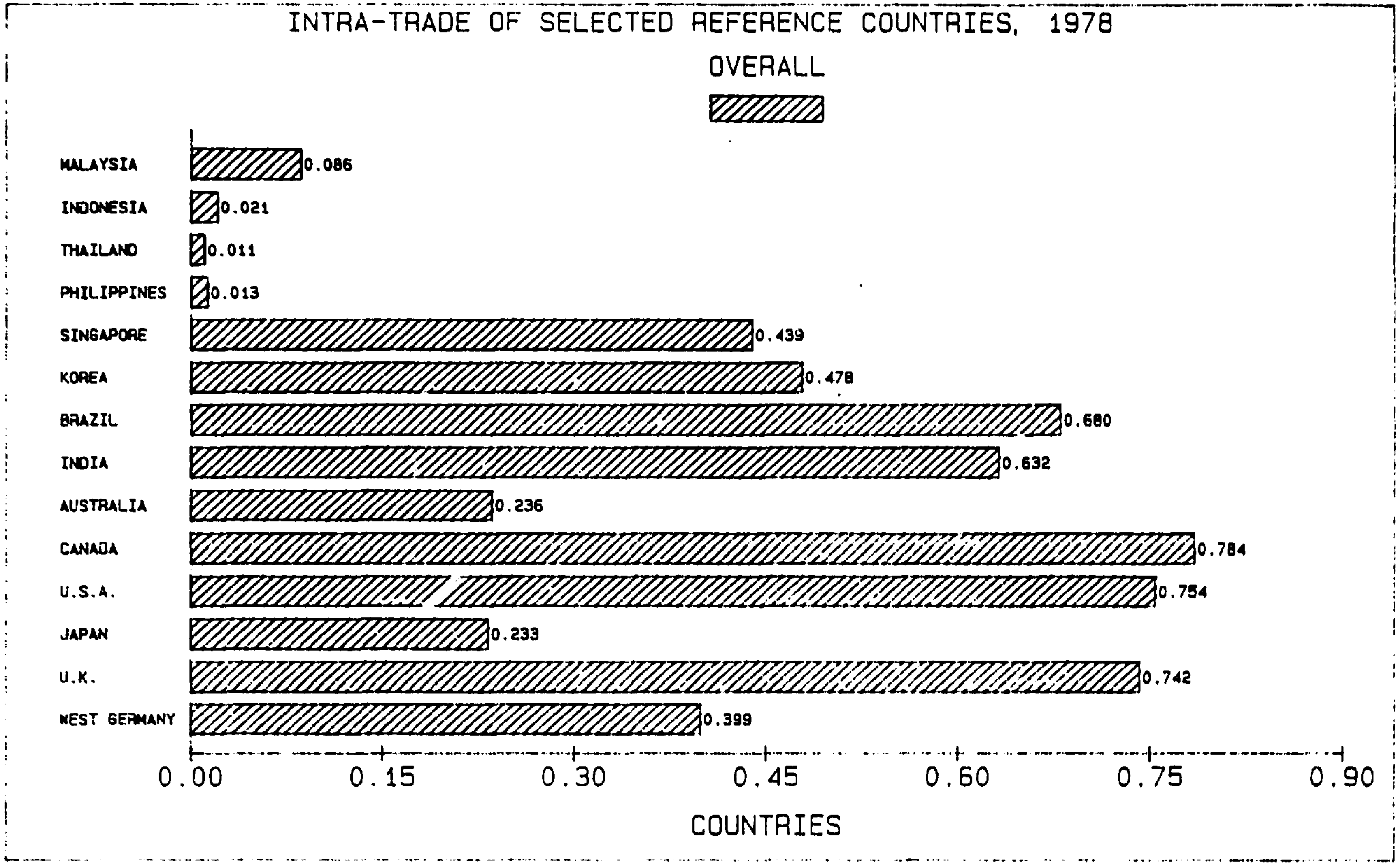
TABLE 3.1.9

INTRA-TRADE OF SELECTED REFERENCE COUNTRIES, 1978,1979, 1980

| COUNTRIES | | ENGINES & TURBINES | AGRICULTURAL MACHINERY EQUIPMENT | METAL AND WOODWORKING MACHINERY | MATERIAL HANDLING EQUIPMENT | OVERALL |
|---|---|---|---|---|---|---|
| CATEGORY 1 | | | | | | |
| MALAYSIA | - 1978 | 0.065 | 0.156 | 0.047 | 0.165 | 0.086 |
| | - 1979 | 0.191 | 0.116 | 0.068 | 0.111 | 0.144 |
| | - 1980 | 0.190 | 0.145 | 0.048 | 0.066 | 0.125 |
| INDONESIA | - 1978 | 0.017 | 0.088 | 0.011 | 0.053 | 0.021 |
| | - 1979 | 0.061 | 0.369 | 0.000 | 0.010 | 0.055 |
| | - 1980 | .000 | 0.000 | 0.000 | 0.031 | 0.004 |
| THAILAND | - 1978 | 0.013 | 0.062 | 0.004 | 0.000 | 0.011 |
| | - 1979 | 0.018 | 0.113 | 0.004 | 0.000 | 0.015 |
| | - 1980 | 0.016 | 0.259 | 0.035 | 0.000 | 0.025 |
| PHILIPPINES | - 1978 | 0.006 | 0.000 | 0.000 | 0.042 | 0.013 |
| | - 1979 | 0.003 | 0.000 | 0.010 | 0.031 | 0.012 |
| | - 1980 | 0.002 | 0.000 | 0.000 | 0.047 | 0.015 |
| CATEGORY 2 | | | | | | |
| SINGAPORE | - 1978 | 0.439 | 0.502 | 0.577 | 0.337 | 0.439 |
| | - 1979 | 0.664 | 0.583 | 0.478 | 0.473 | 0.574 |
| | - 1980 | 0.595 | 0.804 | 0.549 | 0.377 | 0.529 |
| KOREA | - 1978 | 0.907 | 0.259 | 0.021 | 0.171 | 0.478 |
| | - 1979 | 0.764 | 0.230 | 0.049 | 0.285 | 0.594 |
| | - 1980 | 0.673 | 0.206 | 0.157 | 0.234 | 0.687 |
| BRAZIL | - 1978 | 0.962 | 0.657 | 0.121 | 0.287 | 0.680 |
| | - 1979 | 0.807 | 0.442 | 0.187 | 0.436 | 0.786 |
| | - 1980 | 0.765 | 0.359 | 0.246 | 0.811 | 0.877 |
| INDIA | - 1978 | 0.885 | 0.481 | 0.357 | 0.480 | 0.632 |
| | - 1979 | 0.834 | 0.979 | 0.530 | 0.395 | 0.672 |
| | - 1980 | - | - | - | - | - |
| CATEGORY 3 | | | | | | |
| AUSTRALIA | - 1978 | 0.163 | 0.375 | 0.100 | 0.305 | 0.236 |
| | - 1979 | 0.148 | 0.566 | 0.270 | 0.273 | 0.262 |
| | - 1980 | 0.134 | 0.599 | 0.226 | 0.303 | 0.267 |
| CANADA | - 1978 | 0.828 | 0.840 | 0.425 | 0.766 | 0.784 |
| | - 1979 | 0.759 | 0.867 | 0.458 | 0.730 | 0.741 |
| | - 1980 | 0.657 | 0.864 | 0.364 | 0.714 | 0.662 |
| CATEGORY 4 | | | | | | |
| U.S.A. | - 1978 | 0.787 | 0.797 | 0.910 | 0.454 | 0.754 |
| | - 1979 | 0.713 | 0.841 | 0.959 | 0.463 | 0.747 |
| | - 1980 | 0.666 | 0.752 | 0.970 | 0.385 | 0.699 |
| JAPAN | - 1978 | 0.272 | 0.301 | 0.212 | 0.154 | 0.233 |
| | - 1979 | 0.299 | 0.832 | 0.252 | 0.167 | 0.278 |
| | - 1980 | - | 0.711 | 0.278 | 0.141 | 0.304 |
| U.K. | - 1978 | 0.663 | 0.924 | 0.906 | 0.745 | 0.742 |
| | - 1979 | 0.662 | 0.978 | 0.682 | 0.774 | 0.709 |
| | - 1980 | 0.614 | 0.974 | 0.912 | 0.726 | 0.711 |
| WEST GERMANY | - 1978 | 0.397 | 0.538 | 0.359 | 0.415 | 0.399 |
| | - 1979 | 0.442 | 0.551 | 0.398 | 0.490 | 0.445 |
| | - 1980 | 0.509 | 0.555 | 0.456 | 0.486 | 0.490 |

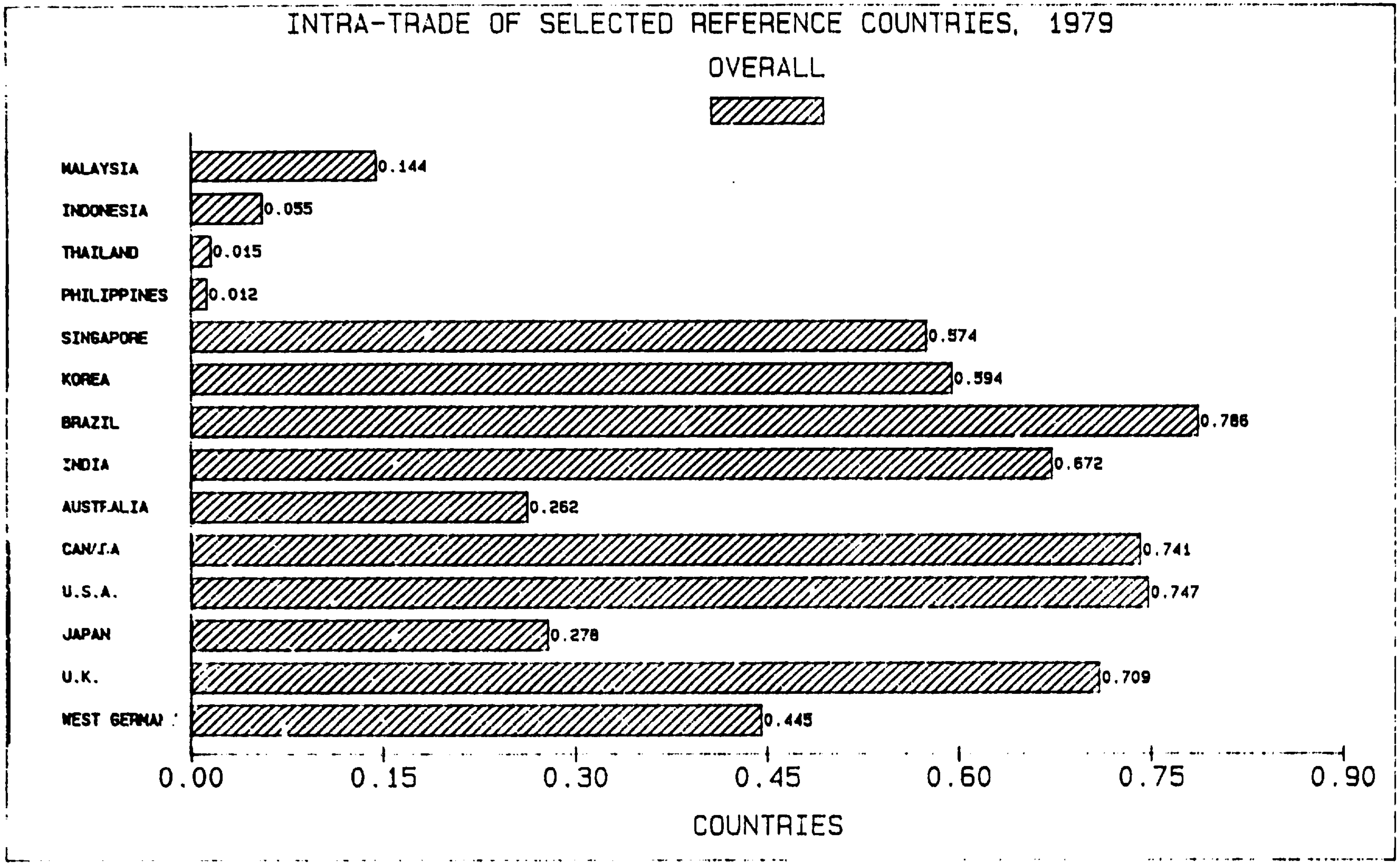
SOURCE : DERIVED FROM TABLE 3.1.10

FIGURE 3.1.8



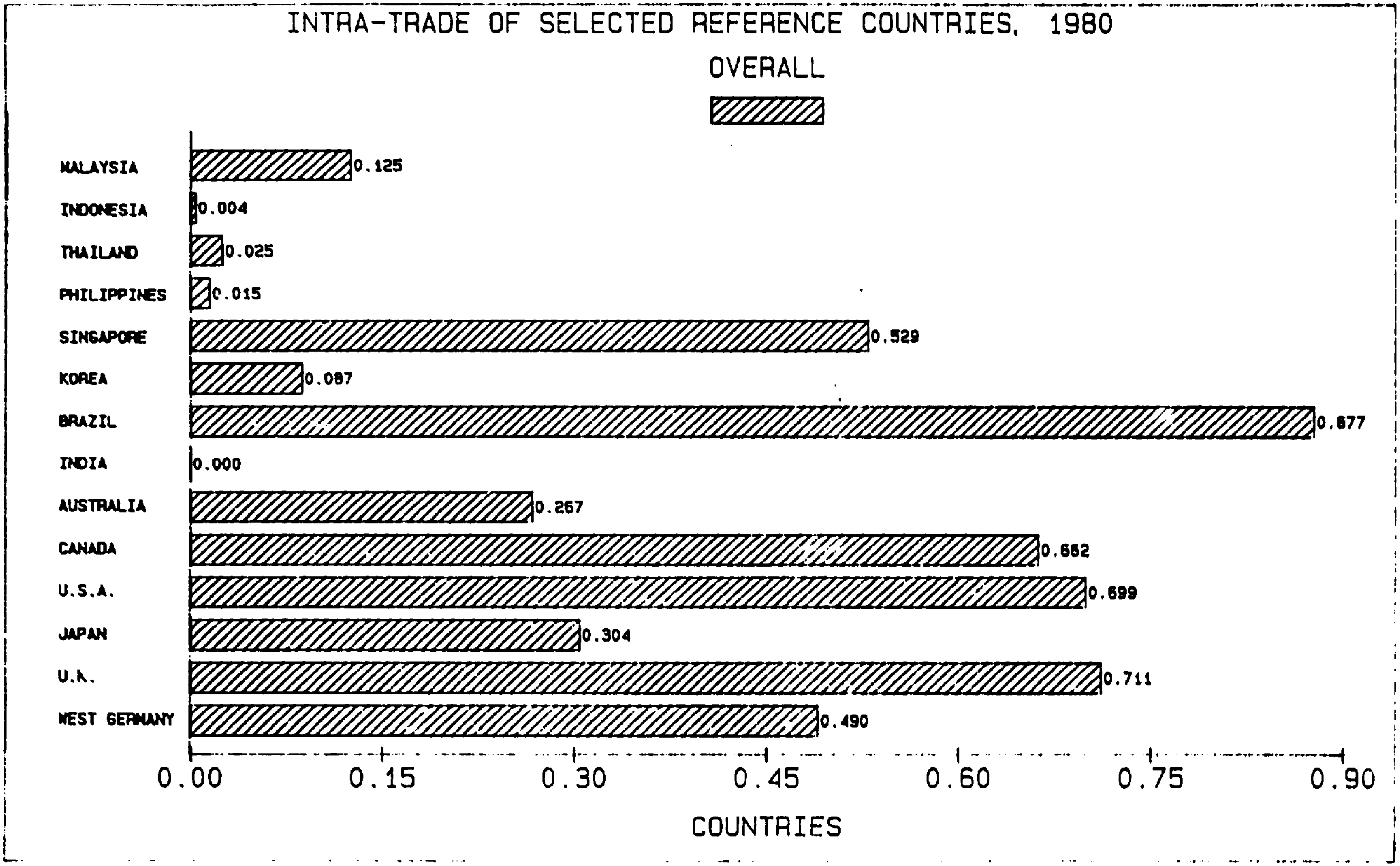

SOURCE: DERIVED FROM TABLE 3.1.9

FIGURE 3.1.9




SOURCE: DERIVED FROM TABLE 3.1.9

FIGURE 3.1.10




SOURCE: DERIVED FROM TABLE 3.1.9

TABLE [illegible]

IMPORTS AND EXPORTS OF MACHINERY FOR SELECTED REFERENCE COUNTRIES, 1978, 1979, 1980

| COUNTRIES | | ENGINES & TURBINES | | AGRICULTURAL MACHINERY AND EQUIPMENT | | METAL & WOODWORKING MACHINERY | | MATERIAL HANDLING EQUIPMENT | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | IMPORT | EXPORT | IMPORT | EXPORT | IMPORT | EXPORT | IMPORT | EXPORT | IMPORT | EXPORT |
| CATEGORY 1 | | | | | | | | | | | |
| MALAYSIA | - 1978 | 128,208 | 4,316 | 6,332 | 534 | 34,914 | 839 | 42,717 | 3,833 | 212,171 | 9,522 |
| | - 1979 | 116,648 | 12,321 | 11,985 | 736 | 46,598 | 1,629 | 59,483 | 3,485 | 234,714 | 18,171 |
| | - 1980 | 151,000 | 15,890 | 12,260 | 961 | 79,100 | 1,956 | 83,000 | 2,820 | 325,360 | 21,627 |
| INDONESIA | - 1978 | 1,080,745 | 9,207 | 31,236 | 1,445 | 25,289 | 139 | 66,801 | 1,806 | 1,204,071 | 12,597 |
| | - 1979 | 433,728 | 13,621 | 5,884 | 1,329 | 39,865 | - | 65,337 | 340 | 544,814 | 15,290 |
| | - 1980 | 705,220 | 116 | 6,882 | - | 56,463 | - | 106,729 | 1,677 | 875,294 | 1,793 |
| THAILAND | - 1978 | 170,520 | 1,105 | 4,501 | 145 | 49,143 | 110 | 28,092 | | 252,256 | 1,360 |
| | - 1979 | 178,764 | 1,632 | 8,253 | 492 | 61,653 | 121 | 38,902 | | 287,572 | 2,245 |
| | - 1980 | 155,722 | 1,223 | 8,844 | 1,314 | 50,863 | 911 | 54,094 | | 269,523 | 3,448 |
| PHILIPPINES | - 1978 | 125,419 | 382 | 4,363 | - | 39,472 | | 54,092 | 1,148 | 223,346 | 1,530 |
| | - 1979 | 131,315 | 205 | 7,239 | - | 48,201 | 246 | 72,529 | 1,127 | 259,284 | 1,578 |
| | - 1980 | 149,148 | 153 | 12,578 | - | 55,591 | | 90,648 | 2,193 | 307,965 | 2,346 |
| CATEGORY 2 | | | | | | | | | | | |
| SINGAPORE | - 1978 | 198,158 | 55,736 | 12,796 | 4,231 | 49,646 | 20,126 | 88,351 | 17,891 | 348,951 | 98,106 |
| | - 1979 | 237,083 | 117,699 | 5,190 | 2,137 | 125,853 | 39,480 | 122,202 | 37,833 | 490,328 | 197,143 |
| | - 1980 | 337,016 | 142,616 | 6,858 | 4,615 | 153,724 | 58,230 | 204,726 | 47,531 | 702,324 | 252,992 |
| KOREA | - 1978 | 159,811 | 236,466 | 11,065 | 1,644 | 432,195 | 4,487 | 240,865 | 22,523 | 843,936 | 265,120 |
| | - 1979 | 246,263 | 398,106 | 24,295 | 3,161 | 603,513 | 15,030 | 183,549 | 30,534 | 1,057,620 | 446,831 |
| | - 1980 | 161,271 | 318,205 | 32,098 | 3,681 | 387,869 | 33,097 | 129,996 | 17,193 | 711,134 | 372,176 |
| BRAZIL | - 1978 | 204,216 | 220,135 | 48,201 | 98,426 | 331,399 | 21,328 | 111,739 | 18,737 | 695,555 | 358,626 |
| | - 1979 | 168,492 | 249,279 | 39,390 | 138,685 | 395,350 | 40,745 | 103,174 | 28,789 | 706,406 | 457,498 |
| | - 1980 | 217,992 | 351,638 | 44,026 | 201,477 | 530,485 | 74,562 | 82,319 | 56,155 | 874,822 | 683,632 |
| INDIA | - 1978 | 84,126 | 66,836 | 15,890 | 5,032 | 93,974 | 20,438 | 17,676 | 5,588 | 211,666 | 97,894 |
| | - 1979 | 80,580 | 57,584 | 3,954 | 4,124 | 97,291 | 35,058 | 18,114 | 4,460 | 199,939 | 101,726 |
| | - 1980 | - | - | - | - | - | - | - | - | - | - |
| CATEGORY 3 | | | | | | | | | | | |
| AUSTRALIA | - 1978 | 287,358 | 25,492 | 180,675 | 41,633 | 121,164 | 6,388 | 119,878 | 21,533 | 709,075 | 95,046 |
| | - 1979 | 393,596 | 31,469 | 107,980 | 42,644 | 134,879 | 21,092 | 106,311 | 16,794 | 742,766 | 111,999 |
| | - 1980 | 430,890 | 30,840 | 139,080 | 59,517 | 217,482 | 27,682 | 145,926 | 26,069 | 933,378 | 144,108 |
| CANADA | - 1978 | 1,920,424 | 1,357,001 | 509,648 | 369,060 | 392,699 | 106,121 | 378,552 | 235,181 | 3,201,323 | 2,067,363 |
| | - 1979 | 2,145,805 | 1,312,075 | 707,466 | 541,115 | 567,125 | 168,298 | 501,842 | 288,729 | 3,922,239 | 2,310,217 |
| | - 1980 | 2,185,506 | 1,069,965 | 754,392 | 573,269 | 809,483 | 179,901 | 517,879 | 28[illegible],505 | 4,267,260 | 2,110,640 |
| CATEGORY 4 | | | | | | | | | | | |
| U.S.A. | - 1978 | 3,023,097 | 4,661,106 | 559,291 | 844,509 | 1,006,963 | 1,205,713 | 496,616 | 1,689,804 | 5,085,967 | 8,401,132 |
| | - 1979 | 3,159,199 | 5,701,824 | 789,758 | 1,088,192 | 1,536,119 | 1,414,346 | 601,101 | 1,995,472 | 6,086,177 | 10,199,834 |
| | - 1980 | 3,439,682 | 6,892,767 | 779,831 | 1,294,586 | 1,906,711 | 1,797,099 | 607,315 | 2,548,072 | 6,733,539 | 12,532,524 |
| JAPAN | - 1978 | 312,355 | 2,228,052 | 54,557 | 66,509 | 164,617 | 1,387,313 | 78,176 | 934,693 | 609,705 | 4,616,567 |
| | - 1979 | 355,994 | 1,981,569 | 78,910 | 110,687 | 239,515 | 1,657,655 | 87,166 | 958,874 | 761,588 | 4,708,785 |
| | - 1980 | 478,252 | 2,024,910 | 78,180 | 141,584 | 299,575 | 1,857,236 | 99,627 | 1,312,643 | 955,634 | 5,336,373 |
| U.K. | - 1978 | 1,347,573 | 2,717,794 | 243,823 | 283,772 | 614,123 | 740,889 | 415,079 | 698,514 | 2,620,598 | 4,440,969 |
| | - 1979 | 1,567,166 | 3,168,429 | 329,679 | 315,598 | 876,916 | 1,693,280 | 527,476 | 834,633 | 3,301,237 | 6,011,940 |
| | - 1980 | 1,960,101 | 4,419,403 | 315,959 | 332,676 | 948,236 | 1,131,137 | 622,227 | 1,091,075 | 3,846,523 | 6,974,291 |
| WEST GERMANY | - 1978 | 903,047 | 3,640,950 | 263,941 | 717,992 | 712,441 | 3,258,861 | 444,745 | 1,696,601 | 2,324,174 | 9,314,404 |
| | - 1979 | 1,146,296 | 4,045,730 | 326,807 | 859,259 | 943,327 | 3,797,217 | 606,986 | 1,868,860 | 3,023,416 | 10,571,066 |
| | - 1980 | 1,300,831 | 3,809,792 | 341,750 | 888,856 | 1,196,285 | 4,028,269 | 636,021 | 1,980,820 | 3,474,887 | 10,701,737 |

SOURCE COMMODITY TRADE STATISTICS, UN

### 3.1.8 Revealed Comparative Advantage

One widely used method of assessing export performance is that of revealed comparative advantage (RCA). This static measure is represented by the formula,

$$RCAi = \frac{Eij/\sum j\ Eij}{\sum i\ Eij/\sum j \sum i\ Eij}$$

$$= \frac{\text{Country j's export share in total market export of commodity}}{\text{Country j's export share in total world market export of all manufactured products}}$$

An index greater than 1 implies comparative advantage of the industry, while a value less than 1 indicates comparative disadvantage.

Table 3.1.11 summarises the revealed comparative advantage indices of the various industries within the machinery sector of Malaysia and some selected countries over the period of 1970-1979. Within Malaysia, the overall export performance of the machinery industry is poor. The average RCA index of the machinery industries in Malaysia was 0.07 in 1979. Compared to other ASEAN countries, except Indonesia, Malaysia had a relatively higher comparative advantage in exports but when compared to the NICs and developed countries, the export performance trailed way behind. In fact, while most of the ASEAN countries and NICs experienced

## TABLE 3.1.11

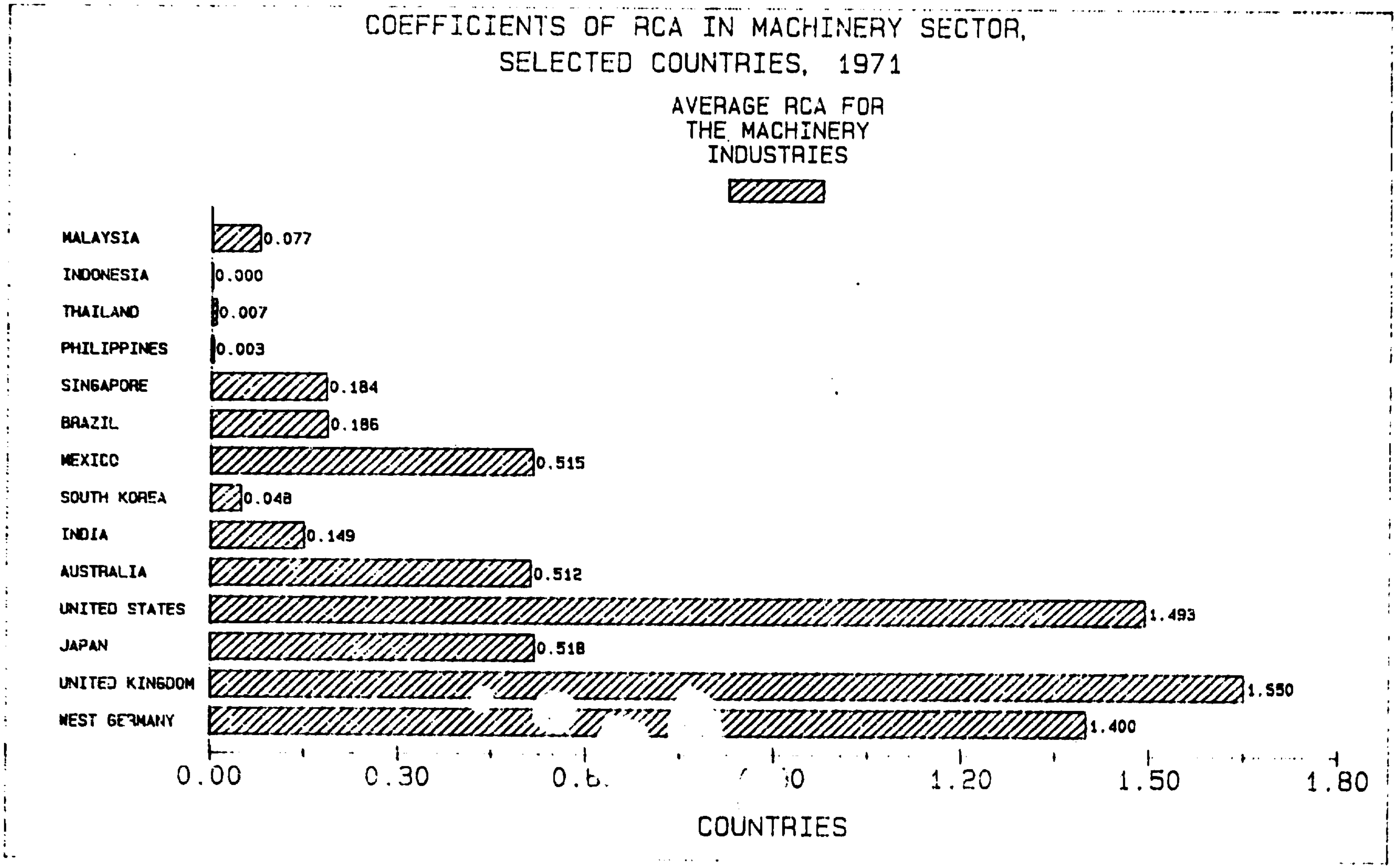
COEFFICIENTS OF RCA IN MACHINERY SECTOR, SELECTED COUNTRIES, 1970 - 1979

| COUNTRY | YEAR | ENGINES & TURBINES | AGRICULTURAL MACHINERY | METAL & WOOD WORKING MACHINERY | MACHINERY & EQUIPMENT N.E.C. | AVERAGE RCA FOR THE MACHINERY INDUSTRIES |
|---|---|---|---|---|---|---|
| **GROUP 1** | | | | | | |
| MALAYSIA | 1971 | 0.014 | 0.070 | 0.019 | 0.114 | 0.077 |
| | 1979 | 0.073 | 0.020 | 0.010 | 0.176 | 0.070 |
| INDONESIA | 1971 | - | - | - | - | - |
| | 1979 | 0.253 | 0.076 | 0.007 | 0.045 | 0.095 |
| THAILAND | 1971 | 0.003 | 0.002 | - | 0.015 | 0.007 |
| | 1979 | 0.020 | 0.013 | 0.005 | 0.043 | 0.020 |
| PHILIPPINES | 1971 | 0.001 | 0.001 | - | 0.006 | 0.003 |
| | 1979 | 0.006 | 0.009 | 0.002 | 0.048 | 0.016 |
| **GROUP 2** | | | | | | |
| SINGAPORE | 1971 | 0.372 | 0.024 | 0.079 | 0.260 | 0.184 |
| | 1979 | 0.439 | 0.050 | 0.255 | 0.474 | 0.305 |
| BRAZIL | 1971 | 0.109 | 0.129 | 0.315 | 0.199 | 0.186 |
| | 1979 | 0.144 | 1.206 | 0.336 | 0.354 | 0.510 |
| MEXICO | 1971 | 0.779 | 0.068 | - | 0.697 | 0.515 |
| | 1979 | 1.913 | 0.212 | 0.040 | 0.339 | 0.626 |
| SOUTH KOREA | 1971 | 0.120 | 0.021 | 0.027 | 0.024 | 0.048 |
| | 1979 | 0.109 | 0.020 | 0.068 | 0.092 | 0.072 |
| INDIA | 1971 | 0.227 | 0.047 | 0.200 | 0.122 | 0.149 |
| | 1979 | 0.695 | 0.144 | 0.427 | 0.260 | 0.382 |
| **GROUP 3** | | | | | | |
| AUSTRALIA | 1971 | 0.216 | 0.617 | 0.927 | 0.286 | 0.512 |
| | 1979 | 0.154 | 0.542 | 1.039 | 0.308 | 0.511 |
| **GROUP 4** | | | | | | |
| UNITED STATES | 1971 | 1.834 | 1.776 | 0.982 | 1.380 | 1.493 |
| | 1979 | 1.863 | 1.877 | 0.725 | 1.259 | 1.431 |
| JAPAN | 1971 | 0.576 | 0.383 | 0.518 | 0.595 | 0.519 |
| | 1979 | 0.936 | 0.796 | 1.446 | 0.942 | 1.030 |
| UNITED KINGDOM | 1971 | 2.010 | 2.167 | 1.241 | 1.182 | 1.650 |
| | 1979 | 1.872 | 1.591 | 0.888 | 1.133 | 1.371 |
| WEST GERMANY | 1971 | 0.933 | 0.897 | 2.181 | 1.569 | 1.400 |
| | 1979 | 1.160 | 0.991 | 1.990 | 1.534 | 1.419 |

* SIMPLE ARITHMETIC AVERAGE

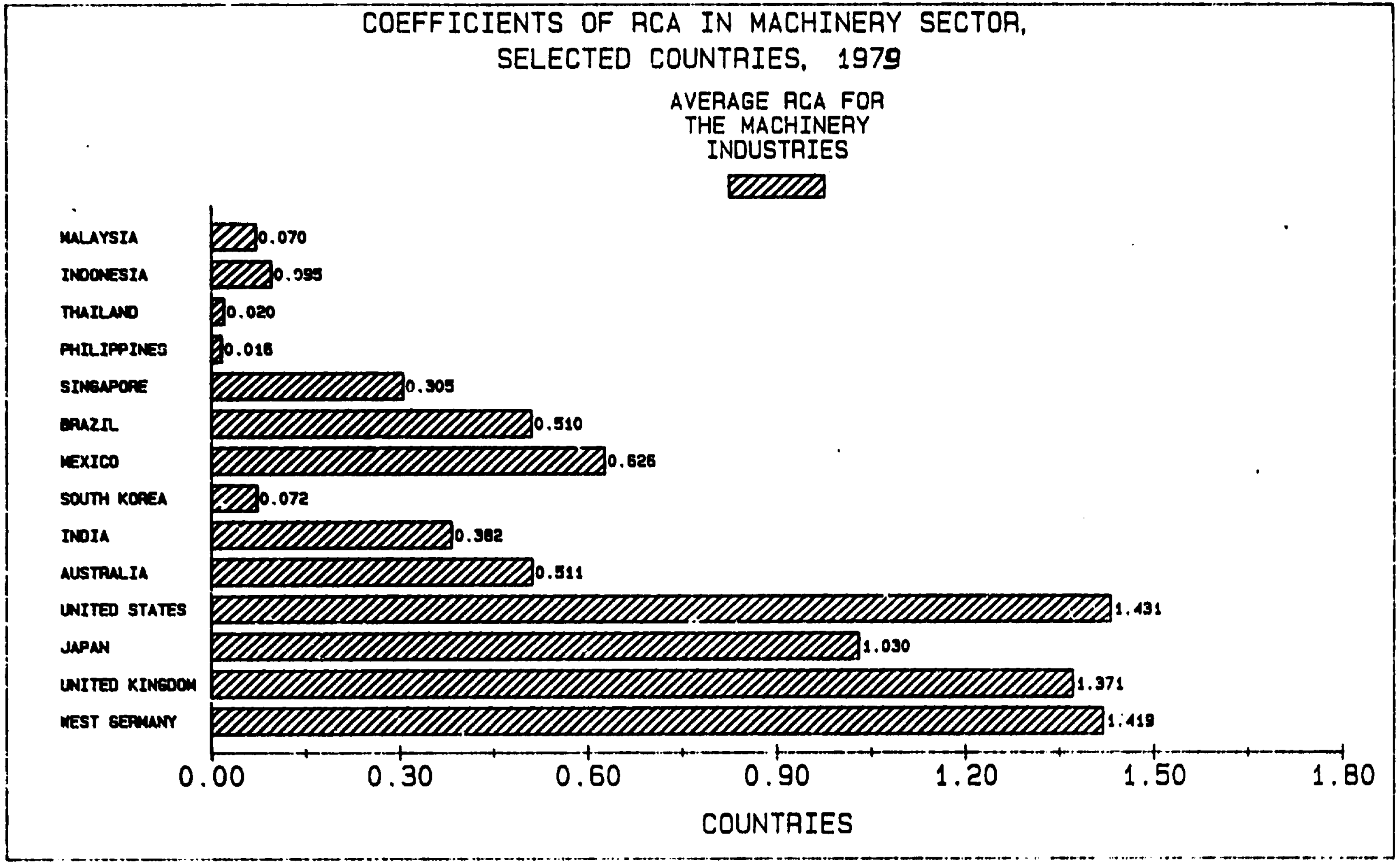
SOURCE : UNIDO; WORLD NON-ELECTRICAL MACHINERY 1984

FIGURE 3.1.11




SOURCE: DERIVED FROM TABLE 3.1.11

FIGURE 3.1.12




SOURCE: DERIVED FROM TABLE 3.1.11

improved export performance in the 1970s, Malaysia had the opposite experience. The revealed comparative disadvantage of the machinery sector in Malaysia had actually worsen. Besides being not competitive (as was reflected by the high Domestic Resource Coefficient) in the international market, the local machinery sector also suffered from neglect in terms of government incentives and promotional policies.

As expected, the developed countries had the highest RCA coefficients. In recent years, the relatively high comparative advantage enjoyed by the United States in the world market had been marginally eroded away by the upsurge in the export performance of the Japanese machinery industries. This trend is expected to continue in the future.

### 3.1.9 Trend of Foreign Equity Ownership Over-Time

By year end 1980, foreign equity ownership was slightly higher ie. 40% compared with 38% for all manufacturing sector (see Table 3.1.12). However total fixed assets owned by foreigners in the machinery sector was 42% compared with 40% for the manufacturing sector. Thus, one may conclude that the technology in this industry is "imported" from overseas in the form of joint-ventures. This trend is not expected to change very much in the late 1980s as the industry has no ability to build the high technology machines necessary to this sector.

TABLE 3.1.12

PATTERN OF CAPITAL STRUCTURE, MACHINERY MANUFACTURING, PENINSULAR MALAYSIA, 1980

| | IN PRODUCTION, Y/E 1980 ($'000) | | | PROJECTS APPROVED 1981 ($'000) | |
|---|---|---|---|---|---|
| | PAID-UP CAPITAL | LOANS | TOTAL FIXED ASSETS | PROPOSED CALL-UP CAPITAL | LOANS |
| MACHINERY MANUFACTURING SECTOR | 124,249 | 17,106 | 116,261 | 71,500 | 79,100 |
| - FOREIGN | 49,398 | 1,807 | 49,482 | 28.6 | N.A. |
| - % FOREIGN | (39.76) | (10.56) | (42.56) | (0.04) | (N.A.) |
| ALL MANUFACTURING | 6,145,580 | 2,113,631 | 6,931,312 | 1,509,800 | 2,938,600 |
| - FOREIGN | 2,365,699 | 534,620 | 2,696,485 | 0.495 | N.A. |
| - % FOREIGN | (38.49) | (25.29) | (38.90) | (0.00003) | (N.A.) |

| COUNTRY OF ORIGIN | 1980 PAID-UP CAPITAL ($'000) | % |
|---|---|---|
| JAPAN | 19,762 | 40 |
| UNITED KINGDOM | 16,936 | 34 |
| U.S.A. | 3,902 | 8 |
| AUSTRALIA | 3,468 | 7 |
| SINGAPORE | 3,023 | 6 |
| FED. REP OF GERMANY | 1,218 | 2 |
| TAIWAN | 380 | 1 |
| INDIA | 350 | 1 |
| OTHERS | 259 | 1 |
| ALL | 49,398 | 100 |

SOURCE : MIDA ANNUAL REPORT 1981, TABLE 5
ALL MANFACTURING EXCLUDES HOTEL AND TOURIST COMPLEXES

Japan ranked highest with total investment of $19.8 million constituting 40% of total paid-up capital. Next is the United Kingdom with 34%. Together with the United States, they contributed 82% of total foreign paid-up capital.

As the present policy is to "Look East", Japan is still expected to provide the thrust in terms of capital, technical know-how, machinery as well as skilled personnel. However, this position may be eroded by other countries like Taiwan as the country shifts away from complete dependence on any single investing nation.

### 3.1.10 Value Added Analysis For The Machinery Sector

While output has tripled, the value added for the machinery industries has increased by rapidly. Table 3.1.13 shows that value added for the sector was only $25.1 million. (Please note that this figure excludes electrical machinery) in 1968 but by the early 1970s the value added for the sector has increased 45 times. This suggests that the product mix from the industry has changed and moved a step higher. Whereas in the late 1960s, the technical processes may include simple assembly, repairing and servicing of imported machines, the early 1970s included manufacturing of simple component parts. A very good example is seen in the agricultural machinery industry product mix in 1973 which included $225,000 of "Income for services". By 1978, products like power tillers, dryers and manufacture of spare parts were being produced. This trend has been reinforced subsequently. By the early 80s, the

## TABLE 3.1.13

PENINSULAR MALAYSIA : VALUE ADDED[1] ($ MILLION) BY MANUFACTURING INDUSTRIES

| INDUSTRIES | CENSUS DATA[2] | | ANNUAL SURVEY DATA[3,4] | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1968 | 1973 | 1972 | 1974 | 1975 | 1976 | 1978 | 1979 | 1981 |
| PROCESSING OF ESTATE-TYPE AGRICULTURAL PRODUCTS IN FACTORIES OFF ESTATES[5] | 77.3 | t.d. | 142.8 | t.d. | t.d. | t.d. | t.d. | 1,085.5 | 1,038.8 |
| FOOD | 140.1 | 364.[illegible] | 160.7 | 477.0 | 634.4 | 793.3 | 1,101.4 | 601.3 | 836.5 |
| BEVERAGES | 36.3 | 61.2 | 47.1 | 59.6 | 90.5 | 107.3 | 131.7 | 164.[illegible] | 305.4 |
| TOBACCO PRODUCTS | 57.1 | 130.4 | 90.5 | 113.9 | 98.7 | 129.6 | 147.5 | 174.6 | 271.5 |
| TEXTILES | 19.5 | 104.2 | 55.8 | 106.4 | 178.9 | 251.5 | 346.2 | 389.9 | 525.4 |
| FOOTWEAR (EXCEPT RUBBER FOOTWEAR), OTHER WEARING APPAREL AND MADE-UP TEXTILE GOODS | 7.7 | 35.5 | 25.8 | 38.6 | 47.4 | 51.9 | 77.1 | 100.0 | 31.4 |
| WOOD PRODUCTS | 94.4 | 304.2 | 177.1 | 279.8 | 246.1 | 347.3 | 514.3 | 668.5 | 870.7 |
| FURNITURE AND FIXTURES | 10.3 | 19.3 | 10.4 | 19.8 | 24.3 | 23.1 | 36.7 | 45.6 | 100.9 |
| PRINTING, PUBLISHING AND ALLIED INDUSTRIES | 52.6 | 114.6 | 96.1 | 142.2 | 126.8 | 133.6 | 206.8 | 241.0 | 413.7 |
| PAPER AND PAPER PRODUCTS | 6.2 | 18.0 | 12.8 | 27.0 | 32.2 | 27.4 | 46.6 | 63.7 | 93.9 |
| LEATHER AND LEATHER PRODUCTS | 1.0 | 222.5 | 2.0 | 2.9 | 1.8 | 2.1 | 4.6 | 4.8 | 89.5 |
| RUBBER PRODUCTS | 50.9 | 222.5 | [illegible] | 252.3 | 332.0 | 432.9 | 526.4 | 284.1 | 315.9 |
| CHEMICAL AND CHEMICAL PRODUCTS | 79.5 | 175.1 | 145.0 | 187.6 | 194.4 | 228.5 | 302.1 | 538.1 | 461.6 |
| PRODUCTS OF PETROLEUM AND COAL | 40.7 | 51.9 | 46.7 | 50.3 | 86.7 | 126.5 | 176.4 | 243.5 | 544.7 |
| NON-METALLIC MINERAL PRODUCTS | 61.8 | 104.2 | 117.4 | 122.0 | 107.6 | 115.5 | 208.6 | 334.7 | 581.3 |
| BASIC METAL INDUSTRIES | 21.2 | 85.9 | 50.4 | 97.5 | 97.0 | 102.4 | 166.4 | 170.9 | 222.1 |
| METAL PRODUCTS | 39.0 | 114.4 | 65.9 | 126.1 | 111.6 | 126.8 | 199.2 | 255.3 | 388.0 |
| MACHINERY EXCEPT ELECTRICAL MACHINERY | 25.1 | 87.2 | 43.6 | 114.4 | 94.3 | 76.1 | 153.9 | 209.1 | 329.9 |
| ELECTRICAL MACHINERY | 20.8 | 188.5 | 72.4 | 259.1 | 334.0 | 424.5 | 572.2 | 892.9 | 1,235.3 |
| TRANSPORT EQUIPMENT. | 18.7 | 62.2 | 40.7 | 88.4 | 90.3 | 107.8 | 160.7 | 239.3 | 441.0 |
| MISCELLANEOUS MANUFACTURING INDUSTRIES | 13.7 | 80.1 | 41.5 | 94.1 | 94.7 | 126.8 | 223.5 | 34.6 | 301.4 |
| TOTAL | 873.9 | 2,326.9 | 1,524.9 | 2,759.0 | 3,023.7 | [illegible],608.9 | 5,302.3 | 6,742.2 | 9,398.9 |
| GROWTH RATE P.A. | | | | | | | | | |
| MACHINERY EXCEPT ELECTRICAL MACHINERY | | | 22.00% | | | | | | |
| NON-METALLIC MINERAL PRODUCTS | | | 18.82% | | | | | | |
| BASIC METAL INDUSTRIES | | | 19.81% | | | | | | |
| ALL MANUFACTURING | | | 20.00% | | | | | | |

1 PRIOR TO 1970, VALUE ADDED WAS DERIVED AS FOLLOWS: (GROSS VALUE OF SALES) - (VALUE OF MATERIALS PURCHASED) (STOCK CHANGES). VALUE ADDED IN SUBSEQUENT SURVEYS WAS DERIVED AS FOLLOWS: (VALUE OF PRODUCTION) - (COST OF MATERIALS CONSUMED) (STOCK CHANGES)

2 THE 1968 AND 1973 CENSUS REPORT DO NOT COVER THE FOLLOWING INDUSTRIES: TAILORING AND DRESS-MAKING; REPAIR OF MOTOR VEHICLES; BICYCLE REPAIR SHOPS AND GOLDSMITHS; ABATTOIRS AND TIN SMELTING

3 SURVEY DATA FOR 1970-1972 AND 1974-1978 RELATED TO 95 PERCENT AND ABOVE 90 PERCENT OF VALUE ADDED COVERED BY THE 1968 AND 1973 CENSUS REPORTS RESPECTIVELY

4 1977 SURVEY DATA WERE NOT AVAILABLE

5 HAVE BEEN DISTRIBUTED TO FOOD AND RUBBER PRODUCTS FROM 1973 CENSUS AND SUBSEQUENT SURVEYS, UP TO 1978.

SOURCE : DEPARTMENT OF STATISTICS

industry has increased its value added to $330 million as compared to $221.1 million for basic metal industries in 1981.

As the machinery industry is inter-linked with the basic metal and metal products industries, these 2 sectors have also exhibited a similar growth pattern. It should be noted that the sharp increases experienced by the 3 industries mentioned above have also been boosted by the economy emerging from the economic depression in 1974.

However, it is interesting to note that the "machinery except electrical machinery" sector has achieved higher growth rates per annum compared with the non-metallic mineral products, basic metal industries and all manufacturing.

### 3.1.11 Domestic Production In The Machinery Sector

While output has tripled, domestic production still lags behind imports as the major contributor to the domestic market. Table 3.1.14 shows the relationship between local production and external trade. In 1968, production was a mere 33% of domestic consumption but by 1973 it accounted for more than 1/2 of local demand. However, due to the inherent weakness in the industry, it again lost its market share to imports.

This is not surprising as local products are not price competitive, of inferior quality and with design limitations. Local products could not with stand the aggressive on slaught made by imports

TABLE 3.1.14

SHARE OF DOMESTIC PRODUCTION, EXPORTS & IMPORTS IN THE DOMESTIC MARKET, FOR THE MACHINERY SECTOR, 1968 - 1981

| YEAR | PRODUCTION AS % DOMESTIC MARKET | EXPORT AS % DOMESTIC MARKET | IMPORT AS % DOMESTIC MARKET |
|---|---|---|---|
| 1968 | 38.6 | 66.5 | 5.1 |
| 1973 | 54.7 | 47.9 | 2.6 |
| 1978 | 34.9 | 67.9 | 2.9 |
| 1981 | 45.0 | 56.6 | 1.6 |

SOURCE : DERIVED FROM TABLE 5.2.1

from Japan, Korea and the technically more advanced nations. It is also for these reasons, that exports have been negligible. This trend is expected to continue unless the sector can harness sufficient technical sophistication to compete with imports.

## 3.1.12 Excess Capacity Problem

Table 3.1.15 summarises the extent excess capacity affected the industry during mid-1984. Field survey conducted on selected products showed that the maximum level of capacity utilised was at 60% while the minimum was about 22% . In aggregate, 41% of the product range had expanded their installed capacity since the start of operation.

Diesel engines and stationary engines had excess capacity of more than 70%. This problem is even more acute for diesel engines. Metal working machinery faired better; operating between 50%-60% capacity. The more badly affected products were saw blades, tool bits, air mills and milling cutters which operated at 24% capacity since 1982. In order to absorb this excess capacity, some firms contract for jobs on an irregular basis. For die casting, jobbing took up 75% of cperational capacity.

TABLE 3.1.15

INSTALLED AND OPERATIONAL PRODUCTION CAPACITY OF SELECTED PRODUCTS, 1984

| | MAXIMUM INSTALLED PRODUCTION CAPACITY PER ANNUM N /SHIFT | | LEVEL OF CAPACITY UTILISED (%) | |
|---|---|---|---|---|
| | AT START OF OPERATION | PRESENT | AT START OF OPERATION | PRESENT |
| 1. STATIONARY ENGINES | 5,000 H.P. | 5,000 H.P. | 42% | 30 |
| 2. DIESEL ENGINES | | | | |
| 3. CONCRETE MIXER | 252/YEAR | N.A. | 40 | 22 |
| 4. CIRCULAR SAW | 158/YEAR | N.A. | 40 | 55 |
| 5. SMALL BAND SAWS | N.A. | 100 UNITS/MTH. | 2 OR 3 UNITS/MTH. | 50 - 60 |
| 6. SURFACE PLANNER | N.A. | 100 UNITS/MTH. | 2 OR 3 UNITS/MTH. | 50 - 60 |
| 7. SPINDLE MOULDING M/C | N.A. | 100 UNITS/MTH. | 2 OR 3 UNITS/MTH. | 50 - 60 |
| 8. THICKNESER | N.A. | 100 UNITS/MTH. | 2 OR 3 UNITS/MTH. | 50 - 60 |
| 9. HOLLOW CHISELER MOTISER | N.A. | 100 UNITS/MTH. | 2 OR 3 UNITS/MTH. | 50 - 60 |
| 10. TANNERING M/C | N.A. | 100 UNITS/MTH. | 2 OR 3 UNITS/MTH. | 50 - 60 |
| 11. MULTI-BORING M/C | N.A. | 100 UNITS/MTH. | 2 OR 3 UNITS/MTH. | 50 - 60 |
| 12. SAW BLADES | | | | |
| 13. TOOL BITS | | | | |
| 14. AIR MILLS | | | 25 % CAPACITY SINCE 1982 | |
| 15. MILLING CUTTERS | | | | |
| 16. DIE CASTING | | | | |
| 17. COMPONENT PARTS SERVICES | | | 3/4 JOBBING | |

SOURCE : FIELD SURVEY

## 3.2 Current Status Of The Engines And Turbines Manufacturing Industry

### 3.2.1 Industry Structure

From the 1981 manufacturing census, there were 37 establishments engaged in the manufacturing of engines and turbines as evident in Table 3.2.1. Relative to the NEM sector, this industry was very small, accounting for only 2.6% of NEM sector and 0.2% of total manufacturing sector establishments.

The engines and turbines industry only contributed 0.06% of employment in the manufacturing sector. From Table 3.2.1, it may be seen that 49% of the firms in the industry had less than 5 employees and 81% had less than 10 employees and these firms provide employment to 41% of the total number employed in this industry. None of the firms employed 50 or more employees. Even Yanmar, a leading diesel engine assembler, has only 28 employees.

The majority of the firms are non-limited companies, with 31 or 84% of the 37 companies registered as individual proprietorships or partnerships as shown in Table 3.2.2, employing 55% of the total employees in the industry. Of the 31 companies, 19 (51%) are individual proprietorships and 12 (33%) are partnerships. Only 6 (16%) of the 37 companies are private limited companies while none are public companies.

TABLE 3.2.1

INDUSTRY STRUCTURE OF THE ENGINES AND TURBINES
MANUFACTURING INDUSTRY BY EMPLOYMENT SIZE, 1981

| EMPLOYMENT SIZE | NO. OF ESTB. | % | TOTAL EMPLOYMENT | % | SALARIES & WAGES ($) | SALARY/ EMPLOYMENT | FIXED ASSETS ($) | FA/ NO. OF ESTB. ($) | FA/L ($) |
|---|---|---|---|---|---|---|---|---|---|
| < 5 | 18 | 49 | 48 | 16 | 139,865 | 2,913 | 300,332 | 16,685 | 6,257 |
| 5 - 9 | 12 | 32 | 78 | 25 | 278,127 | 3,566 | 316,283 | 26,357 | 4,055 |
| 10 - 19 | 2 | 5 | 27 | 9 | 106,584 | 3,948 | 133,347 | 66,674 | 4,939 |
| 20 - 29 | 3 | 8 | 76 | 25 | 344,807 | 4,537 | 542,144 | 180,715 | 7,133 |
| 30 - 49 | 2 | 5 | 78 | 25 | 625,720 | 8,022 | 1,889,868 | 944,934 | 24,229 |
| 50 - 199 | - | - | - | - | - | - | - | - | - |
| INDUSTRY | 37 | 100 | 307 | 100 | 1,495,103 | 4,870 | 3,181,974 | 85,999 | 10,365 |
| NEM SECTOR | 1,445 | | 21,687 | | 110,581,452 | 5,099 | 230,354,563 | 159,415 | 10,622 |
| MANUFACTURING SECTOR | 17,780 | | 534,145 | | 2,614,142,000 | 4,890 | 9,730,327,000 | 547,262 | 18,217 |
| INDUSTRY/NEM SECTOR | 2.6% | | 1.4% | | 1.4% | 0.96 | 1.4% | 0.54 | 0.98 |
| INDUSTRY / MANUFACTURING SECTOR | 0.2% | | 0.06% | | 0.06% | 1.00 | 0.03% | 0.16 | 0.57 |

SOURCE: CENSUS OF MANUFACTURING INDUSTRIES,1981.

TABLE 3.2.2

INDUSTRY STRUCTURE OF THE ENGINES AND TURBINES MANUFACTURING
INDUSTRY BY LEGAL STATUS, 1981

| LEGAL STATUS | NO. OF ESTB. | | TOTAL EMPLOYMENT | | SALARIES & WAGES ($) | SALARIES/ EMPLOYMENT ($) | FIXED ASSETS ($) | FIXED ASSETS/ NO. OF ESTB. ($) | FIXED ASSETS/ LABOUR ($) |
|---|---|---|---|---|---|---|---|---|---|
| | | % | | % | | | | | |
| INDIVIDUAL PROPRIETORSHIP | 19 | 51 | 81 | 26 | 242,469 | 2,993 | 381,625 | 20,086 | 4,711 |
| PARTNERSHIP | 12 | 33 | 89 | 29 | 350,215 | 3,935 | 350,406 | 29,201 | 3,937 |
| PRIVATE LTD | 6 | 16 | 137 | 45 | 902,420 | 6,587 | 12,449,943 | 408,324 | 17,883 |
| PUBLIC LTD | - | - | - | - | - | - | - | - | - |
| TOTAL | 37 | 100 | 307 | 100 | 1,495,103 | 4,870 | 3,181,974 | 85,999 | 10,365 |

SOURCE : CENSUS OF MANUFACTURING INDUSTRIES, 1981

This pattern is consistent with the earlier analysis which indicated that the majority of the firms are very small.

The prevalance of small individual businesses in this industry is not surprising because like the rest of the industries studied in this report or for that matter, engineering - based industries in general, many of the firms are established by former employees who have some years of working experience and had developed some personal contacts. These together with an entrepreneurial spirit, have contributed to the establishment of small businesses in the industry. To a certain extent, the limited local market size has also contributed to the formation of many resilient small firms rather than large corporations which would not be able to enjoy large scale economies in a limited market.

The salaries and wages paid by the industry are competitive with those of the sector but slightly less than the manufacturing sector in general. (See Table 3.2.1) The average wage per employee is $4,870 per annum which was slightly less than the manufacturing sector's $4,890 and even lower than the NEM sector's $5,099. The interview survey findings have in fact indicated that the salaries and wages in this industry and the sector for that matter is still currently less than that of manufacturing sector as a whole indicating that the industry is using relatively lower skill labour.

Further analysis shows that on the average, the salaries and wages in the smaller firms are lower than those in the larger firms. It can be seen that the average salaries per employee increased with the size of the firms from $2,913 for firms with less than 5 employees to $8,022 for firms with 30 - 49 employees. This is not unexpected because for the smaller firms, the skill level of labour is lower than that of larger firms, hence commanding a lower level of wages. Smaller firms do not employ highly skilled engineers or technicians as their functions are usually being performed by the proprietors. As the proprietors are mostly ex-apprentices, the level of technical innovation is poor and partly contributes to the poor quality products.

From Table 3.2.3 it can be seen that of the 37 firms in the industry, 62% are concentrated in the central region of Kuala Lumpur, Perak and Melaka/Selangor and the Southern State of Johore. Kuala Lumpur and Perak with 7 establishments each have the highest concentration and this is quite expected because these two areas are amongst the most developed areas of the country. By the same token, in the less industrialised states like Kedah, Kelantan and Trengganu there are very few firms engaged in this industry. However there is better representation of firms in this industry among the various states compared with the agricultural machinery industry.

Table 3.2.1 also shows the capital intensity utilised in the industry. This industry employed only $86,000 of fixed assets per establishment compared with $547,262 for the manufacturing

TAPLE 3.2.3

SPATIAL DISTRIBUTION OF PRODUCTION YEAR 1981
INDUSTRY : 38210, MANUFACTURING OF ENGINES AND TURBINES

| STATE | NO. OF ESTABLISHMENT | | TOTAL REVENUE | | TOTAL EMPLOYMENT | |
|---|---|---|---|---|---|---|
| JOHOR | 5 | 13.51% | 528,328 | 5.51% | 26 | 8.47% |
| KEDAH/KELANTAN/TRENGGANU | 5 | 13.51% | 2,488,248 | 25.93% | 60 | 19.54% |
| MELAKA/SELANGOR | 4 | 10.81% | 2,444,295 | 25.47% | 41 | 13.36% |
| NEGRI SEMBILAN | 3 | 8.11% | 1,040,092 | 10.84% | 36 | 11.73% |
| PAHANG | 3 | 8.11% | 192,294 | 2.00% | 13 | 4.23% |
| PENANG | 3 | 8.11% | 218,721 | 2.28% | 14 | 4.56% |
| PERAK | 7 | 18.92% | 1,777,612 | 18.53% | 84 | 27.36% |
| WILAYAH PERSEKUTUAN | 7 | 18.92% | 905,543 | 9.44% | 33 | 10.75% |
| TOTAL | 37 | 100.00% | 9,595,133 | 100.00% | 307 | 100.00% |

SOURCE : CALCULATED FROM MANUF. CENSUS, 1981 sector as a whole. In 1981, total fixed assets contribution was only 0.03% of that utilised by all manufacturing sector.

Among firms within the industry, Table 3.2.1 shows the direct relationship between the size of the firm and total capital per labour. This trend is substantiated in Table 3.2.2 which shows that capital intensity is highest for private limited companies ($17,883) and lowest for individual proprietors ($4,711).

### 3.2.2 Investment

Investment in fixed assets by firms in the industry increases with the size of the firm. The average fixed asset per establishment ranges from $16,685 for firms with less than 5 employees to $944,934 for firms with 30-49 employees as observed from Table 3.2.1. This is not unexpected since the levels of operation of smaller firms are lower as compared to the larger firms, hence requiring lower fixed asset investment. Another reason for the lower fixed asset investment level for smaller firms is that when firms start in this business, they normally make do with a few employees and investing in less sophisticated and often used machinery. As the firm establishes itself it usually upgrades itself with higher investment in more sophisticated machinery. This is a characteristic of the industry or sector for that matter that has been attested by industry sources interviewed.

### 3.2.3 Output Performance

Table 3.2.4 is an illustration of the performance of the firms in the engines and turbines manufacturing industry according to firm size and in comparison with the performance of the NEM sector and the manufacturing sector as a whole.

From the table, it can be seen that the output contribution to the industry's total output value of $9.6 million by the smaller firms is relatively small compared to the larger firms' output in 1981. For example, firms with less than 20 employees contributed 87% of the industry's establishments and 50% of the industry's employment, yet its output contribution is only 31% of total industry output. However the largest two firms which constituted only 5% of the industry's establishments and 25% of employment, accounted for 46% of the industry's output. This is due to the higher capital intensity enjoyed by the larger firms (as analysed earlier) and the ability of these firms to attract higher skilled labour.

This situation of higher total employment contribution but lower output contribution by the smaller firms and vice versa by the larger firm implies that labour productivity of the smaller firms is lower than that of larger firms. This is evident from the ratio(value added to labour) which shows that generally, the smaller firms have lower values for these factors than larger firms. An exception are the smaliest firms which appear to have a relatively high value added to labour. A possible explanation for this phenomenon is that

TABLE 3.2.4

OUTPUT PERFORMANCE OF THE ENGINES AND TURBINES MANUFACTURING INDUSTRY
BY EMPLOYMENT SIZE, 1981

| EMPLOYMENT SIZE | NO. OF ESTABLISHMENT | | TOTAL EMPLOYMENT | | OUTPUT | | VALUE ADDED ($) | VALUE ADDED/ LABOUR ($) | VALUE ADDED/ OUTPUT |
|---|---|---|---|---|---|---|---|---|---|
| < 5 | 18 | 49% | 48 | 16% | $1,328,062 | 14% | $777,912 | $16,207 | 0.59 |
| 5 - 9 | 12 | 32% | 78 | 25% | $1,273,006 | 13% | $676,318 | $8,671 | 0.53 |
| 10 - 19 | 2 | 5% | 27 | 9% | $367,815 | 4% | $203,830 | $7,549 | 0.55 |
| 20 - 29 | 3 | 8% | 76 | 25% | $2,201,549 | 23% | $1,314,224 | $17,292 | 0.60 |
| 30 - 49 | 2 | 5% | 78 | 25% | $4,390,685 | 46% | $1,829,534 | $23,456 | 0.42 |
| INDUSTRY | 37 | 100% | 307 | 100% | $9,561,117 | 100% | $4,801,818 | $15,641 | 0.50 |
| NEM SECTOR | 1445 | | 21,687 | | 912,927,217 | | 323,433,034 | 14,914 | 0.35 |
| MANUFACTURING SECTOR | 17,780 | | 534,145 | | $34,486,493,000 | | $8,895,302,000 | $16,653 | 0.26 |
| INDUSTRY/NEM SECTOR | 2.6% | | 1.4% | | 1.0% | | 1.5% | 1.05 | 1.43 |
| INDUSTRY / MANUFACTURING SECTOR | 0.21% | | 0.06% | | 0.03% | | 0.05% | 0.94 | 1.92 |

SOURCES : CALCULATED FROM CENSUS OF MANUFACTURING INDUSTRIES, 1981.

the very small firms probably use human resources not reflected in the official labour force, including the proprietors and their families and furthermore, when firms start out, they are generally more hardworking and productive.

An analysis of the value added to output ratio, which to an extent measures the degree of technical sophistication, indicated that the largest two firms are less technically sophisticated in their operations than the smaller firms. The explanation for this apparent paradox is that the largest firms include assemblers like Yanmar, hence their value added relative to output is lower on the other hand, while the smaller firms are general engineering workshops which undertake jobbings including engines and turbines, hence are able to produce a higher value added relative to output. This paradox should not be seen as an economic trend but rather as a peculiarity of the engines and turbines manufacturing industry of Malaysia which is in its infancy of development.

However, while its contribution is insignificant, its performance as measured by labour productivity is slightly better to that of the sector's. As illustrated in Table 3.2.4, value added per labour unit was $15,641 which was nearly 35% more than the sector's $14,914.

Value added per unit value of output for the industry is 0.50 which is 43% higher than NEM sector's corresponding figure of 0.35. The crude implication is that the technology level of the industry is comparable to the NEM sector's as a whole. The implication is fairly evident from the case studies which revealed that while there are some companies involved in full manufacturing of machinery like Mah Cheok Pui (woodworking machinery) and Malaysia Gauge and Tool (hacksaws), the other companies in the sector undertake more assembly or simple "manufacturing" rather than sophisticated processing.

The industry's output contribution is negligible vis-a-vis the manufacturing sector. The industry's output is only 0.03% of total manufacturing sector output, and when viewed with its employment percentage of 0.06%, the insignificance of its output contribution is even more obvious.

### 3.2.4 Production Characteristics

Table 3.2.5 shows the trend in the production characteristics of the engines and turbines industry. Generally the productivity of the industry has grown rapidly and at a much faster pace than for all manufacturing which was 20.0% per annum and 9.9% per annum respectively.

However, the level of productivity in the industry is still lower than all manufacturing. Two reasons have contributed to this situation namely, firms are less capital intensive and utilised lesser skilled workers.This is observed from K/L and W/L figures for the industry which trails behind all manufacturing.

TABLE 3.2.5

PRODUCTION CHARACTERISTICS OF THE MANUFACTURING OF ENGINES AND TURBINES INDUSTRY (MIC 38210) IN PENINSULAR MALAYSIA, OVERTIME

| YEAR | L/ESTB. | K/ESTB. ($'000) | K/L ($'000) | VA/L ($'000) | W/L ($'000) | W/VA ($'000) | VA/OUTPUT ($'000) |
|---|---|---|---|---|---|---|---|
| 1973 | 6.83 | 19.47 | 2.85 | 3.64 | 1.29 | 0.35 | 0.35 |
| 1978 | 16.38 | 79.96 | 4.88 | 10.41 | 3.11 | 0.30 | 0.25 |
| 1981 | 8.30 | 86.00 | 10.36 | 15.64 | 4.87 | 0.31 | 0.50 |
| ALL MANUFACTURING | | | | | | | |
| 1981 | 30.04 | 547.26 | 18.22 | 16.65 | 4.89 | 0.29 | 0.26 |
| 1978 | 83.96 | 1154.76 | 13.75 | 14.04 | 3.60 | 0.26 | 0.29 |
| 1973 | 26.94 | 207.47 | 7.70 | 7.81 | 1.97 | 0.25 | 0.30 |
| GROWTH P.A. (1973-1981) | | | | | | | |
| MANUFACTURING OF ENGINES & TURBINES | | | 17.50 | 20.00 | 18.10 | 1.00 | |
| ALL MANUFACTURING | | | 11.40 | 9.90 | 12.00 | 1.90 | |

SOURCE : CALCULATED FROM CENSUS OF MANUFACTURNG INDUSTRIES, 1973 & 1981 AND SURVEY OF MANUF. INDUSTRIES, 1978

While productivity is lower, the degree of processing by the industry is far superior to that in the manufacturing sector. The manufacturing sector produced $260 of value added per unit of output while the industry produced $500 of value added per unit of output.

3.2.5 External Trade Performance

The external trade performance of the engines and turbines industry has been unfavourable in the five year period from 1978 to 1982 as illustrated in Table 3.2.6. Exports have been increasing at a very significant annual average rate of 42% from $3.3 million in 1978 to $19.0 million in 1983. Though, imports have been decreasing at a less significant rate of 7% per annum from $195 million in 1978 to reach $133 million in 1983, in absolute terms, it surpassed exports to result in a deficit situation throughout the period.

The trade deficit increased from $191.8 million in 1978 to a peak of $197.7 million before dropping slightly to $113.6 million in 1983.

The poor trade performance of this industry can be attributed to a number of factors. First, the raw materials including component parts for the industry are mostly imported, thus contributing to the high imports. To illustrate the point, take the case of Syarikat Lee Industries, the largest manufacturer of air-cooled diesel engines in Malaysia imports at least 30% of its engine parts (not to mention a higher percentage for other raw materials not classified under this industry

TABLE 3.2.6

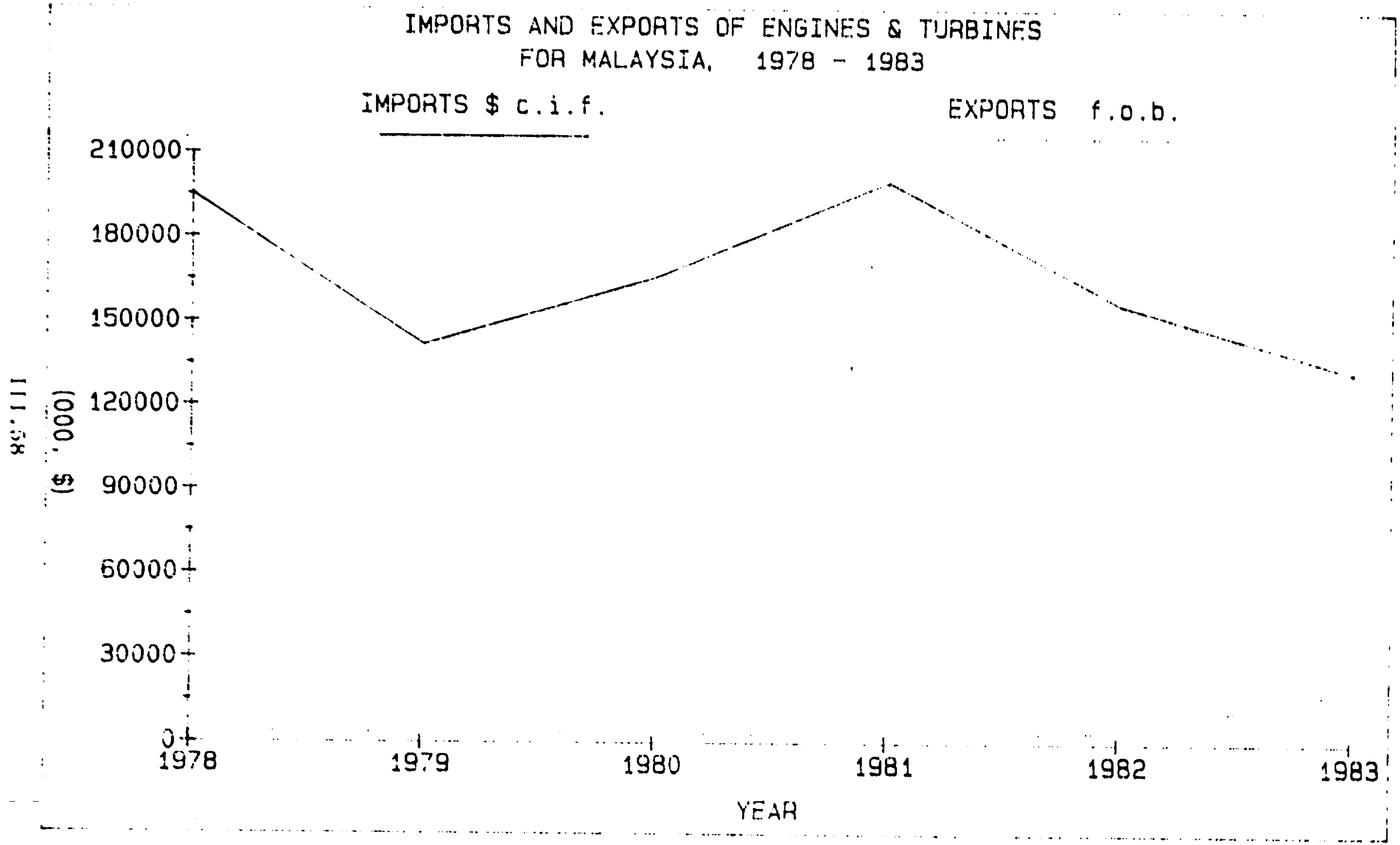
IMPORTS AND EXPORTS OF ENGINES & TURBINES FOR MALAYSIA, 1978 - 1983

| SITC CODE | 1978 | | 1979 | | 1980 | | 1981 | | 1982 | | 1983 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. |
| 712-601-00 | 70,198,234 | NIL | 17,279,921 | NIL | 2,796,670 | NIL | 10,128,138 | NIL | 952,669 | NIL | 6,985,925 | 361,920 |
| 712-602-00 | 148,167 | 20,964 | 71,000 | 19,985 | 31,659 | NIL | 157,873 | 16,248 | 263,399 | 41,488 | 178,989 | 121,362 |
| 712-900-00 | 18,776,717 | 1,612,502 | 5,684,439 | 72,476 | 13,977,578 | 50,774 | 20,861,266 | 57,182 | 8,527,716 | 369,205 | 16,215,521 | 1,481,113 |
| 713-811-00 | 4,743,403 | 104,099 | 5,456,287 | 310,841 | 7,674,745 | 55,565 | 8,376,529 | 33,467 | NIL | NIL | NIL | NIL |
| 713-811-10 | NIL | NIL | NIL | NIL | NIL | NIL | 597,916 | NIL | 2,908,266 | 11,660 | 2,338,519 | 1,764,212 |
| 713-811-20 | NIL | NIL | NIL | NIL | NIL | NIL | 2,013,607 | 155,413 | 23,498,857 | 1,823,530 | 26,571,843 | 1,554,241 |
| 713-812-00 | 1,452,385 | 46,040 | 1,740,276 | 51,325 | 2,297,354 | 4,075 | 6,009,554 | 29,544 | NIL | NIL | NIL | NIL |
| 713-813-00 | 13,519,515 | 174,254 | 12,050,748 | 105,600 | 6,912,361 | 124,160 | 8,640,674 | 77,227 | NIL | NIL | NIL | NIL |
| 713-814-00 | 96,673 | NIL | 571,669 | 10,500 | 1,711,506 | NIL | 1,367,519 | NIL | NIL | NIL | NIL | NIL |
| 713-815-00 | 31,354 | NIL | 284,328 | NIL | 1,553,507 | NIL | 2,057,327 | NIL | NIL | NIL | NIL | NIL |
| 713-819-00 | 947,287 | 6,600 | 350,750 | 7,150 | 2,204,827 | 11,500 | 3,697,667 | 7,095 | 453,003 | 2,100 | 187,805 | 267,422 |
| 713-890-00 | 5,850,082 | 79,344 | 6,470,640 | 10,951 | 10,533,600 | 85,643 | 9,389,373 | 62,241 | 12,657,431 | 78,712 | 13,767,366 | 3,540,428 |
| 713-910-00 | 2,400,940 | 35,131 | 1,857,455 | 8,229 | 2,921,015 | 14,136 | 4,223,236 | 27,440 | 2,825,899 | 108,830 | 1,412,268 | 480,374 |
| 713-920-00 | 11,487,755 | 84,923 | 14,351,975 | 33,160 | 16,452,898 | 91,601 | 17,522,141 | 87,583 | 17,101,138 | 186,932 | 13,528,288 | 1,198,694 |
| 713-930-00 | 2,428,684 | 63,276 | 2,017,023 | 51,518 | 2,787,508 | 75,117 | 4,471,584 | 34,085 | 4,563,028 | 135,923 | 2,340,679 | 2,577,862 |
| 713-990-00 | 63,047,623 | 1,116,144 | 73,453,149 | 2,367,256 | 94,024,328 | 2,457,596 | 100,573,448 | 1,763,460 | 82,758,283 | 1,266,597 | 49,078,565 | 5,660,950 |
| | 195,128,819 | 3,343,277 | 141,639,660 | 3,048,991 | 165,879,556 | 2,971,067 | 200,087,852 | 2,350,985 | 156,509,689 | 4,025,037 | 132,605,768 | 19,008,578 |

NOTE : 1983 DATA IS FOR PENINSULAR MALAYSIA
SEE APPENDIX 3.1.1 FOR LEGEND

SOURCE : DS. ASSET, v.y.

FIGURE 3.2.1




SOURCE: DERIVED FROM TABLE 3.2.6

grouping). Needless to say, an assembler like Yanmar has a very high raw material import percentage of 80%.

Secondly, from the marketing point of view general consumer prejudice against local products and engines are no exceptions. For an assembler like Yanmar, the prejudice is not so conspicious since the product is essentially Japanese but locally assembled. But for a manufacturer like Syarikat Lee Industries, its product is perceived as completely local, and hence perceived as inferior. Thus, even though engines are manufactured locally, there is still a great demand for imported engines.

Thirdly, again on the marketing aspect but from the manufacturer's point of view, export efforts are inadequate because local manufacturers are either ignorant of export marketing or just do not make any conscious effort to export. Furthermore, local products are not as competitive as foreign products in the overseas market in terms of price and quality.

Malaysia's main trading partners in this industry based on 1981's trade figures, are presented in Table 3.2.7. As evident from the table, Japan is the leading source of imports accounting for 29% of imports while the USA accounted for 25%.

Singapore was the main destination of Malaysia's engine exports in 1983, accounting for slightly more than $1 million in export value. The other export destination included ASEAN and to a very small extent, Taiwan and Papua New Guinea.

TABLE 3.2.7

SOURCES OF IMPORTS OF ENGINES & TURBINES (SITC 712 & 713)
INTO MALAYSIA FOR 1978 - 1981

| COUNTRY OF ORIGIN | 1978 % | 1979 % | 1980 % | 1981 % |
|---|---|---|---|---|
| JAPAN | 48.76 | 32.76 | 26.39 | 28.64 |
| UNITED STATES | 19.05 | 23.43 | 24.26 | 25.34 |
| GERMANY | 0.66 | 1.46 | 17.96 | 15.12 |
| ITALY | 0.78 | 1.27 | 1.06 | 1.11 |
| TAIWAN | 0.73 | 1.63 | 1.22 | 0.82 |
| OTHERS | 30.02 | 39.45 | 29.11 | 28.97 |
| TOTAL | 100.00 | 100.00 | 100.00 | 100.00 |

SOURCE: D.S. ASI I,V.Y.

### 3.2.6 Input Materials

Table 3.2.8 shows the types of input materials consumed by the industry for 1978. From the table, it may be observed that 86% of raw material is in the form of parts and spare parts for machinery. Actual raw materials for making the intermediate goods accounted for less than 20% . As is the case for the machinery industry, almost all the raw materials are imported.

## TABLE 3.2.8

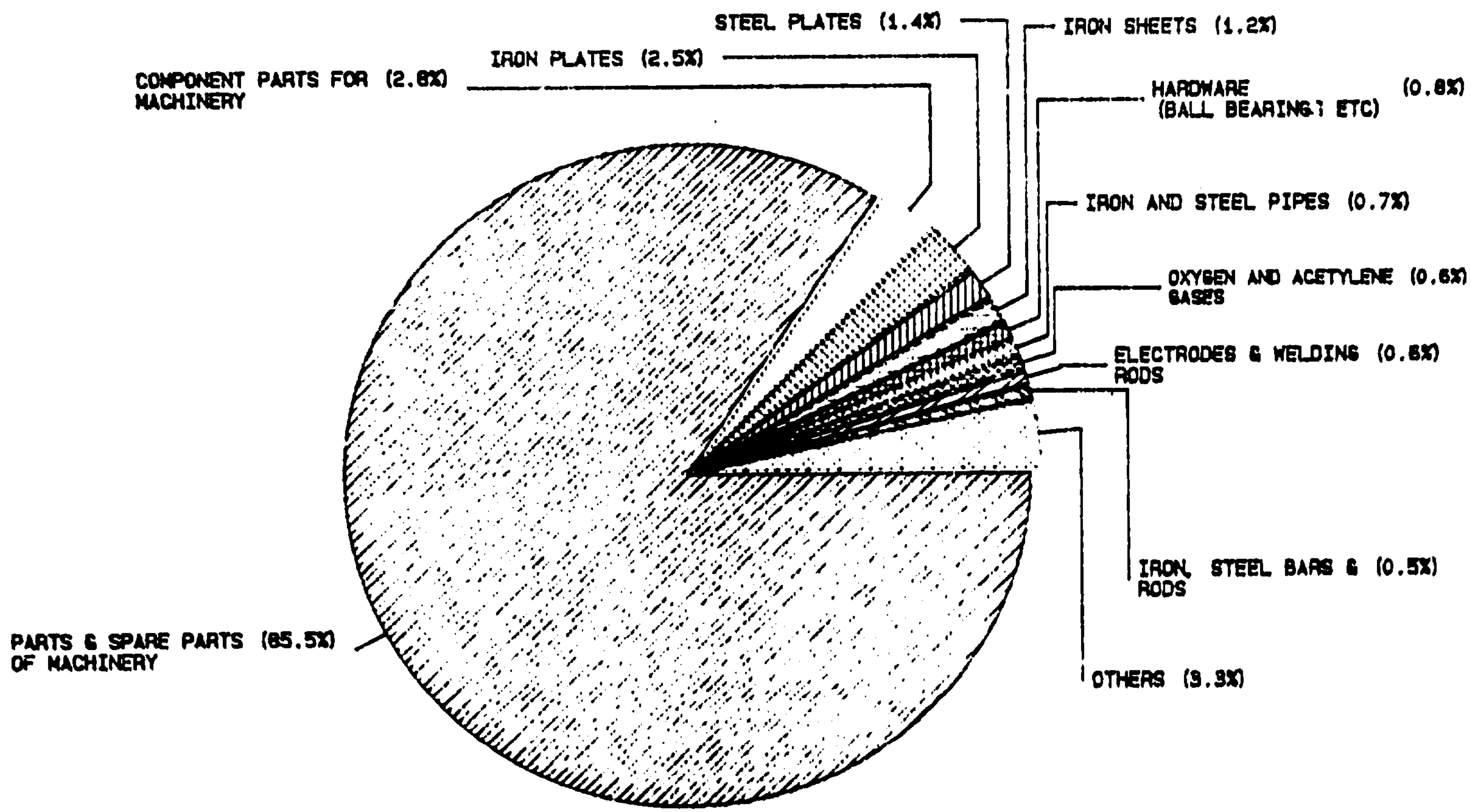
INPUT MATERIALS USED FOR INDUSTRY: 38210; MANUFACTURING OF ENGINES AND TURBINES, PENINSULAR MALAYSIA, 1978

| TOP 10 MATERIALS CONSUMED | (%) |
|---|---|
| PARTS AND SPARE PARTS OF MACHINERY | 85.52% |
| COMPONENT PARTS FOR MACHINERY | 2.76% |
| IRON PLATES | 2.55% |
| STEEL PLATES | 1.40% |
| IRON SHEETS | 1.21% |
| HARDWARE ( BALLBEARING ETC. ) | 0.80% |
| IRON AND STEEL PIPES | 0.68% |
| OXYGEN AND ACETYLENE GASES | 0.64% |
| ELECTRODES AND WELDING RODS | 0.57% |
| IRON, STEEL BARS AND RODS | 0.54% |
| OTHERS | 3.33% |
| TOTAL | 100.00% |

SOURCE: SURVEY OF MANUFACTURING INDUSTRIES, 1978

FIGURE 3.2.2

INDUSTRY 38210
MANUFACTURING OF ENGINES AND TURBINES, 1981




SOURCE: DERIVED FROM TABLE 3.2.8

## 3.3 Current Status of the Agricultural Machinery and Equipment Manufacturing Industry

### 3.3.1 Introduction

The agricultural machinery sector is rather undeveloped and is characterised by very small manufacturers, which produces simple tools like portable sprayers, bush cutters, seeders and ploughs. A large portion of the capacity is engaged in servicing and repairing imported farm machinery as well as other types of machinery. Local manufacturers face strong price and quality competition from imported products. Most manufacturers complain of low turnover, low productivity and inability to adapt imported technology.

There is only one agricultural machinery manufacturer in the true sense of the definition of machinery manufacturing in Malaysia. The company, Howard Alat Pertanian Sdn Bhd, is a Malaysian-Australian joint-venture company. It produces among other things, rotary tillers, slashers and rotavators. There are other small manufacturers, but none of these manufacturers have expanded their base since incorporation.

As the manufacture of such machinery is capital intensive, the market is able to sustain only one manufacturer. Demand in this industry is also met by imports. Competition from imports comes mainly from Taiwan, Japan and Britain. Generally, the industry is not protected against foreign competition as the present government policy is to mechanize the agricultural sector at lower cost and to encourage faster technology transfer.

During the course of the field study and compilation of data, the researchers encountered the difficulty of isolating agricultural machinery for soil preparation from machinery for processing (as required under the terms of reference) as the data are highly aggregated. Whenever necessary, this conceptual problem would be higlighted.

### 3.3.2 Industry Structure

According to the 1981 Manufacturing Census, there were a total of 55 establishments (see Table 3.3.1). In the context of the Malaysian economy, this industry was very small. It accounted for only 0.3% of the total establishments in the manufacturing sector. The size of the firms in the industry is also small in terms of employment. About 60% of the firms employed less than 20 workers, 33% of these firms had 20 to 99 employees and only 6% had more than 100 employees. This may be an exaggeration because the Census included firms which were involved in products other than agricultural machinery. Howard Alat Pertanian has only 59 workers, and it is the largest known manufacturer.

In 1981, the agricultural machinery provided employment to 1535 workers or 0.3% of total manufacturing sector. On the average, a firm in the industry has about 28 employees which is

TABLE 3.3.1

OUTPUT PERFORMANCE OF THE AGRICULTURAL MACHINERY AND EQUIPMENT MANUFACTURING INDUSTRY BY EMPLOYMENT SIZE, PENINSULAR MALAYSIA, 1981

| EMPLOYMENT SIZE | ESTABLISHMENT | % | OUTPUT | % | EMPLOYMENT | % | K/L $ | V.A./L $ | WAGES/L $ | V.A./OUTPUT |
|---|---|---|---|---|---|---|---|---|---|---|
| < 5 | 10 | 18.2 | 705,396 | 1.0 | 30 | 2.0 | 17717 | 968 | 2,152 | 0.4 |
| 5 - 19 | 23 | 41.8 | 6,095,819 | 8.6 | 258 | 16.8 | 3251 | 9,712 | 3,777 | 0.4 |
| 20 - 49 | 13 | 23.6 | 26,121,784 | 37.0 | 428 | 27.9 | 24931 | 18,488 | 5,600 | 0.3 |
| 50 - 99 | 6 | 10.9 | 20,717,005 | 29.4 | 405 | 26.4 | 6724 | 15,067 | 5,654 | 0.3 |
| > 100 | 3 | 5.5 | 16,882,476 | 23.9 | 414 | 27.0 | 5353 | 15,513 | 6,267 | 0.4 |
| INDUSTRY TOTAL | 55 | 100.0 | 70,522,480 | 100.0 | 1,535 | 100.0 | 11062 | 15,136 | 5,420 | 0.33 |
| NEM SECTOR | 1445 | | 912,927,217 | | 21,687 | | 10,622 | 14,914 | 5,099 | 0.35 |
| TOTAL MANUF. ('000) | 17.78 | | 34,486,493 | | 534.145 | | 18.22 | 16.65 | 4.89 | 0.000026 |
| INDUSTRY/NEM SECTOR | 3.8% | | 7.7% | | 7.1% | | 1.04 | 1.01 | 1.06 | 0.94 |
| INDUSTRY/MANUF. SECT. | 0.3% | | 0.2% | | 0.3% | | 0.61 | 0.91 | 1.11 | 1.27 |

SOURCE : CENSUS OF MANUFACTURING INDUSTRIES, 1981

considerably more than the average employment of 15 workers for the whole NEM sector. It is also comparable with the average of 30 workers for total manufacturing sector.

Slightly more than $^1/_3$ of the firms were individual proprietorships, less than $^1/_3$ were partnerships and $^1/_3$ were private limited companies. There are no public limited companies. This breakdown of legal status of firms in the industry is shown in Table 3.3.2.

Typical of individual proprietorships and partnerships, the employment levels of the two groups constituted only 40% of the industry's employment while the private limited companies accounted for 60%.

On the average, a private limited company in this industry utilised $813,750 of fixed assets while proprietorships utilised only $81,408 per establishment. Value added contribution from the private limited companies was substantially higher than that for the individual firms. These two characteristics confirm the evidence (as discussed in the overall current status) that most manufacturing activities were carried out by private firms, while individual proprietorships were engaged in "services" like repairing, servicing and doing small contract jobs.

TABLE 3.3.2

PRINCIPAL STATISTICS BY INDUSTRY BY LEGAL STATUS, PENINSULAR MALAYSIA, 1981
INDUSTRY 38220 : MANUFACTURE OF AGRICULTURAL MACHINERY AND EQUIPMENT

| | NO. OF ESTB. | OUTPUT | INPUT | VALUE ADDED | TOTAL EMPLOYMENT | SALARIES & WAGES | FIXED ASSETS AS AT 31/12/81 |
|---|---|---|---|---|---|---|---|
| INDIVIDUAL PROPRIETORSHIP | 20 | 5,175,561 | 3,144,231 | 2,031,330 | 409 | 892,904 | 1,628,159 |
| PARTNERSHIP | 17 | 6,201,079 | 3,278,409 | 2,922,670 | 203 | 757,093 | 704,278 |
| PRIVATE LTD | 18 | 59,145,840 | 40,866,056 | 18,279,784 | 923 | 6,669,892 | 14,647,507 |
| PUBLIC LTD | NIL | NIL | NIL | NIL | NIL | NIL | NIL |
| OTHERS | NIL | NIL | NIL | NIL | NIL | NIL | NIL |
| TOTAL | 55 | 70,522,480 | 47,288,696 | 23,233,784 | 1,535 | 8,319,889 | 16,979,944 |

SOURCE : CENSUS OF MANUFACTURING INDUSTRIES, 1981

### 3.3.3 Principal Product Mix

While "income derived from services" was an important component of the product mix in the early 1970's, its importance has been eroded by more tangible products which are produced by the larger, more capital intensive firms.

The agricultural machinery industry produced a rather diversified range of equipment but these products are on the lower end of the technology scale. (Table 3.3.3 and 3.3.4). As early as 1973, "agricultural machinery and implements" accounted for 78% of the product mix in this industry. There is no statistical record on the major types of agricultural products which were included in this range. A high proportion of goods, 10.0%, was also sold in the same condition as purchased, which supports the evidence that the level of technology is still low.

However, by 1978, "agricultural machinery and equipment, n.e.c." accounted for only 29% of the product mix. New products like power tillers, rubber machinery dryer and agricultural tractors accounted for 41% of the product mix for 1978. (Though agricultural tractor is noted as part of the product mix, agricultural tractors are not produced locally. Thus, this item is most probably the manufacture of certain parts for the tractor).

The trend in machinery production is expected to move away from soil preparation and harvesting towards the production of fabricated processing equipment for the rubber and oil palm industry.

TABLE 3.3.3

PRINCIPAL PRODUCT MIX FOR PENINSULAR MALAYSIA, 1973
INDUSTRY : 38220 ; MANUFACTURE OF AGRICULTURAL MACHINERY & EQUIPMENT

| TOP TEN PRODUCT ITEM | 1973 VALUE | % |
|---|---|---|
| AGRICULTURAL MACHINERY AND IMPLEMENTS | 5,229,000 | 77.75% |
| OTHER PRODUCTS | 248,000 | 3.69% |
| INCOME FOR SERVICES | 225,000 | 3.35% |
| VALUE OF GOODS SOLD IN THE SAME CONDITION AS PURCHASED | 685,000 | 10.19% |
| STOCK EXCHANGE OF GOODS IN PROCESS | 338,000 | 5.02% |
| TOTAL GROSS VALUE OF OUTPUT | 6,725,000 | 100.00% |

SOURCE: CENSUS OF MANUFACTURING INDUSTRIES, 1973

TABLE 3.3.4

PRINCIPAL PRODUCT MIX FOR PENINSULAR MALAYSIA, 1978
INDUSTRY : 38220 ; MANUFACTURE OF AGRICULTURAL MACHINERY

| TOP 10 PRODUCT ITEM | 1978 VALUE | % |
|---|---|---|
| AGRICULTURAL MACHINERY AND EQUIPMENT N.E.C. | 7,362,052 | 28.76 |
| POWER TILLER | 4,851,815 | 18.95 |
| MACHINERY, RUBBER INDUSTRY | 2,030,704 | 7.93 |
| DRYER | 1,986,905 | 7.76 |
| AGRICULTURAL TRACTOR | 1,716,241 | 6.70 |
| CONVEYOR | 938,754 | 3.67 |
| STRUCTURAL METAL | 825,416 | 3.22 |
| SPARE PARTS | 798,279 | 3.08 |
| STAINLESS STEEL, SLEAVE PRESSEAGE | 564,865 | 2.21 |
| MACHINERY, PALM OIL INDUSTRY | 517,528 | 2.02 |
| OTHERS | 4,004,693 | 15.65 |
| TOTAL | 25,597,252 | 100.00 |

SOURCE : SURVEY OF MANUFACTURING INDUSTRIES, 1978

This is not surprising as this industry has its origins providing repairing and maintenance services to the rubber and oil palm industries.

### 3.3.4 Spatial Distribution

Table 3.3.5 shows the geographical distribution of firms in the agricultural machinery industry. 51.0% of the firms in the agricultural machinery industry were located in Selangor and the Federal Territory otherwise known as Wilayah. The main reason is that firms in this industry prefer an established infrastructure with the necessary supply of skilled and semi-skilled workmen.

As most of the raw materials are imported, accessibility to the nation's port is also an important factor. The concentration of firms also coincides with agricultural zones in which paddy cultivation is almost 100% mechanized. These areas notably Sekinchan in Selangor, practise 100% mechanisation for soil preparation, spraying and harvesting activities.

78% of total revenue are accounted from Selangor and Wilayah, which in turn accounts for 68.66% of total employment. Though the distribution of establishments in the other states was fairly even, total revenue generated was very small. In some states, especially the eastern coastal states is insignificant.

TABLE 3.3.5

SPATIAL DISTRIBUTION OF PRODUCTION YEAR 1981
INDUSTRY : 38220, MANUFACTURE OF AGRICULTURAL MACHINERY & EQUIPMENT

| STATE | TOTAL REVENUE | | TOTAL EMPLOYMENT | | NO. OF ESTB. | |
|---|---|---|---|---|---|---|
| | | % | | % | | % |
| JOHOR | 6,793,251 | 9.3 | 268 | 17.5 | 8 | 14.5 |
| KEDAH | 6,286,306 | 8.6 | 68 | 4.4 | 6 | 10.9 |
| NEGRI SEMBILAN | 771,086 | 1.1 | 24 | 1.6 | 3 | 5.5 |
| PAHANG/MELAKA/PENANG/TRENGGANU | 860,496 | 1.2 | 73 | 4.8 | 6 | 10.9 |
| PERAK | 895,739 | 1.2 | 48 | 3.1 | 4 | 7.3 |
| SELANGOR | 43,234,404 | 59.5 | 805 | 52.4 | 15 | 27.3 |
| WILAYAH | 13,877,359 | 19.1 | 249 | 16.2 | 13 | 23.6 |
| TOTAL | 72,718,641 | 100.0 | 1535 | 100.0 | 55 | 100.0 |

SOURCE : CENSUS OF MANUFACTURING INDUSTRIES, 1981

## 3.3.5 Material Input

Input materials for the agricultural machinery industry are mostly imported parts and spare parts which form 37% of total imports (see Table 3.3.6). These were imported mainly from Japan, Taiwan and West Germany. However, products which require higher precision are mostly imported from Japan by the smaller manufacturers and also from Australia.

Component parts for machinery accounted for 14% of products imported with basic metals like steel and iron products occupying a fair share of top 10 materials used. It is unlikely that the industry's dependence on these raw materials will lessen. On the other hand, imports of quality precision products are expected to increase if the industry expands further.

## 3.3.6 Fixed Assets Utilisation

Fixed assets for the agricultural machinery have expanded in value from \$2.08 million in 1973 to \$7.552 million in 1978. (Table 3.3.7) The highest growth rate achieved was 58% for transport equipment and only 20% for machinery and equipment.

The proportion of machinery and equipment was only 38% of total assets utilised in the industry for 1978 compared with 56% in 1973. The higher proportion of value attributable to "land and residence" is probably a result of capital appreciation. As the use of machinery equipment is directly linked to production process, it may

TABLE 3.3.6

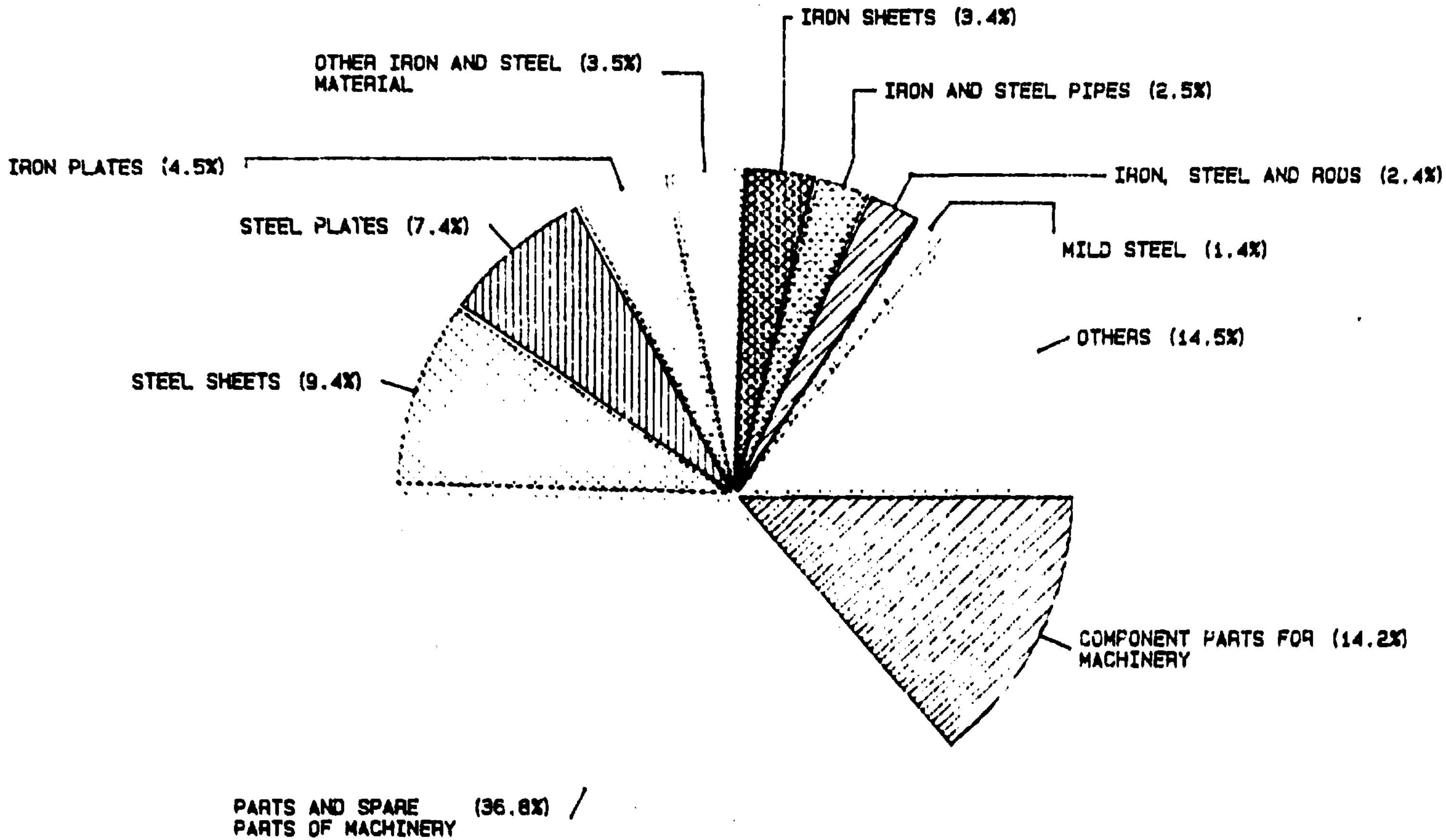
INPUT MATERIALS USED FOR INDUSTRY 38220, (MANUFACTURE OF AGRICULTURAL MACHINERY), PENINSULAR MALAYSIA, 1978

| TOP 10 MATERIALS CONSUMED | (%) | VALUE ($) |
|---|---|---|
| PARTS AND SPARE PARTS OF MACHINERY | 36.77 | 7,098,415 |
| COMPONENT PARTS FOR MACHINERY | 14.22 | 2,745,340 |
| STEEL SHEETS | 9.40 | 1,814,629 |
| STEEL PLATES | 7.41 | 1,429,479 |
| IRON PLATES | 4.50 | 868,432 |
| OTHER IRON AND STEEL MATERIAL | 3.47 | 670,787 |
| IRON SHEETS | 3.38 | 652,480 |
| IRON AND STEEL PIPES | 2.54 | 490,673 |
| IRON, STEEL BARS AND RODS | 2.45 | 472,531 |
| MILD STEEL | 1.39 | 268,274 |
| OTHERS | 14.47 | 2,792,638 |
| TOTAL | 100.00 | 19,303,678 |

SOURCE : SURVEY OF MANUFACTURING INDUSTRIES, 1978

FIGURE 3.3.1

INPUT MATERIALS USED FOR INDUSTRY 38220
MANUFACTURE OF AGRICULTURAL MACHINERY
PENINSULAR MALAYSIA, 1978




SOURCE: DERIVED 3.3.6

TABLE 3.3.7

TYPE OF FIXED ASSETS FOR PENINSULAR MALAYSIA, 1973 & 1978
INDUSTRY 38220, MANUFACTURE OF AGRICULTURAL MACHINERY & EQUIPMENT

| | 1973 | | 1978 | | GROWTH RATE P.A. 1973-1978 |
|---|---|---|---|---|---|
| | VALUE ($'000) | % | VALUE ($'000) | % | |
| LAND & RESIDENCE | 850 | 40.87 | 3,758 | 49.76 | 35% |
| TRANSPORT EQUIPMENT | 59 | 2.84 | 582 | 7.71 | 58% |
| MACHINERY AND EQUIPMENT | 1,171 | 56.30 | 2,889 | 38.25 | 20% |
| FURNITURE AND FITTINGS | 0 | 0.00 | 221 | 2.93 | (N.A.) |
| OTHER CAPITAL EXPENSES | 0 | 0.00 | 102 | 1.35 | (N.A.) |
| TOTAL | 2,080 | 100.00 | 7,552 | 100.0 | 29.42% |

SOURCE : DEPARTMENT OF STATISTICS, CENSUS OF MANUFACTURING INDUSTRIES, 1973 and 1978 be inferred that during the period 1973 - 1978, there has not been any significant change in production processes as well.

After observing the trend in the types of fixed assets utilised in the industry, the industry by fixed asset size groups is analysed from Table 3.3.8. 83% of establishments in the agricultural machinery industry have fixed assets of less than $500,000 in 1978. These firms accounted for 58% of output and 80.4% of employment. There is also a high proportion of small firms with less than $50,000 fixed assets. While these firms account for almost 30% of establishments, they only contribute marginally to output and employment. Firms with fixed assets in the range ($500,000 -$999,999) have the highest output and value added per worker. Surprisingly, this high productivity is not enjoyed by firms with over $1 million worth of assets.

### 3.3.7 Trend of Domestic Utilisation

The domestic utilisation of agricultural machinery has expanded very rapidly over the years. In absolute terms, domestic utilisation for 1981 was $146 million compared to $24.2 million in 1973. This is due to the country's mechanisation programme for the agricultural sector.

The component products defined as "agricultural machinery" under Table 3.3.9 are found in Appendix 1.2.2. From the table, it may be seen that local production has increased even more rapidly to meet the increase in domestic

TABLE 3.3.8

DISTRIBUTION AND CHARACTERISTICS OF FIRMS BY FIXED ASSETS FOR INDUSTRY 38220
( MANUFACTURE OF AGRICULTURAL MACHINERY ), PENINSULAR MALAYSIA, 1978

| FIXED ASSETS SIZE GROUP ( $ ) | ESTABLISHMENT | | OUTPUT $ '000 | | EMPLOYMENT | | K/L $ | V.A./L $ | WAGES/L $ | V.A./OUTPUT |
|---|---|---|---|---|---|---|---|---|---|---|
| < 10,000 | 2 | 8% | 375 | 1.1% | 28 | 3.4% | 0 | 4821 | 2536 | 0.36 |
| 10,000 - 49,999 | 5 | 21% | 1839 | 5.6% | 106 | 12.7% | 1368 | 7038 | 2717 | 0.41 |
| 50,000 - 99,999 | 3 | 13% | 3122 | 9.5% | 92 | 11.0% | 2228 | 11630 | 3870 | 0.34 |
| 100,000 - 199,999 | 5 | 21% | 4025 | 12.3% | 189 | 22.7% | 4042 | 7735 | 4217 | 0.36 |
| 200,000 - 499,999 | 5 | 21% | 9708 | 29.6% | 255 | 30.6% | 5373 | 16047 | 5396 | 0.42 |
| 500,000 - 999,999 | 3 | 13% | 10363 | 31.6% | 105 | 12.6% | 18410 | 25962 | 6648 | 0.26 |
| 1,000,000 - 4,999,999 | 1 | 4% | 3386 | 10.3% | 58 | 7.0% | 54017 | 15328 | 6880 | 0.26 |
| INDUSTRY TOTAL | 24 | 100% | 32818 | 100.0% | 833 | 100.0% | 9065 | 13349 | 4784 | 0.34 |
| MANUFACTURING SECTOR (' 000) | 4.499 | | 18,548,583 | | 377,718 | | 13.754 | 14.038 | 3.598 | 0.00029 |
| INDUSTRY/MANUFACTURING SECTOR | 0.53% | | 0.0002% | | 0.22% | | 0.66 | 0.95 | 1.33 | 1.17 |

SOURCE : SURVEY OF MANUFACTURING INDUSTRIES, 1978

TABLE 3.3.9

DOMESTIC PRODUCTION VS. DOMESTIC CONSUMPTION FOR INDUSTRY 38220 MANUF. OF AGRICULTURAL MACHINERY, PENINSULAR MALAYSIA, 1973 - 1981

| YEAR | LOCAL PRODUCTION ($'000) | IMPORT ($'000) | EXPORT ($'000) | DOMESTIC CONSUMPTION ($'000) | % LOCAL PRODUCTION TO CONSUMPTION |
|---|---|---|---|---|---|
| 1973 | 6,725 | 18,903 | 1,448 | 24,180 | 28 |
| 1978 | 32,818 | 46,545 | 1,615 | 77,748 | 42 |
| 1981 | 70,522 | 78,185 | 2,985 | 145,722 | 48 |
| GROWTH RATE P.A. | | | | | |
| 1973-1978 | 37.3% | 19.7% | 2.2% | 26.3% | |
| 1978-1981 | 29.0% | 18.9% | 22.7% | 23.3% | |
| 1978-1981 | 34.1% | 19.4% | 95.0% | 25.2% | |

NOTE : INCLUDES AGRICULTURAL TRACTORS

DERIVED FROM APPENDIX 5.2.3

SOURCE : D.S. ASET, v.y. & MANUFACTURING CENSUS, v.y.

consumption. Annual growth rate for local production was 34.1% for the period 1973 to 1981. This increase is reflected in the high ratio for local production to domestic consumption which increased from 28% in 1973 to 48% in 1981. But the bulk of domestic consumption is still met by imports.

The volume of imports has also increased but the rate of increase is smaller compared to local production. In 1973, imports accounted for 78% of domestic consumption but over the years there has been a decline in the proportion. By 1981, the ratio of imports to domestic consumption was down to 53%.

Exports are not significant. In 1981, the ratio of exports to local production was only 0.04%.

The agricultural sector employs about 40% of the total working population in 1980; in 1970 it was 51%. Between 1970and 1980, agricultural labour registered a growth rate of 1.9% compared to 7.6% for manufacturing and 6.8% for construction. With the migration of labour to other sectors, the shortage of labour must thus be met by greater mechanisation. Thus the New Agricultural Policy (NAP) stresses greater use of machinery to solve labour shortage in the agricultural sector.

Paddy-farm machinery are available to farmers through private contractors, co-operatives and government institutions. In 1982, private contractors accounted for 34% of total population of 4 wheel tractors in the non-plantation sector.

The most popular farm machinery are the combine harvester, the rotary tiller and the agricultural tractor.

Table 3.3.10 shows the number of agricultural tractors in the non-plantation sector. Four-wheel tractors have about doubled since 1982 while that for pedestrian tractors have fallen. For products like threshers, water pumps and sprayers, their numbers have generally increased over the years. Thus the increase in domestic consumption for agricultural machinery is a result of increased mechanization in processing machinery, as well as in the plantation sector.

### 3.3.8 Production Characteristics

Table 3.3.11 summarises the production characteristics of the agricultural machinery. Productivity has increased. Growth per annum increased at 37.8% and 5.4% for capital per labour and value added per labour respectively. Overall, the industry is relatively less capital intensive than the manufacturing sector. Thus in 1981, its capital labour ratio was $11,060 per worker, lower than that for all manufacturing which was at $18,220.

The industry also has a higher wage level that is, $5,420 per worker compared to $4,890 in the manufacturing sector for 1981. This may suggest that the industry utilised higher skill workers. However, this higher labour skill seems to be offset by less efficient utilisation of capital.

TABLE 3.3.10

AGRICULTURAL MACHINERY POPULATION AND OWNERSHIP IN THE NON PLANTATION SECTOR, PEN. MALAYSIA

| YEAR | 1978 % | 1979 % | 1980 % | 1981 % | 1982 % |
|---|---|---|---|---|---|
| **4- WHEEL TRACTOR** | | | | | |
| DEPT. OF AGRICULTURE | 16.88 | 18.26 | 15.94 | 13.34 | 10.59 |
| CONTRACTORS | 47.83 | 46.99 | 43.52 | 44.63 | 34.32 |
| FARMERS | 24.65 | 24.88 | 25.32 | 27.54 | 41.47 |
| FARMERS CO-OP | 10.64 | 9.90 | 15.22 | 14.49 | 13.62 |
| TOTAL | 2856 (100) | 2777 (100) | 2911 (100) | 3507 (100) | 4514 (100) |
| **PEDESTRIAN TRACTORS** | | | | | |
| DEPT. OF AGRICULTURE | 3.10 | 7.55 | 3.61 | 3.02 | 4.05 |
| CONTRACTORS | 16.10 | 15.83 | 13.50 | 14.99 | 20.14 |
| FARMERS | 76.57 | 71.98 | 75.39 | 73.92 | 65.17 |
| FARMERS CO-OP | 4.23 | 4.64 | 7.50 | 8.06 | 10.64 |
| TOTAL | 4302 (100) | 5111 (100) | 4519 (100) | 4502 (100) | 3460 (100) |
| **THRESHER** | | | | | |
| DEPT. OF AGRICULTURE | 63.46 | 68.63 | 91.43 | 70.00 | 66.67 |
| CONTRACTORS | 19.23 | 19.61 | 2.86 | N.A. | N.A. |
| FARMERS | 17.31 | 11.76 | 5.71 | N.A. | 12.50 |
| FARMERS CO-OP | N.A. | N.A. | N.A. | 30.00 | 20.83 |
| TOTAL | 52 (100) | 51 (100) | 35 (100) | 20 (100) | 24 (100) |
| **WATER PUMPS** | | | | | |
| DEPT. OF AGRICULTURE | 6.60 | 15.28 | 18.62 | 20.96 | 23.55 |
| CONTRACTORS | 24.78 | 21.85 | 11.70 | 11.32 | 11.02 |
| FARMERS | 60.56 | 53.76 | 56.03 | 57.38 | 55.30 |
| FARMERS CO-OP | 8.06 | 9.11 | 13.65 | 10.34 | 10.13 |
| TOTAL | 2046 (100) | 2448 (100) | 2411 (100) | 2738 (100) | 2913 (100) |
| **SPRAYERS** | | | | | |
| DEPT. OF AGRICULTURE | 11.86 | 27.94 | 22.15 | 24.24 | 26.72 |
| CONTRACTORS | 1.83 | 0.17 | 0.57 | 0.70 | 1.29 |
| FARMERS | 30.16 | 54.41 | 62.03 | 62.63 | 55.97 |
| FARMERS CO-OP | 4.51 | 17.47 | 15.25 | 12.44 | 16.02 |
| TOTAL | 2082 (100) | 1156 (100) | 1580 (100) | 1576 (100) | 1785 (100) |

SOURCE : CALCULATED FROM ANNUAL REPORT, EXTENSION BRANCH, DEPT. OF AGRICULTURE - 1978 to 1982

TABLE 3.3.11

PRODUCTION CHARACTERISTICS OF THE AGRICULTURAL MACHINERY & EQUIPMENT INDUSTRY (MIC 38220) IN PENINSULAR MALAYSIA FOR VARIOUS YEARS

| YEAR | K/ESTB. | L/ESTB. | K/L | VA/L | W/L | W/VA | VA/OUTPUT |
|---|---|---|---|---|---|---|---|
| 1973 | 260,135 | 30.50 | 853,853 | 9,914 | 3,049 | 0.31 | 0.36 |
| 1978 | 314,625 | 34.71 | 9,065 | 13,349 | 4,784 | 0.36 | 0.34 |
| 1981 | 308,727 | 27.91 | 11,062 | 15,136 | 5,420 | 0.36 | 0.33 |
| ALL MANUF. | | | | | | | |
| 1981 | 547,262 | 30.04 | 18,217 | 16,653 | 4,894 | 0.29 | 0.26 |
| 1978 | 1,154,760 | 83.96 | 13,754 | 14,038 | 3,598 | 0.26 | 0.29 |
| 1973 | 207,473 | 26.94 | 7,702 | 7,810 | 1,970 | 0.25 | 0.30 |
| GROWTH P.A. FOR INDUSTRY | | | | | | | |
| 1973 - 1981 | | | 37.8 | 5.4 | 7.5 | | |
| GROWTH P.A. FOR ALL MANUF. | | | | | | | |
| 1973 - 1981 | | | 11.4 | 9.9 | 12.0 | | |

SOURCE : CENSUS OF MANUFACTURING INDUSTRIES, 1973, 1981
SURVEY OF MANUFACTURING INDUSTRIES, 1978.

Overall productivity has increased by 5.4% per annum from 1973 to 1981 but in general, productivity was lower than the manufacturing section, that is $15,136 compared to $16,653 in 1981. This is not surprising in that the lower level of capital used has affected overall labour productivity as discussed earlier.

However the degree of processing was higher in the industry than for all manufacturing as a whole since VA/output was 0.33 compared with 0.26 for the manufacturing sector.

### 3.3.9 Problems Facing The Industry

For the agricultural machinery sector, problems arose when the Malaysian government decided to tighten its budget in late 1982 because of the growing budget deficit. The cutback in the government's agricultural expenditure has affected the agricultural machinery industry. Firms in the industry had not received any large government order since the beginning of 1983 (Business Times, July 7, 1984).

The drastic drop in government orders was not compensated by any increase in orders from the other 2 major groups of customers. On the contrary, there was a similar decline from the other 2 sources. The plantations cut down on expenditure when commodity prices remain depressed in 1983.

The contractors, on the other hand, have declined significantly in number. They were displaced by government programmes which were set up to equip farming groups. These groups displaced many of the contractors because the latter were unable to reduce their service fees. As for farmers, they can only afford to buy machinery if loans are available but financial institutions are reluctant to offer such loans for fear of bad debts.

The above situation has been exacerbated by the mushrooming of second-hand dealers selling reconditioned farm tractors at cut-rate prices. An average 40hp tractor costs about $11,000, a second-hand reconditioned tractor is sold for $7,000.

Given the above situation, in the immediate short run the agricultural machinery industry is facing a downturn. However, in the longer run the situation could be better. First, the government has committed the country to an accelerated mechanization programme for the agricultural sector in the recently formulated NAP (Malaysia, 1984). Thus government orders for agricultural machinery will increase once the economy recovers.

Secondly, as agricultural income increases, more farmers can afford agricultural machinery. Thirdly, there is still substantial scope for the expansion of the agricultural machinery industry in Malaysia. As explained earlier, there is only one firm manufacturing agricultural machinery in the country. A study has shown that local components constituted 30% of the ex-factory cost of locally-assembled tractors in 1975 (Chee, 1978). When one compares the local content and the number of agricultural machinery manufacturing firms in Thailand and the Philippines, it would appear that there is a lot of scope for the development of the small tractor industry in Malaysia.

The main source of demand for agricultural machinery comes from the government and its associated agencies such as the Agricultural Bank of Malaysia, The Farmer's Organization Authority and The Federal Land Consolidation and Rehabilitation. The machinery was purchased by the government and distributed to farming groups or used by the agencies.

The large estates or plantations form the second largest group of customers, followed next by the contractors. These contractors cultivate the land for the farmers for a fee. The contractors provide an attractive service because they could cultivate different plots of small land while the farmer by himself would not be able to recoup the cost of the tractor if it were used only on his small piece of land.

The smallest group of customers for agricultural machinery is the farmers. This is because many farmers are still poor and very few can afford to buy any machinery. Thus it would appear that the demand for agricultural machinery in Malaysia depends largely on the government. This is a strange situation which is also the root cause of the major problem currently faced by the agricultural machinery industry in Malaysia.

## 3.3.10 Export and Import Trend

Since 1978, exports of agricultural machinery have increased. This increase is due to the increased transactions in parts for agricultural machinery and the re-exports of agricultural tractor, non-pedestrian controlled. The total exports for 1983 were $8.003 million compared to $1.615 million in 1978 as shown in Table 3.3.12.

Major export items were agriculture tractor non-pedestrian controlled which accounted for 59% of total agricultural machinery for 1983 and parts for other agricultural equipment, 19% other relatively significant products were "scarifiers, cultivators, weėders, hoes and harows" and parts for agricultural and horticultural machines for soil preparation or cultivation (see Apendix 3.1.1 for description) . This equipment was exported mainly to Brunei, Thailand, Singapore and Australia.

There is no consistent trend for exports of agricultural machinery in Malaysia. Value per unit of exports however is generally lower than per unit value of imports. A very high proportion of exports in this industry for 1982 was re-exports. Table 3.3.13 shows re-exports of selected agricultural machinery. All items selected showed that re-exports equalled total actual exports. See Table 3.3.12 for a comparison. The quantity exported was also very small with low value per unit.

TABLE 3.3.12

IMPORTS AND EXPORTS OF AGRICULTURAL MACHINERY (INCLUDING TRACTORS) FOR MALAYSIA, 1978 - 1983

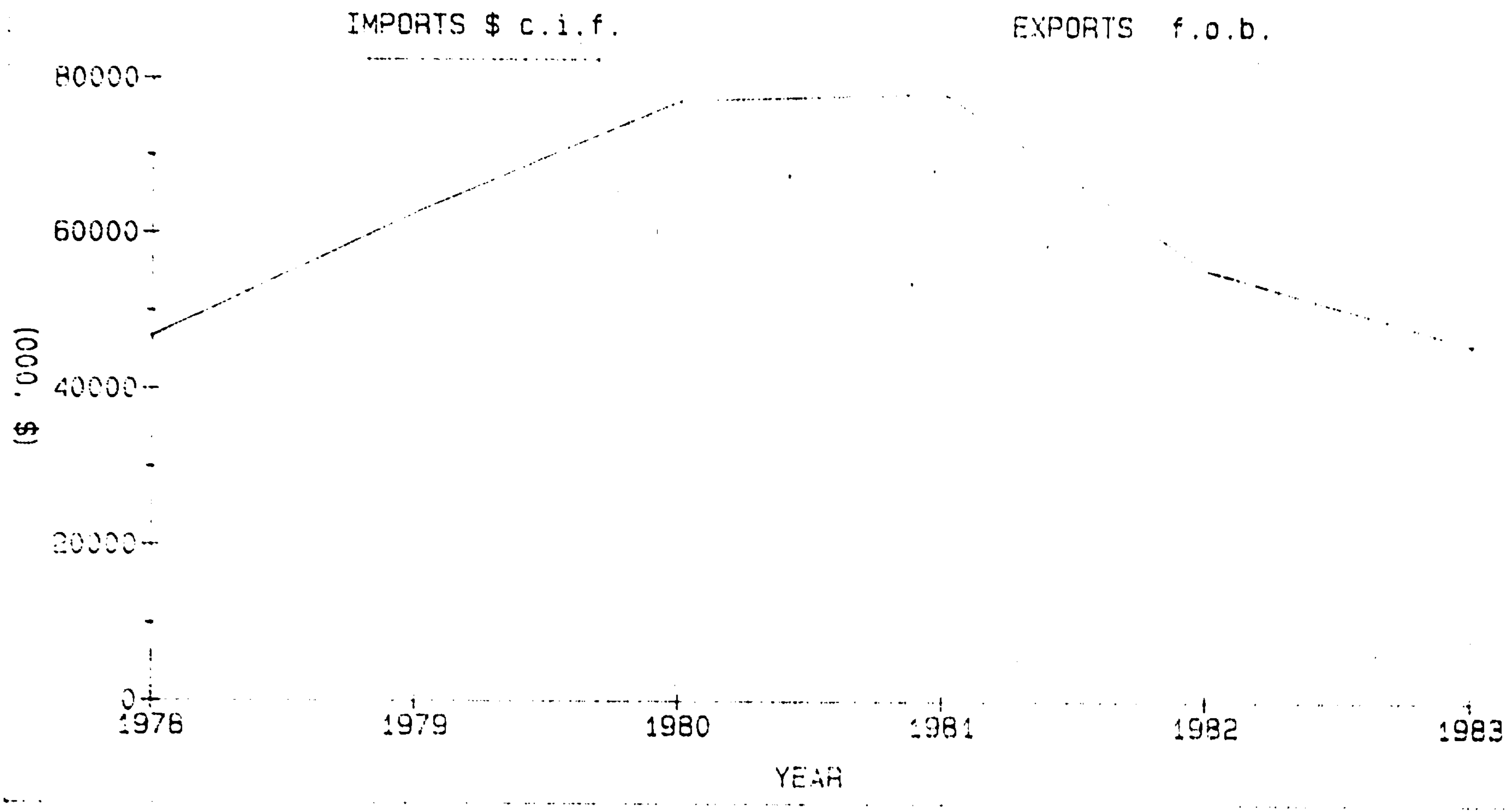
| SITC CODE POST 1978 | 1978 | | 1979 | | 1980 | | 1981 | | 1982 | | 1983 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b |
| 721-220-00 | 2,649,052 | NIL | 11,435,207 | 243,525 | 7,265,644 | NIL | 8,351,454 | NIL | 4,821,487 | NIL | 7,354,148 | 9,4 |
| 721-290-00 | 1,090,976 | 39,044 | 1,714,384 | 58,488 | 2,603,672 | 115,601 | 3,090,267 | 27,489 | 2,390,874 | 5,078 | 2,451,018 | 252,3 |
| 721-971-00 | 944,035 | 5,883 | 901,920 | NIL | 1,514,193 | 41,990 | 1,753,069 | NIL | 456,706 | NIL | 1,683,642 | 46,7 |
| 721-130-00 | 1,058,533 | 699,362 | 2,704,542 | 543,069 | 1,390,785 | 131,696 | 1,767,681 | 76,762 | 1,837,335 | 15,212 | 1,833,171 | 224,2 |
| 721-240-00 | 198,902 | 1,850 | 453,835 | 8,791 | 424,645 | 2,316 | 554,507 | 19,031 | 216,460 | NIL | 1,146,473 | 29,1 |
| 721-180-00 | 1,188,900 | 132,064 | 619,784 | 375,407 | 1,081,892 | 602,846 | 1,473,560 | 969,931 | 1,596,856 | NIL | 1,266,528 | 22,0 |
| 721-230-00 | 1,037,376 | 15,467 | 737,799 | 159,629 | 1,446,319 | 116,299 | 1,103,249 | 106,686 | 1,219,191 | 20,009 | 897,066 | 193,9 |
| 721-110-00 | 561,968 | 80,302 | 862,162 | 17,350 | 722,509 | 848 | 1,125,187 | 2,893 | 712,171 | 13,216 | 849,885 | 48,7 |
| 721-120-00 | 292,953 | 4,466 | 348,483 | 17,193 | 777,198 | 14,940 | 632,970 | 16,500 | 399,770 | NIL | 741,032 | 7,5 |
| 721-990-00 | 505,804 | 5,420 | 499,543 | 2,744 | 718,681 | 1,519 | 312,837 | 18,926 | 832,364 | 664 | 398,545 | 1,553,4 |
| 722-411-00 | 1,241,801 | NIL | 1,332,470 | NIL | 328,143 | 800 | 207,486 | 1,250 | 1,872,736 | 1,872,736 | 2,394,936 | 158,1 |
| 722-419-00 | 33,865,612 | 526,724 | 39,030,747 | 577,402 | 54,578,174 | 391,347 | 53,821,423 | 907,500 | 33,598,534 | 285,292 | 20,222,413 | 4,698,1 |
| 721-190-00 | 1,105,485 | 71,740 | 784,838 | 69,968 | 1,065,393 | 556,181 | 1,821,647 | 812,385 | 1,147,074 | 515,705 | 1,467,944 | 610,9 |
| 721-310-00 | 86,280 | NIL | 53,664 | NIL | 1,322,977 | NIL | 288,785 | 3,987 | 535,198 | NIL | 73,515 | NIL |
| 721-380-00 | 142,729 | 5,000 | 194,844 | NIL | 620,327 | NIL | 766,721 | NIL | 1,782,712 | NIL | 1,526,388 | 5 |
| 721-390-00 | 204,671 | 11,378 | 317,178 | 1,200 | 342,476 | 352 | 274,832 | 6,601 | 333,437 | 9,593 | 144,061 | 42,0 |
| 721-979-00 | 369,533 | 16,141 | 621,902 | 1,182 | 945,815 | 1,519 | 838,952 | 15,357 | 1,538,607 | 74,364 | 1,236,379 | 105,5 |
| | 46,544,610 | 1,614,841 | 62,613,302 | 2,075,948 | 77,148,843 | 1,978,254 | 78,184,627 | 2,985,298 | 55,291,212 | 2,811,869 | 45,687,244 | 8,003,1 |

NOTE : 1983 DATA IS FOR PENINSULAR MALAYSIA
See Appendix 3.1.1 for legend

SOURCE : DS. ASSET, v.y.

FIGURE 3.3.2

IMPORTS AND EXPORTS OF AGRICULTURAL MACHINERY
(INCLUDING TRACTORS) FOR MALAYSIA.
1978 - 1983




SOURCE: DERIVED FROM TABLE 3.3.12

TABLE 3.3.13

RE- EXPORTS OF AGRICULTURAL MACHINERY

| SITC CODE | DESCRIPTION | 1982 UNIT | 1982 VALUE (f.o.b.) |
|---|---|---|---|
| 721-220-00 | COMBINED HARVESTER, THRESHERS | NIL | NIL |
| 721-290-00 | PARTS FOR HARVESTING AND THRESHING MACHINERY | 0 | 5,078 |
| 721-130-00 | SCARIFIERS, CULTIVATORS, WEEDERS, HOES & HARROWS | 2 | 15,212 |
| 721-110-00 | PLOUGHS | 4 | 13,216 |
| 721-120-00 | SEEDERS, PLANTERS, TRANSPLANTERS, FERTILISER DISTRIBUTORS AND MANURE SPREADERS | NIL | NIL |
| 721-990-00 | PARTS FOR OTHER AGRICULTURAL, HORTICULTURAL POULTRY, KEEPING & BEE KEEPING MACHINERY, GERMINATION PLANT, ETC. | 0 | 664 |
| 721-180-00 | OTHER AGRICULTURAL, HORTICULTURAL MACHINERY FOR SOIL PREPARATION OR CULTIVATORS, LAWN & SPORTS GROUND ROLLERS | NIL | NIL |
| 722-411-00 | TRACTOR FOR AGRICULTURAL USE, PEDESTRIAN CONTROLLED | 1 | 5,092 |
| 722-419-00 | TRACTOR FOR AGRICULTURAL USE, NON PEDESTRIAN CONTROLLED | 10 | 285,292 |

SOURCE : D.S. ASET. 1982

Imports increased from 1978 to 1980 but had subsequently declined in absolute value as shown in Table 3.3.12. Agricultural tractor non-pedestrian controlled formed the bulk of imports, followed by combine harvest-threshers and parts for combine harvester-threshers. These imports were mostly traded through local agents. While some of the agricultural tractors were re-exported, combine-harvesters were imported for domestic consumption. Only parts that were re-exported were shown in Table 3.3.13.

Since 1982, imports of agricultural tractors, pedestrian-controlled have again increased in importance. "Winnowing, cleaning machines for seeding, grading, etc." constituted 2.5% of total imports in 1983 and only 0.43% in 1978 reflecting the gradual shift to mechanisation due to increasing lack of farm labour.

The economic recession and the government cutback in late 1982 have affected imports which declined to $55.3 million in 1982 and $45.7 million in 1983. The imports of "agricultural tractor non-pedestrian controlled" appeared to be most affected by the government cutback. Import on this product declined by 40% to $20.2 million in 1983. This decline is partly attributed to the poor economic performance by other industries which also brought in tractors under the category of "agricultural tractor" to avoid import duty.

Table 3.3.14 summarises the main sources of imports for agricultural machinery for 1978-1981. The main exporting countries have pre-dominantly been either Japan or Italy. By 1981, Italy

TABLE 3.3.14

SOURCES OF IMPORTS OF AGRICULTURAL MACHINERY (INCLUDING TRACTORS) (SITC 721 & 722) INTO MALAYSIA FOR 1978 - 1981

| COUNTRY OF ORIGIN | 1978 % | 1979 % | 1980 % | 1981 % |
|---|---|---|---|---|
| JAPAN | 14.17 | 13.68 | 14.42 | 15.70 |
| UNITED STATES | 8.33 | 3.70 | 9.74 | 4.47 |
| GERMANY | 5.29 | 14.23 | 13.12 | 10.92 |
| ITALY | 10.08 | 12.48 | 12.04 | 17.08 |
| TAIWAN | 0.38 | 0.43 | 0.73 | 0.51 |
| OTHERS | 61.75 | 55.48 | 49.95 | 51.32 |
| TOTAL | 100.00 | 100.00 | 100.00 | 100.00 |

SOURCE : D[illegible], [illegible]

contributed 17.08% of Malaysia's total imports with Japan accounting for 15.7%. On the average, the top 5 exporters have maintained their position over this period, with the USA and Germany both losing out slowly to Japan and Italy.

## 3.4 Current Status of the Metal and Woodworking Machinery Manufacturing Industry

### 3.4.1 Introduction

The metalworking and woodworking machinery manufacturing industry is in the infancy stage of development in Malaysia. A total number of 35 manufacturing licences were given to local companies to produce metalworking and woodworking machinery, however, there are a large number of small and medium sized unapproved producers.

These firms are normally small proprietors using labour intensive techniques and operated by ex-apprentices. They are clustered on the verge of residential areas or in light industrial areas. Local Town Councils, because of environmental regulations, do not issue the necessary operating permits to them. Most, in fact, need to be relocated.

Generally, the locally produced machinery is simple and use lower technology. On the whole, Malaysia's metalworking and woodworking machinery requirements are met by imports.

The recognised metalworking machinery manufacturers include Malaysian Gauge and Tool (hacksaws), See Sun Engineering, Wing Fatt Power Industries and LVD (metal presses), Leader Engineering and Lee Industries (drilling machine and presses), Machine Products and Indo Malaysia Engineering (grinder and power saw). For woodworking machinery, there is only one principal manufacturer, Mah Cheok Pui Foundry, which manufactures a wide range of machinery including bandsaws, circular saws, surface planers mortising machines, thicknessing machines. There are also a large number of small engineering workshops which undertake the fabrication of a very limited range of products (usually bandsaws and circular saws) on a jobbing basis.

3.4.2 Industry Structure

Based on the 1981 Manufacturing Census, there were 47 companies involved in the manufacturing of metalworking and woodworking machinery (Table 3.4.1). This industry is very small in the context of the Malaysian economy. It constitutes only 3.3% of the NEM sector's establishments and a negligible 0.3% of that of the manufacturing sector's.

The majority of the firms in the industry are small, with 36 firms or 77% of the industry's firms having less than 20 employees. Only 17% or 8 firms have 30 or more employees but they account for 51% of the industry's employment. The criteria for smallness of enterprises differ in the NICs and developed countries. In Taiwan, a relatively small enterprise employs more than 50 full-time paid employees while the cut-off rate for small enterprises in Japan is less than 100 employees. It should be noted that companies in this industry are also involved in the manufacturing of products not classified as

TABLE 3.4.1

PRINCIPAL STATISTICS BY EMPLOYMENT SIZE, PEN. MALAYSIA, 1981
INDUSTRY 38230 : MANUFACTURE OF METAL AND WOODWORKING MACHINERY

| EMPLOYMENT SIZE | NO. OF ESTB. | | EMPLOYMENT | | SALARIES & WAGES $ | SALARIES/ EMPLOYMENT $ | FIXED ASSETS $ | FIXED ASSETS/ NO. OF ESTB. $ | FIXED ASSETS/ EMPLOYMENT $ |
|---|---|---|---|---|---|---|---|---|---|
| < 5 | 11 | 23% | 30 | 4% | 77,421 | 2,581 | 209,451 | 19,041 | 6,982 |
| 5 - 9 | 13 | 28% | 83 | 12% | 310,869 | 3,745 | 359,064 | 27,620 | 4,326 |
| 10 - 19 | 12 | 26% | 155 | 22% | 882,583 | 5,694 | 1,878,235 | 156,520 | 12,118 |
| 20 - 29 | 3 | 6% | 79 | 11% | 391,980 | 4,962 | 158,342 | 52,781 | 2,004 |
| 30 - 49 | 5 | 11% | 179 | 25% | 606,655 | 3,389 | 1,964,821 | 392,964 | 10.977 |
| 50 - 99 | 3 | 6% | 189 | 26% | 796,943 | 4,217 | 9,428,873 | 3,142,958 | 49,888 |
| 100 - 199 | 0 | 0% | 0 | 0% | 0 | 0 | 0 | 0 | 0 |
| INDUSTRY TOTAL | 47 | 100% | 715 | 100% | 3,066,451 | 4,289 | 13,998,786 | 297,847 | 19,579 |
| NEM SECTOR | 1445 | | 21687 | | 110,581,452 | 5099 | 230,354,563 | 159,415 | 10,622 |
| MANUF. SECTOR ('000) | 17.780 | | 534.145 | | 2,614,142 | 4.890 | 9,730,327 | 547.363 | 18.217 |
| INDUSTRY/NEM SECTOR | 3.3% | | 3.3% | | 2.8% | 0.84 | 6.10% | 1.87 | 1.84 |
| INDUSTRY/MANUF. SECTOR | 0.26 % | | 0.13 % | | 0.12 % | 0.88% | 0.14% | 0.54% | 1.07% |

SOURCE : CENSUS OF MANUF. INDUSTRIES, 1981.

metalworking and woodworking. Thus, the "true" level of employment generation by metalworking and woodworking manufacturing should be smaller.

The industry generates about 715 jobs, which constitute only 3.3% of the total sectoral employment and 0.13% of the manufacturing sector. This low employment level corresponds to its low contribution in terms of number of establishments and is also due to the relatively more capital-intensive nature of the industry.

3.4.3 Investment

The average fixed asset investment in the industry amounted to $297,847 in 1981. The average fixed asset investment of the industry is significantly lower than that of the manufacturing sector's which amounted to $547,363 but higher than the NEM sector's average of $159,415. This reflects the capital intensive nature of the industry

An analysis of the general investment pattern amongst firms in the industry shows that fixed asset investment increases with the size of the firm. It ranges from $19,041 for the smallest firms to more than $3 million for the largest. As individual proprietorships and partnerships are usually associated with small firms, their level of fixed asset investment is lower than for public companies. The increase in fixed assets corresponding to the expansion of a firm is best illustrated by the case of Ban Hing Lee, a firm engage in the manufacturing of tools and dies in addition to other products on a jobbing basis.

When it started about 10 years ago, it had a few pieces of used, general purpose machinery costing "a few thousand dollars" each and was occupying about 1,000 square feet of factory space. Today it owns the second welding robot (costing more than a hundred thousand dollars) in the country and will be acquiring at least three CNC machines (there are only about twenty in the country at the moment) and occupying about 6,000 square feet of factory space.

The capital intensity of the industry as measured by the fixed asset/labour ratio was slightly higher than the manufacturing sector (See Table 3.4.1). The respective fixed asset/labour ratios for metal and woodworking machinery industry, the NEM sector and the manufacturing sector were $19,579, $8,977 and $18,217 respectively. The relatively higher fixed asset deployment of the industry is again reflective of the larger number of limited companies whose combined fixed asset investment constituted more than 80% of the industry fixed asset investment.

Within the industry, there is a diverse range in the capital intensities of firms of different sizes. There is no obvious trend, with the fixed asset/labour ratios fluctuating as the size of the firms increases. The only obvious conclusion is that smaller firms, i.e., those with less than 50 employees have higher capital intensities, reflective of the higher fixed asset investment that can be afford by larger firms. Smaller firms as confirmed by field survey evidence usually operate on rented land, often including the factory buildings, and utilising used machinery and equipment. Many firms expressed reluctance to invest in modern machinery on rented premises as tenure is not permanent. Industrial land is too expensive for the majority of firms. Hence, many operate in cramped congested factory space.

A possible reason for the fluctuating levels of capital intensities amongst the firms of varying sizes is the "step" effect of capital investment. Some firms go through a cycle of fixed asset investment whereby they invest in a particular level of fixed assets and as operations increase that level is maintained while expansion of capacity is met solely or almost entirely by an increase in labour intake. As the level of operations increase still further, investments in fixed assets increase again, i.e. moving up to the next "step" this time without increasing labour. This cyclical pattern of fixed asset investment could be the factor causing the fluctuating intensities.

### 3.4.4 Employment

Consistent with the earlier finding that the majority of the firms in this industry are small, 35 firms or 75% of the firms are individual proprietorships or partnerships (See Table 3.4.2). Their total employment level is accordingly low, accounting for 62% of the industry's total. Eleven or 23% of the firms are private limited companies while only one is a public limited company. Between them, they account for 38% of the industry's employment although they constitute only 23% of the industry's establishments.

TABLE 3.4 2

PRINCIPAL STATISTICS BY LEGAL STATUS, PENINSULAR MALAYSIA, 1981
INDUSTRY 38230 : MANUFACTURE OF METAL AND WOODWORKING MACHINERY

| LEGAL STATUS | NO. OF ESTB. | | TOTAL EMPLOYMENT | | SALARIES & WAGES $ | SALARIES/ EMPLOYMENT $ | FIXED ASSETS $ | FIXED ASSETS/ NO. OF ESTB. $ | FIXED ASSETS/ EMPLOYMENT $ |
|---|---|---|---|---|---|---|---|---|---|
| INDIVIDUAL PROPRIETORSHIP | 20 | 43% | 259 | 36% | 766,106 | 2,958 | 1,741,485 | 87,074 | 6,724 |
| PARTNERSHIP | 15 | 32% | 187 | 26% | 861,604 | 4,608 | 844,101 | 56,273 | 4,514 |
| PTE. LTD. | 11 | 23% | 213 | 30% | 1,085,977 | 5,098 | 10,391,385 | 944,671 | 4,435 |
| PUBLIC LTD. | 1 | 2% | 56 | 8% | 352,764 | 6,299 | 1,021,815 | 1,021,815 | 18,247 |
| INDUSTRY TOTAL | 47 | 100% | 715 | 100% | 3,066,451 | 4,289 | 13,998,786 | 297,847 | 19,579 |

SOURCE : CENSUS OF MANUFACTURING INDUSTRIES, 1981

The metalworking and woodworking machinery industry offers the best competitive wage rates relative to the NEM sector and the manufacturing sector. The average salary in the industry was $4,289 in 1981 and this was 19% lower than the NEM sector's of $5,099 and the manufacturing sector's of $4,890.

The non-competitive wage rates are due to the presence of many small firms and individual proprietorships and partnerships. This is very evident in Table 3.4.2 which indicates that proprietorships and partnerships on the average have lower salaries. It is less evident in Table 3.4.1 that smaller firms have on the average lower salaries.

### 3.4.5 Spatial Distribution

The metalworking and woodworking manufacturers are concentrated in the Kuala Lumpur/Selangor region as shown in Table 3.4.3.

The Wilayah/Selangor region accounted for 30 of the 47 firms in the industry in 1981. This is equivalent to 64% of the industry's establishments. Kuala Lumpur alone had 22 firms or 47% of the industry's establishments. This nucleus of firms generated about 80% of revenue and more than 60% of employment within the industry. The other firms are concentrated mainly in other parts of West Malaysia. The reason for this concentration along the West Malaysian states is obvious - this is the region where the end-user

TABLE 3.4.3

SPATIAL DISTRIBUTION OF PRODUCTION BY STATE, PEN. MALAYSIA, 1981
INDUSTRY 38230 : MANUFACTURE OF METAL AND WOODWORKING MACHINERY

| STATE | NO. OF ESTB. | | TOTAL REVENUE ('000) | | TOTAL EMPLOYMENT | |
|---|---|---|---|---|---|---|
| WILAYAH | 22 | 47% | 7,3[illegible]2,961 | 40.28% | 298 | 41.68% |
| SELANGOR | 8 | 17% | 6,[illegible]5,641 | 37.72% | 171 | 23.92% |
| PENANG | 4 | 9% | 2,422,334 | 13.31% | 135 | 18.88% |
| JOHORE | [illegible] | 9% | 399,963 | 2.20% | 33 | 4.62% |
| PERAK | 3 | 6% | 473,185 | 2.60% | 15 | 2.10% |
| OTHERS | 6 | 13% | 709,831 | 3.90% | 63 | 8.81% |
| TOTAL | 47 | 100% | 18,203,915 | 100.00% | 715 | 100.00% |

SOURCE : CENSUS OF MANUFACTURING INDUSTRIES, 1981

industries of metalworking and woodworking machinery, i.e. general engineering industries and furniture making industry, are respectively located.

### 3.4.6 Output Performance

The total output of the metalworking and woodworking machinery for 1981 was $17.9 million as shown in Table 3.4.4. The majority of the output was contributed by the larger firms with those employing 50 or more workers contributing $7.1 million or nearly 40% of industry output. This is despite the fact that these firms constitute only 6% of the industry's establishments and 26% of its employment. The high concentration of output by a few firms is qualified by the Gini coefficient for the industry which was 0.59.

Output from the metal and woodworking machinery is not significant when compared to the manufacturing sector, accounting for only 0.05% of the manufacturing sector's output of $34.5 billion in 1981.

Generally, the labour productivity of the firms increased as the firms increase in size although as Table 3.4.4 shows, not necessarily proportionately. The value added/labour ratio ranges from $7,060 for the smallest firms to $10,940 for the largest firms. The higher labour productivity for the large firms is due in part to their higher levels of fixed asset deployment and in part to the better quality and more sophisticated machinery used. As mentioned earlier, the smaller firms tend to deploy used and less sophisticated machinery and as they grow they tend to move on to machinery of a higher level of sophistication. Furthermore, the larger firms are able to attract higher skilled labour and this adds to the productive capabilities of the firms.

The labour productivity of the industry in general is significantly lower than that for manufacturing. The value added/labour ratio of $9,720 was 71% lower than the manufacturing sector's.

Although the larger firms have higher labour productivity than the smaller firms, returns to local factors of production are higher for smaller firms. Indeed as Table 3.4.4. indicates, the value added/output ratio decreases as the employment size of firms increases. The ratio ranges from 0.55 for the very small firms to 0.29 to the largest firms, which seem to suggest that smaller firms enjoy a higher degree of precessing. This is probably because the larger firms are involved in the assembly of component parts which are manufactured by small firms.

The top 10 materials for the metal & woodworking industry are listed in Table 3.4.5. These supplies to the industry are mainly imported. Most of these are in the form of quality raw materials like mild steel and iron bars, sheets and plates. Cast iron amounts to 20.41% of total imports whereas parts and spare parts take up 11.06%. These are imported due to the industry's inability to produce

TABLE 3.4.4

OUTPUT PERFORMANCE OF THE METAL AND WOODWORKING MANUFACTURING INDUSTRY, BY EMPLOYMENT SIZE PEN. MALAYSIA, 1981

| EMPLOYMENT SIZE | NO. OF ESTB. | | EMPLOYMENT | | OUTPUT $ | | VALUE ADDED $ | VALUE ADDED/ LABOUR ($) | VALUE ADDED/ OUTPUT |
|---|---|---|---|---|---|---|---|---|---|
| < 5 | 11 | 23.40% | 30 | 4.20% | 383,225 | 2.14% | 211,686 | 7,056 | 0.55 |
| 5 - 19 | 25 | 53.19% | 238 | 33.29% | 5,141,606 | 28.71% | 2,377,441 | 9,989 | 0.46 |
| 20 - 49 | 8 | 17.02% | 258 | 36.08% | 5,291,127 | 29.54% | 2,292,464 | 8,886 | 0.43 |
| 50 - 99 | 3 | 6.38% | 189 | 26.43% | 7,095,091 | 39.61% | 2,067,212 | 10,938 | 0.29 |
| > 100 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 0 | 0 | 0.00 |
| INDUSTRY TOTAL | 47 | 100.00% | 715 | 100.00% | 17,911,049 | 100.00% | 6,948,803 | 9,719 | 0.39 |
| NEM SECTOR | 1445 | | 21687 | | 912,927,217 | | 323,433,034 | 14,914 | 0.35 |
| MANUF. SECTOR ('000) | 17.78 | | 534.15 | | 34,486,493 | | 8,895,302 | 16.653 | 0.00026 |
| INDUSTRY/NEM SECTOR | 3.3% | | 3.3% | | 1.96% | | 0.21% | 0.65 | 1.11 |
| INDUSTRY/MANUF. SECTOR | 0.26% | | 0.13% | | 0.05% | | 0.08% | 0.58 | 1.50 |

SOURCE : CENSUS OF MANUF. INDUSTRIES, 1981

TABLE 3.4.5

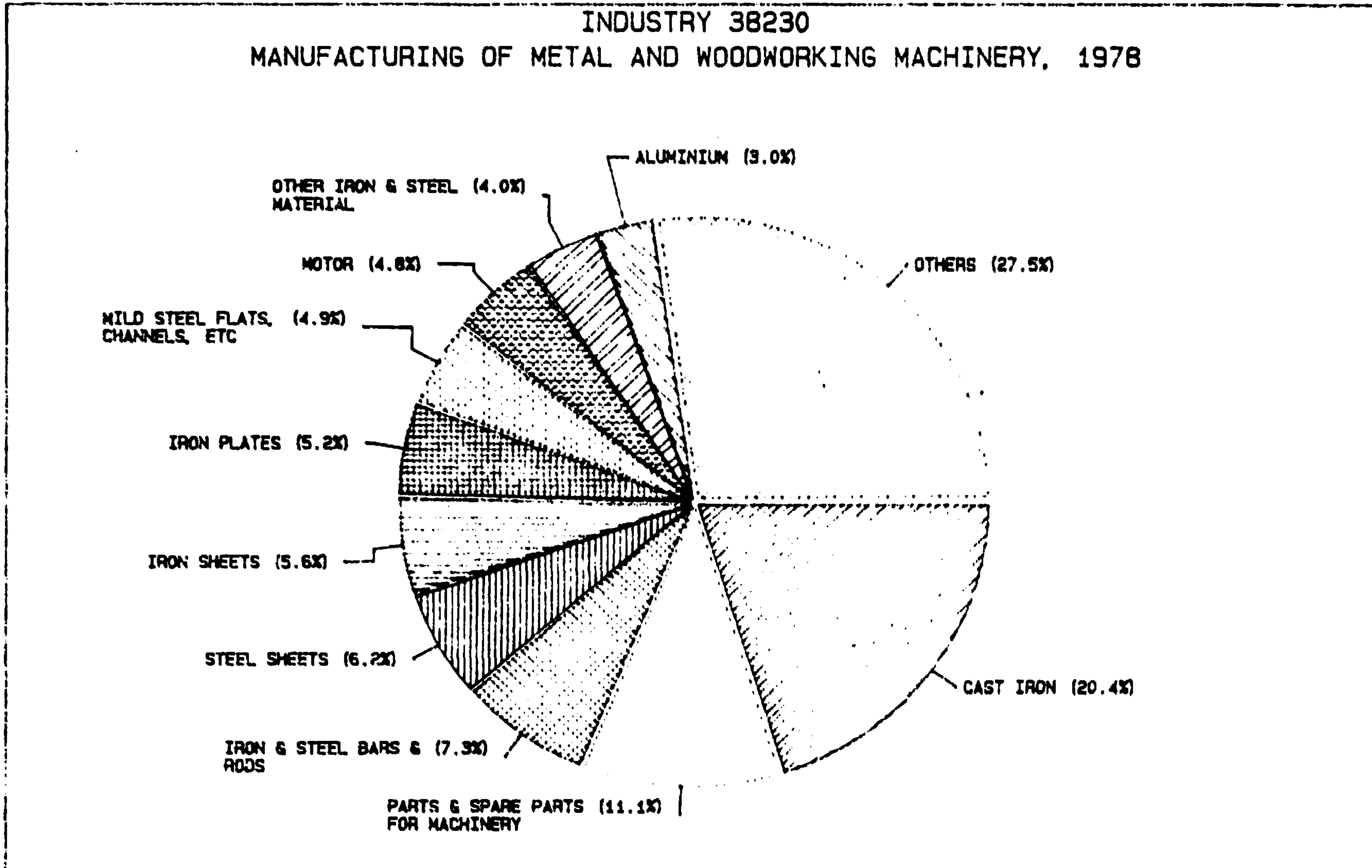
INPUT MATERIAL USED BY INDUSTRY PEN. M'SIA, 1978
INDUSTRY 38230 : MANUFACTURING OF METAL AND WOODWORKING MACHINERY

| TOP 10 MATERIALS CONSUMED | % |
|---|---|
| CAST IRON | 20.41 |
| PARTS & SPARE PARTS FOR MACHINERY | 11.06 |
| IRON & STEEL BARS & RODS | 7.28 |
| STEEL SHEETS | 6.16 |
| IRON SHEETS | 5.61 |
| IRON PLATES | 5.21 |
| MILD STEEL FLATS, CHANNELS, ETC | 4.93 |
| MOTOR | 4.82 |
| OTHER IRON & STEEL MATERIAL | 4.03 |
| ALUMINIUM | 3.03 |
| OTHERS | 27.46 |
| TOTAL | 100.00 |

SOURCE : SURVEY OF MANUFACTURING INDUSTRIES, 1978

FIGURE 3.4.1

INPUT MATERIAL USED BY METAL AND WOODWORKING MACHINERY INDUSTRY




SOURCE: DERIVED FROM TABLE 3.4.5

precision spare parts for metal and woodworking machines. Hence, backward and forward linkages are low.

Top exporters of these materials are Japan, Taiwan, Germany and the United States. Japan, in particular, dominates the market not only in terms of supplying the raw materials but also metal and woodworking machinery as well.

Table 3.4.6 summarises the production characteristics of the metal and woodworking machinery over time. Productivity in the industry has increased almost 3 folds since 1973. The annual rate of growth of productivity was 14.0% which is much higher than the 9.9% achieved by the manufacturing sector. However the productivity level achieved by the industry is much lower than that for all manufacturing. As may be seen, productivity per labour for the industry was $9,720 compared to $16,650 for all manufacturing.

The industry also offered lower wages relative to all manufacturing. Consequently, labour utilised by the industry is less skilled and as a result, productivity per labour trailed behind the manufacturing sector. Generally, the industry is more capital intensive, employing $19,580 worth of capital per labour vs $18,220 employed by the manufacturing sector. This is directly reflected in increasing productivity which increased 14% annually. More efficient utilisation of capital has also improved the degree of processing for the industry which is 39% or 1.5 times higher for every value added per unit output of the manufacturing sector.

TABLE 3.4.6

PRODUCTION CHARACTERISTICS OF THE MANUFACTURING OF METAL AND WOODWORKING MACHINERY INDUSTRY (MIC 38230) IN PENINSULAR MALAYSIA, OVERTIME

| YEAR | L/ESTB. | K/ESTB. | K/L | V.A./ L | W/L | W/V.A. | V.A./ OUTPUT |
|---|---|---|---|---|---|---|---|
| | | ($ '000) | | | | | |
| 1973 | 13.26 | 37.74 | 2.85 | 3.42 | 1.44 | 0.42 | 0.33 |
| 1978 | 26.21 | 142.32 | 5.43 | 7.50 | 3.13 | 0.42 | 0.48 |
| 1981 | 15.21 | 297.85 | 19.58 | 9.72 | 4.29 | 0.44 | 0.39 |
| ALL MANUFACTURING | | | | | | | |
| 1981 | 30.04 | 547.26 | 18.22 | 16.65 | 4.89 | 0.29 | 0.26 |
| 1978 | 83.96 | 1,154.76 | 13.75 | 14.04 | 3.60 | 0.26 | 0.29 |
| 1973 | 26.94 | 207.47 | 7.70 | 7.81 | 1.97 | 0.25 | 0.30 |
| GROWTH P.A. (1973 - 1981) | | | | | | | |
| METAL & WOODWORKING INDUSTRY | | | 27.5 | 14.0 | 14.6 | 0.6 | |
| ALL MANUFACTURING | | | 11.4 | 9.9 | 12.0 | 1.9 | |

SOURCE : CALCULATED FROM CENSUS OF MANUF. INDUSTRIES, 1973, 1981 AND SURVEY OF MANUF. INDUSTRIES 1978.

Table 3.4.7 shows the range of products produced by the industry in 1978. Except for "chain saws" and "fixture metal and woodwork", the industry produces fairly even proportions of woodworking and metal working machinery. These product groups constitute about 7% to 8% each.

It is interesting to note that "Dies and Dic" Set, "metal and woodwork" have become increasingly important. The range of products produced is notably of lower technology when compared with products imported from Japan and Germany. For example, some of these products like "chain saws" and band saws are adapted from designs imported from Taiwan.

### 3.4.7 Import and Export Trend

Malaysia's metalworking and woodworking machinery needs are mostly met by imports which have been increasing tremendously over the years asshown in Table 3.4.8. The inflow of imports has been encouraged by the absence of import tariffs in line with Malaysia's policy of promoting industrialisation, by promoting the import of capital goods to support the industrialisation. As a result, the metalworking and woodworking machinery industry has been consistently experiencing a trade deficit.

The imports of metalworking machinery increased two-folds from $74.8 million in 1978 to $162 million in 1983. Exports had also increased but from a smaller base of $3.44 million in 1978. It

TABLE 3.4.7

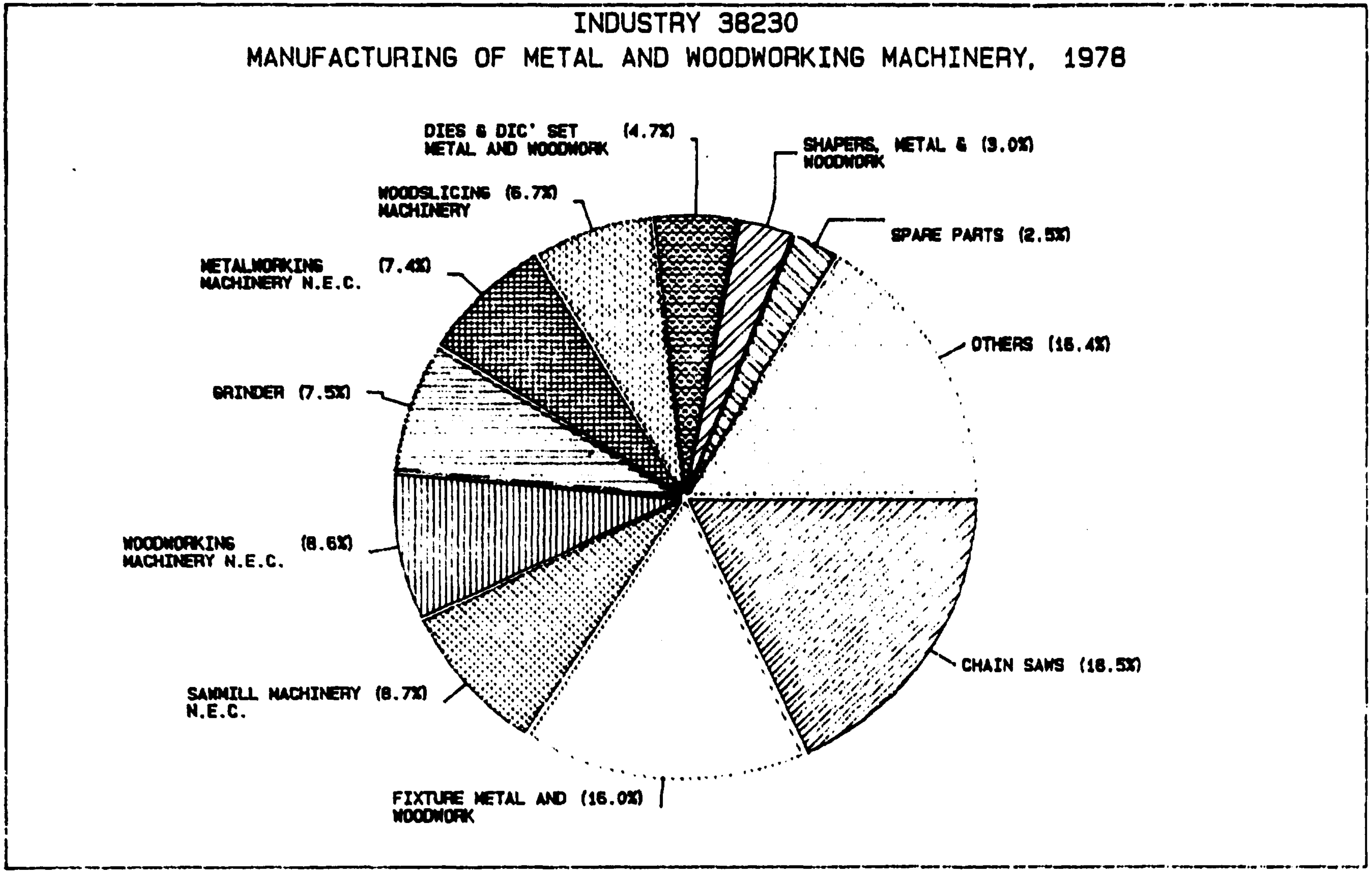
PRINCIPAL PRODUCT MIX FOR PENINSULAR M'SIA, 1978
INDUSTRY : 38230 ; MANUFACTURING OF METAL & WOODWORKING MACHINERY

| TOP 10 PRODUCT ITEM | 1978 VALUE | % |
|---|---|---|
| CHAIN SAWS | 884,350 | 18.45% |
| FIXTURE METAL & WOODWORK | 768,345 | 16.03% |
| SAWMILL MACHINERY N.E.C. | 418,169 | 8.73% |
| WOODWORKING MACHINERY N.E.C. | 410,571 | 8.57% |
| GRINDER | 357,861 | 7.47% |
| METALWORKING MACHINERY N.E.C. | 355,142 | 7.41% |
| WOODSLICING MACHINERY | 321,517 | 6.71% |
| DIES & DIC' SET, METAL & WOODWORK | 226,487 | 4.73% |
| SHAPERS, METAL & WOODWORK | 143,524 | 2.99% |
| SPARE PARTS | 120,810 | 2.52% |
| OTHERS | 785,417 | 16.39% |
| TOTAL | 4,792,193 | 100.00% |

SOURCE : SURVEY OF MANUFACTURING INDUSTRIES, 1978

FIGURE 3.4.2

PRODUCT MIX OF METAL AND WOODWORKING MACHINERY INDUSTRY




SOURCE: DERIVED FROM TABLE 3.4.7

TABLE 3.4.8

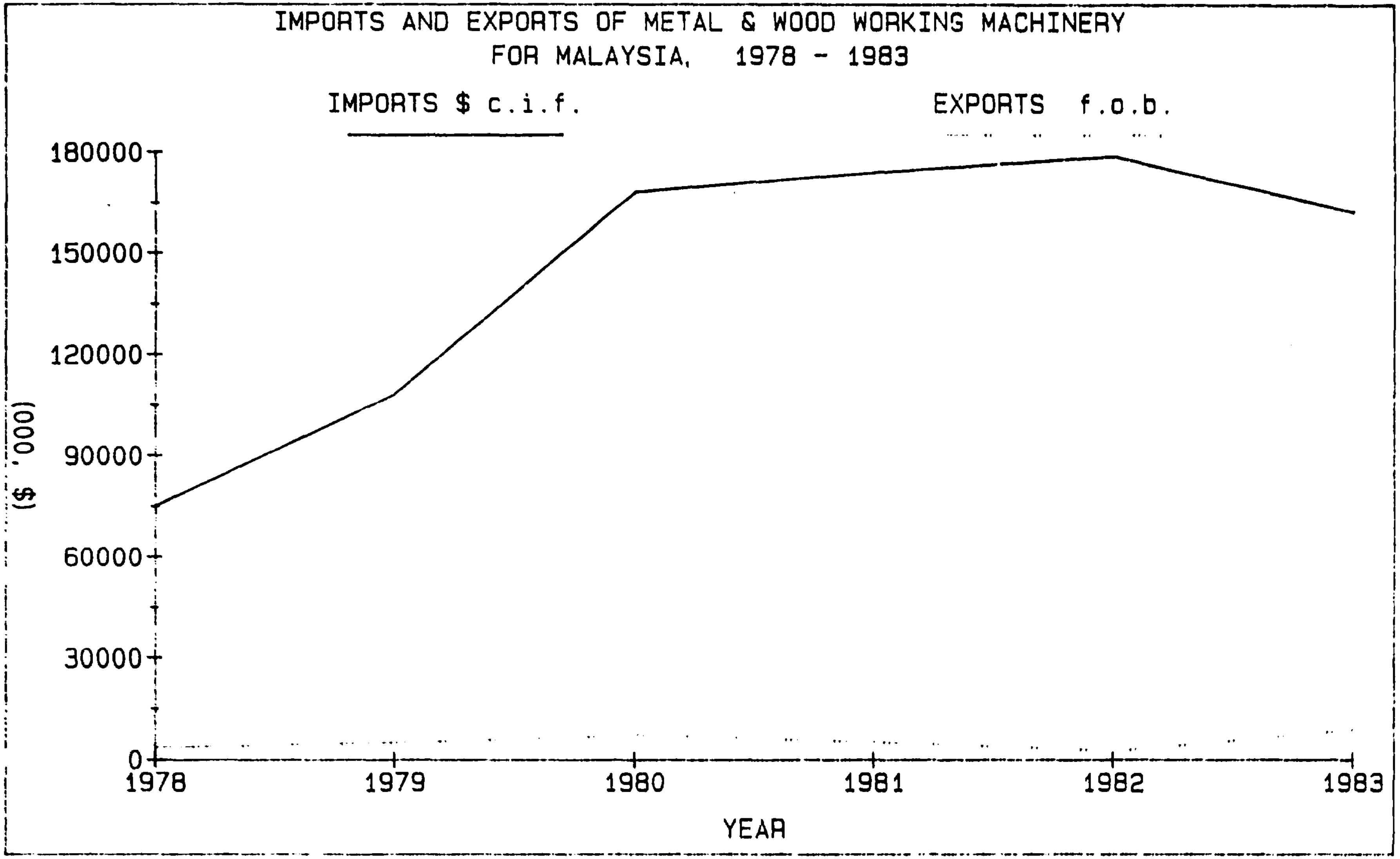
IMPORTS AND EXPORTS OF METAL AND WOOD WORKING MACHINERY FOR MALAYSIA, 1978 - 1983

| SITC CODE | 1978 | | 1979 | | 1980 | | 1981 | | 1982 | | 1983 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORT f.o.b |
| 736-700-00 | 4,805,032 | 173,925 | 12,473,782 | 382,846 | 23,083,270 | 365,544 | 22,069,989 | 303,965 | 29,894,379 | 158,989 | 30,040,362 | 1,746,9 |
| 736-900-00 | 3,990,638 | 790,697 | 1,064,796 | 942,848 | 11,643,634 | 530,280 | 16,141,131 | 353,345 | 16,089,723 | 69,949 | 14,669,279 | 1,040,6 |
| 736-220-00 | 1,983,872 | 41,315 | 4,221,102 | 546,208 | 5,184,730 | 218,152 | 10,727,819 | 201,498 | 9,638,592 | 23,604 | 13,080,929 | 791,6 |
| 736-130-00 | 5,927,871 | 9,229 | 8,397,042 | 57,255 | 16,379,848 | 178,925 | 14,193,766 | 173,476 | 13,895,852 | 35,117 | 15,858,183 | 468,8 |
| 736-190-00 | 4,459,534 | 13,353 | 7,740,308 | 86,911 | 10,945,724 | 119,249 | 11,221,574 | 383,918 | 14,920,084 | 62,871 | 11,847,143 | 413,8 |
| 736-280-00 | 3,489,234 | 41,377 | 8,385,252 | 74,561 | 11,356,547 | 367,645 | 16,731,884 | 452,137 | 1,079,861 | 39,144 | - | 262,6 |
| 736-230-00 | 1,627,133 | 8,524 | 3,191,921 | 7,152 | 4,011,485 | 20,347 | 8,891,512 | 25,650 | 10,467,290 | - | 11,269,401 | 244,2 |
| 736-140-00 | 1,902,967 | 3,430 | 2,310,066 | NIL | 3,791,490 | 4,000 | 3,502,371 | 51,890 | 3,809,551 | 1,150 | 5,612,321 | 171,6 |
| 736-150-00 | 2,086,335 | 16,021 | 4,017,711 | 57,465 | 5,160,614 | 32,142 | 5,766,608 | 229,275 | 5,136,545 | 383,686 | - | 132,6 |
| 736-180-00 | 215,302 | 800 | 1,497,559 | 31,495 | 1,231,764 | 6,535 | 2,301,071 | 38,950 | 1,663,825 | 40,088 | 1,806,074 | 45,0 |
| 736-160-00 | 1,026,098 | 24,998 | 2,486,550 | 6,256 | 2,740,132 | 51,603 | 2,917,184 | NIL | 2,999,973 | 101,580 | 4,011,502 | 53,2 |
| 736-120-00 | 159,009 | 96,252 | 240,683 | 13,358 | 910,751 | 77,313 | 877,897 | 236,913 | 776,047 | - | 1,146,304 | 36,2 |
| 736-170-00 | 188,435 | 2,100 | 530,832 | NIL | 109,874 | NIL | 495,122 | 2,000 | 466,340 | - | - | 4 |
| 737-311-00 | 578,152 | 7,760 | 615,749 | 13,030 | 2,069,128 | 25,641 | 1,838,695 | 41,415 | 1,752,548 | 30,097 | 1,475,535 | 254,2 |
| 737-800-00 | 1,633,704 | 43,977 | 1,044,986 | 50,297 | 2,553,119 | 264,209 | 2,142,212 | 34,513 | 1,079,861 | 23,568 | 1,041,362 | 23,8 |
| 737-319-00 | 1,274,885 | 4,974 | 1,157,337 | 9,784 | 1,383,542 | 59,478 | 1,278,391 | 15,226 | 1,329,230 | 60,082 | 1,139,666 | 322,5 |
| 728-120-00 | 33,648,376 | 1,445,136 | 41,626,190 | 1,847,159 | 54,730,019 | 3,710,529 | 44,486,196 | 1,708,362 | 56,424,809 | 1,016,353 | 43,689,245 | 2,308,0 |
| 728-190-00 | 5,767,527 | 720,872 | 7,135,600 | 844,207 | 10,943,613 | 1,108,290 | 8,434,851 | 836,496 | 7,343,144 | 433,671 | 5,527,674 | 591,0 |
| | 74,764,104 | 3,444,740 | 108,137,466 | 4,970,832 | 168,229,284 | 7,139,882 | 174,018,273 | 5,089,029 | 178,767,654 | 2,479,949 | 162,214,980 | 8,907,8 |

NOTE : REFER TO APPENDIX 3.1.1 FOR LEGEND
IMPORTS & EXPORTS DATA FOR 1983 IS FOR PENINSULAR MALAYSIA ONLY

SOURCE : DS. ASSET, v.y.

FIGURE 3.4.3




SOURCE: DERIVED FROM TABLE 3.4.8

increased 2.6 times from $3.4 million to $8.9 million in 1983. The net result was a continuous trade deficit which increased from $71.32 million in 1978 to $168.93 million in 1981 before decreasing to $153.3 million in 1982.

The major products imported included lathes, machine tools for working metal, machine tools for working metal operated by grinding wheels, abrasives or polishing products. Parts and accessories to machine tools constituted 5% of total imports for 1978 while machine tools for working wood, cork, etc. formed 45%. Over the period 1978 to 1983, shearing, punching or notching machines and gear-cutting machines had increased significantly while imports for woodworking machinery had declined to 27%. This trend is expected to continue. However, imports of quality machine tools, machinery and parts are expected to increase for the next 5 years.

The products exported included machine tools and parts but they are mainly re-exports. The major destinations are Singapore and Japan, and to a lesser extend Philippines and Germany. Malaysian Gauge and Tool Sdn Bhd exports hacksaws to the ASEAN countries.

While exports of metal and woodworking machinery are mainly re-exports, some locally produced woodworking machinery like bandsaws, surface planers wood lathes were exported to nearby ASEAN countries. Mah Cheok Pui, the leading manufacturer used to export surface planers, thicknessers and spindle moulding machines but has stopped since early 1980s because of the lack of marketing support overseas.

The lack of export marketing efforts is just one of the reasons for the poor export performance of the metalworking and woodworking machinery industry. Other reasons which have already been discussed on the trade performance of the other industries in the sector include the local prejudice against local products, price and quality uncompetitiveness.

The major sources of imports for metal and woodworking machinery are shown in Table 3.4.9. Japan dominated the period 1978-1981, exporting between 23% to 30% to Malaysia. Taiwan also exports a significant 10% to Malaysia while Germany has improved its position from 8.35% in 1978 to 9.94% in 1981.

TABLE 3.4.9

SOURCES OF IMPORTS OF METAL & WOODWORKING MACHINERY (SITC 736)
INTO MALAYSIA FOR 1978 - 1981

| COUNTRY OF ORIGIN | 1978 % | 1979 % | 1980 % | 1981 % |
|---|---|---|---|---|
| JAPAN | 23.06 | 30.79 | 25.58 | 30.20 |
| UNITED STATES | 5.83 | 5.38 | 6.11 | 6.28 |
| GERMANY | 8.35 | 7.95 | 10.32 | 9.94 |
| ITALY | 3.76 | 2.77 | 3.97 | 2.90 |
| TAIWAN | 11.94 | 15.83 | 13.09 | 10.18 |
| OTHERS | 47.06 | 37.28 | 40.93 | 40.50 |
| TOTAL | 100.00 | 100.00 | 100.00 | 100.00 |

SOURCE : D.S. [illegible]

## 3.5 Current Status of the Material Handling Machinery Industry

At present, most of the material handling machinery supply are dependent on foreign imports. Despite the fact that many firms have been granted manufacturing licenses (for example, Tractors Malaysia Sdn Bhd and United Motor Work ?n Bhd, the two largest machinery companies in ysia), their activities are predominantly machinery trading. This in part reflected the rapid growth of the imports of material handling machinery and equipment in recent years. For instance, the imports of material handling machinery had increased from $70 million in 1978 to $232 million in 1983. (Table 3.5.1) This represented more than 230% increase over the 5 years.

A detail analysis of the products suggests that the increase in the imports of material handling machinery had been accompanied by a huge increase in conveyors and elevators. Between 1978 and 1983, the imports of conveyors and elevators increased by an enormous 3.037%. In 1983, its imports took up a third of the total imports of material handling machinery. The other equally important imports were lifting, handling, loading or unloading machinery and parts. All of these machinery are utilised for the purpose of moving, shifting and transferring materials from one spot to another within a plant. Such activities are prevalent in the assembly industries of the country.

TABLE 3.5.1

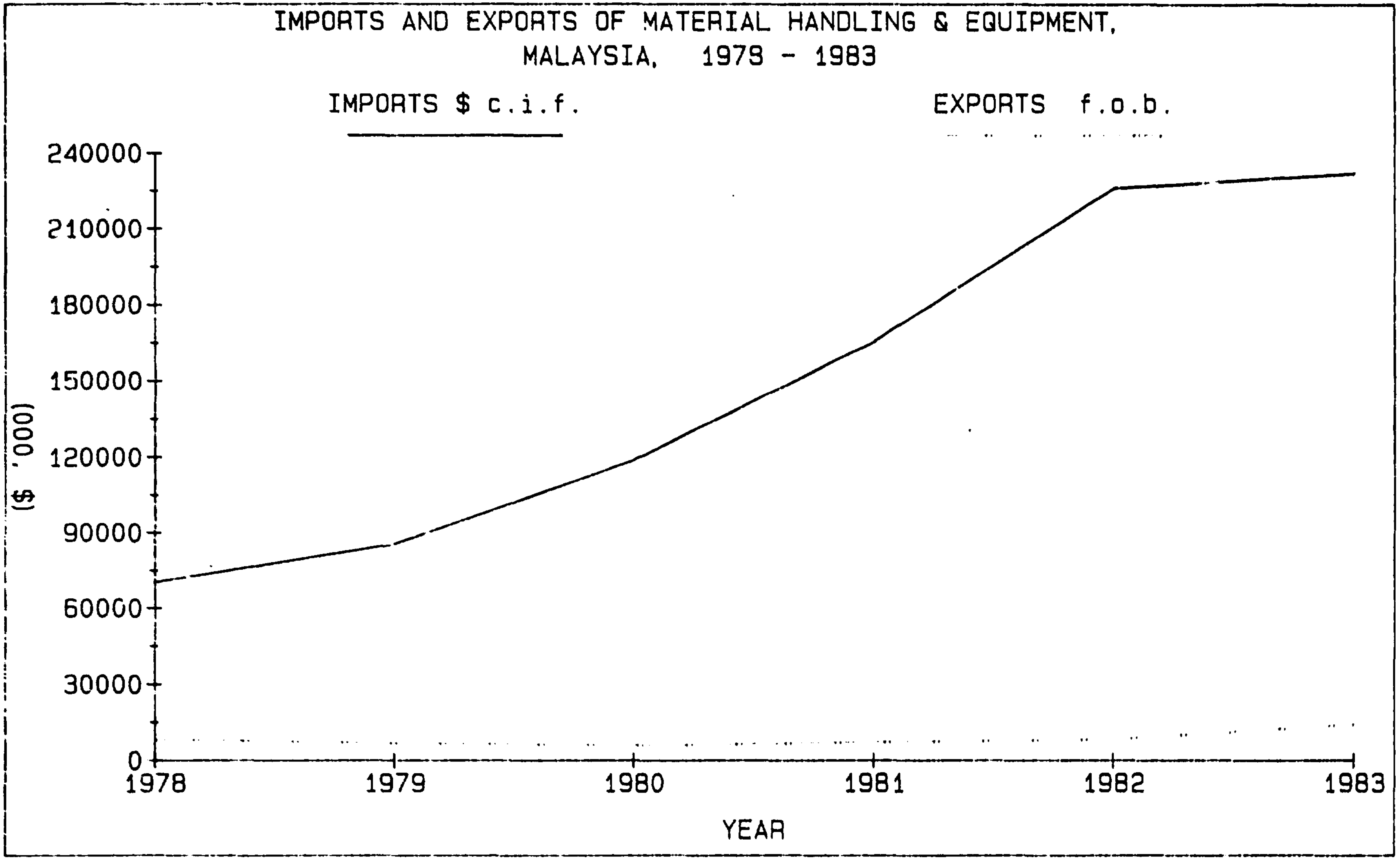
IMPORTS AND EXPORTS OF MATERIAL HANDLING MACHINERY & EQUIPMENT, MALAYSIA, 1978 - 1983

| SITC CODE | 1978 | | 1979 | | 1980 | | 1981 | | 1982 | | 1983 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. | IMPORTS $ c.i.f. | EXPORTS f.o.b. |
| 744-221-00 | 2,656,351 | 1,722,456 | 2,572,890 | 749,380 | 2,275,029 | 400,539 | 5,775,361 | 2,315,302 | 9,146,271 | 90,486 | 4,269,300 | 2,708,829 |
| 744-230-00 | 2,388,268 | 941,389 | 14,033,878 | 393,505 | 10,732,163 | 234,290 | 29,077,552 | 65,565 | 33,973,019 | 14,938 | 74,919,790 | 618,576 |
| 744-250-00 | 1,160,697 | NIL | 1,486,803 | NIL | 1,473,630 | NIL | 1,456,630 | NIL | 5,871,184 | NIL | 5,487,823 | 40,000 |
| 744-280-00 | 10,368,286 | 486,691 | 12,303,273 | 2,482,642 | 25,589,495 | 1,590,441 | 32,952,255 | 585,203 | 30,344,855 | 951,310 | 44,649,866 | 3,229,951 |
| 744-900-00 | 11,020,618 | 2,210,286 | 13,807,985 | 1,810,367 | 15,549,857 | 2,387,725 | 20,099,084 | 2,181,997 | 26,743,336 | 381,752 | 25,212,089 | 1,942,445 |
| 744-212-00 | 1,012,862 | 248,304 | 1,539,671 | 528,578 | 937,776 | 224,609 | 5,851,409 | 130,137 | 4,029,915 | 6,838 | 5,789,473 | 129,767 |
| 744-211-00 | 4,373,331 | 32,710 | 4,605,176 | 19,054 | 6,600,979 | 120,510 | 6,245,334 | 104,016 | 7,534,187 | 113,823 | 8,204,294 | 668,476 |
| 744-219-00 | 12,450,346 | 479,663 | 14,864,487 | 245,615 | 29,884,099 | 395,705 | 20,417,640 | 559,521 | 30,110,443 | 4,268,458 | 37,077,760 | 2,703,932 |
| 744-240-00 | 12,934,957 | 142,000 | 12,328,934 | 100,436 | 14,667,132 | 6,800 | 11,220,285 | 71,851 | 13,379,975 | 53,026 | 12,478,798 | 1,311,916 |
| 744-222-00 | 614 | NIL | 68,381 | NIL | 122,044 | NIL | 485,619 | NIL | 82,000 | NIL | 732,260 | NIL |
| 744-229-00 | 11,738,118 | 1,613,571 | 7,736,927 | 184,205 | 10,802,678 | 322,050 | 31,758,742 | 1,049,742 | 64,629,487 | 2,231,237 | 13,078,422 | 878,282 |
| | 70,104,448 | 7,877,070 | 85,348,405 | 6,513,782 | 118,714,882 | 5,682,669 | 165,339,911 | 7,063,334 | 225,844,672 | 8,111,868 | 231,899,875 | 14,232,174 |

NOTE : 1983 DATA IS FOR PENINSULAR MALAYSIA
SEE APPENDIX 3.1.1 FOR LEGEND

SOURCE : DS. ASSET, v.y.

FIGURE 3.5.1




SOURCE: DERIVED FROM TABLE 3.5.1

Table 3.5.2 shows the sources of imports for material handling equipment. Japan's domination in 1978 was eroded to 48% by 1981. This was fairly equally distributed among the other top importers. On the average, the bulk of imports is expected to remain high given the present trend towards mechanisation and industrialisation.

TABLE 3.5.2

SOURCES OF IMPORTS OF MATERIAL HANDLING MACHINERY (SITC 744)
INTO MALAYSIA FOR 1978 - 1981

| COUNTRY OF ORIGIN | 1978 % | 1979 % | 1980 % | 1981 % |
|---|---|---|---|---|
| JAPAN | 53.19 | 48.50 | 52.84 | 48.24 |
| UNITED STATES | 13.13 | 13.29 | 15.54 | 15.53 |
| GERMANY | 4.59 | 9.98 | 4.98 | 7.92 |
| ITALY | 4.56 | 2.80 | 3.23 | 2.60 |
| TAIWAN | 0.41 | 0.60 | 0.46 | 1.04 |
| OTHERS | 24.12 | 24.83 | 22.95 | 24.67 |
| TOTAL | 100.00 | 100.00 | 100.00 | 100.00 |

SOURCE : DEPARTMENT OF STATISTICS, V.Y.

## 3.6 Technology Trend of the Industry

### 3.6.1 Introduction

At present,the more advanced modern technology is concentrated in the developed countries. This rapid development of technology in the direction of greater sophistication and capital requirements has made the technological gap between the industrialised and industrialising countries seemingly more unbridgeable.

Rapid changes in technological development have widened the technological gap between advanced and developing countries. Some late-developer countries, like Germany, Japan and Russia, however adopt and adapt the technology that had been developed by the countries which had preceded them in development. But for developing countries, like Malaysia, the process of technology acquisition is still being developed.

However, not all advanced technology is suitable for adoption in Malaysia. The technology of the industrialised countries is oriented towards their conditions, problems and factor endowments. Logically, technological development within the machinery sector in Malaysia should also be oriented to the local conditions, problems and factor endowments. However, given the high capital and skilled labour intensiveness of the machinery sector, a different perspective of the technology development within this sector have to be adopted. This section attempts to look into these related issues by examining the current technology level, the technological choice, promotional policies and the problems of technological development found in the Machinery Sector in Malaysia.

### 3.6.2 The Current Technology Level in the Machinery Sector

The machine building process can be divided into 3 main phases.

Phase I : Importation of machinery from more advanced countries

Phase II : Organisation of maintenance and repair of the machinery

Phase III : Organisation and development of the country's production of machinery for its own use and requirements.

In Malaysia, the activities of the machinery sector is centered around phase II. In recent years, the industry has gone into domestic production; basically assembling works with some local manufacturing component parts. For more sophisticated machinery, the demand is met by imported CBU products via local agents. Hence, despite the fact that there are many firms with machinery manufacturing licenses, there is limited manufacturing activity.

Overall, the machinery sector caters to the needs of mainly the resource-based sector like the construction, oil palm and rubber, quarrying and mining sectors and is only marginally related to the manufacturing sector.

### 3.6.3 The Product and Component Tree

The machinery products are very diverse and have wide applications. Moreover, the industrial capability of manufacturing the machinery varies from one machinery to another. Generally, most of the sophisticated machinery are imported CBUs, true of particularly sophisticated machinery. There are some attempts to manufacture the simpler component parts locally. Overall, the assembly of machinery is the predominant activity.

The final output of the machinery sector covers a wide range of products. They can be classified generally into engines and turbines, agricultural machinery and equipment, metal and wood working machinery, and other machinery and equipment not elsewhere classified. Details of the output are presented in Appendix 1.2.1.

### 3.6.4 Engines and Turbines

At present, there is very limited manufacturing of engines and turbines. The production capability in Malaysia is still undeveloped. Although the manufacturing of small engines for electricity generation exists, it is beyond the scope of the present study. However, most of the activities of the manufacturing of engines and turbines (MIC 38210) are limited to assembling works. However, Syarikat Lee Industries Sdn Bhd is the only exception. It manufactures and markets products such as air-cooled diesel engines, concrete mixers and water pumps. The company manufactures a substantial part of the end product. Figure 3.6.1 shows the component tree of an air-cooled engine.

Most of its mild steel and cast iron are locally supplied; the former takes up 30 to 74% of the total material costs while the latter 26 to 39%. The engine parts, which account for 30% of the total material costs, are mostly imported. They come from Taiwan and England.

### 3.6.5 Agricultural Machinery and Equipment

The production process for agricultural machinery is confined to assembly operation where imported CKDs and SKDs are assembled. However, some attempts have been made by several companies to manufacture component parts. Figures 3.6.2 and 3.6.3 illustrate the example of the component tree of agricultural machinery. In the case of the Rotavator, about 30% of the parts are imported while the rest of them are either manufactured or purchased locally. As for the bulldozer, only a mere 14% of the parts are produced locally. However, given appropriate policy incentives there can be another 50% of the parts with potential to be produced locally. Presently, the required raw materials such as steel plates, steel sheets, tubes steel and steel are imported from Japan. Some of them come from Taiwan.

FIGURE 3.6.1

COMPONENT TREE OF AN AIR COOLED DIESEL ENGINE

- **AIR COOLED DIESEL ENGINE**
  - Cyclinder Block-Crankcase-Flywheel-Cooling System
  - Crankshaft-Piston-Connecting Rod System
  - Camshaft-Governor System
  - Govenor Parts-Cyclinder Head Valves System
  - Exhaust Oil-Fuel Injection System
  - Lubricating System
  - Fuel System
  - Air Intake-Exhaust Starter System

Source : Courtesy Of Syarikat Lee Industries Sendirian Berhad

FIGURE 3.6.1

COMPONENT TREE OF AN AIR COOLED DIESEL ENGINE

| | Component | Self Manufacturing | Local Supply | Imports |
|---|---|---|---|---|
| CYCLINDER BLOCK CRANKCASE FLYWHEEL COOLING SYSTEM | End Cover Oil Seal | | | x |
| | End Cover Set Screw | | x | |
| | End Cover Copper Washer | | | x |
| | End Cover Oil Thrower | | x | |
| | End Cover | x | | |
| | End Cover Joint | | x | |
| | End Cover Bush | | | x |
| | End Cover Dowel | x | | |
| | Camshaft Bush - Gear End | | | x |
| | Valve Body Dowel | x | | |
| | Crankcase | x | | |
| | Crankcase Door Joint | | x | |
| | Crankcase Door | | | x |
| | Oil Gallery Plug | | x | |
| | Crankcase Door Washer | | x | |
| | Crankcase Door Screw | | x | |
| | Camshaft Bush - Flywheel End | | | x |
| | Camshaft End Cover Rubber Ring | | x | |
| | Camshaft end Cover Joint | | x | |
| | Camshaft end Cover Clamping Washer | | x | |
| | Camshaft End Cover Screw | | x | |
| | Main Bearing Housing Shim | | x | |
| | Fan Set Screw | | x | |
| | Fan Spring Washer | | x | |
| | Fan Clamping Washer | x | | |
| | Nylon Fan | | x | |
| | Aluminium Fan | | | x |
| | Flywheel | x | | |
| | Flywheel Key | x | | |
| | Flywheel Retaining Lock | | x | |
| | Flywheel Retaining Screw | | x | |
| | Extension Shaft | | | x |
| | Extension Shaft Washer | | x | |
| | Extension Shaft Screw | | x | |
| | Fuel Pump Housing Door Set Screw | | x | |
| | Fuel Pump Housing Door Washer | | x | |
| | Fuel Pump Housing Door | | x | |
| | Fuel Pump Housing Door Joint | | x | |
| | Fuel Pump Housing | | x | |
| | Fuel Pump Housing Joint To Crankcase | | x | |
| | Fuel Pump Housing Plain Washer | | x | |
| | Fuel Pump Housing Set Screw | | x | |
| | Fuel Pump Housing Joint - Top Plate | | x | |
| | Cylinder Head Stud - Short | x | | |
| | - Long | x | | |
| | Cylinder Head Cover Stud | | x | |
| | Cylinder Block | x | | |
| | Cylinder Block Shim | | x | |
| | Cowling System | | x | |
| | Cowling Set Screw | | x | |
| | Cowling Nut | | x | |
| | Side Shield - Gear End | | x | |
| | Side Shield - Flywheel End | | x | |
| | Fan Shroud Clamping Washer | | x | |
| | Fan Shroud Set Screw | | x | |
| | Fan Shroud | | x | |
| | Dipstick Head | x | | |
| | Dipstick Sleeve | x | | |
| | Dipstick Rod | x | | |
| | Dipstick "O" Ring | | x | |
| | Dipstick Adaptor | x | | |

FIGURE 3.6.1(C'ont)

COMPONENT TREE OF AN AIR COOLED DIESEL ENGINE

| | | Self Manufacturing | Local Supply | Imports |
|---|---|---|---|---|
| CRANKSHAFT PISTON CONNECTING ROD SYSTEM | Crankshaft Pinion Gear | x | | |
| | Main Bearing | | | x |
| | Thrust Washer | | | x |
| | Crankshaft Pinion Key | x | | |
| | Crankshaft | | | x |
| | Balancing Weight | | | x |
| | Balancing Weight Screw | | x | |
| | Crankshaft Lock Screw | | x | |
| | Main Bearing Housing | x | | |
| | Main Bearing Housing Disc Washer | | x | |
| | Main Bearing Housing Screw | | x | |
| | Oil Thrower | | x | |
| | Oil Seal | | x | |
| | Piston Ring Set | | | x |
| | Piston Set | | | x |
| | Connecting Rod | | | x |
| | Connecting Rod Bush | | | x |
| | Connecting Rod Screw | | x | |
| | Connecting Rod Nut | | x | |
| | Connecting Rod Bearing | | | x |

FIGURE 3.6.1(C'ont)

COMPONENT TREE OF AN AIR COOLED DIESEL ENGINE

| | | Self Manufacturing | Local Supply | Imports |
|---|---|---|---|---|
| CAMSHAFT GOVERNOR SYSTEM | Fulcrum Level Washer | | | x |
| | Governor Level Fulcrum | x | | |
| | Fulcrum Level Nut | | x | |
| | Cotter Pin | x | x | |
| | Governor Link Washer | | | x |
| | Governor Lever Assy | x | | |
| | Governor Sleeve | x | | |
| | Governor Weight Screw | | x | |
| | Spring Washer | | x | |
| | Governor Weight Carrier | x | | |
| | Governor Weight Pin - Short | x | | |
| | Long | | x | |
| | Governor Weight Spring | | x | |
| | Governor Weight | | x | |
| | Governor Weight Pin Lock Washer | | x | |
| | Camshaft Gear Lock Pin | | x | |
| | Camshaft Shaft | | | x |
| | Camshaft Key | x | | |
| | Camshaft Gear | x | | |

FIGURE 3.6.1(C'ont)

COMPONENT TREE OF AN AIR COOLED DIESEL ENGINE

OVERHAUL PARTS CYCLINDER HEAD VALVES SYSTEM

| | Self Manufacturing | Local Supply | Imports |
|---|---|---|---|
| Valvet Tappet | | | x |
| Fuel Pump Tappet Assy | | | x |
| Fuel Pump Tappet Cap | x | | |
| Guide Locating Pin | | x | |
| Guide Locating Pin Washer | | x | |
| Fuel Pump Tappet Guide | x | | |
| Fuel Pump Shim | | x | |
| Fuel Pump Clamp | | | x |
| Clamp Washer | x | | |
| Clamp Spring Washer | | x | |
| Clamp Screw | | x | |
| Swivel Union Plug | x | | |
| Dowty Washer | | x | |
| Fuel Pump Assy | | x | |
| Fuel Pump Plunger | | x | |
| Nut For Adjusting Screw | | x | |
| Governor Adjusting Lever | | x | |
| Screw | | x | |
| Governor Speeder Spring | | x | |
| Cotter Pin | | x | |
| Governor Link Washer | | x | |
| Governor Link | x | | |
| Nut For Control Lever | | x | |
| Control Lever Spring Washer | | x | |
| Control Lever Piece | x | | |
| Control Lever Spring | | x | |
| Control Lever Rubber Ring | | x | |
| Locating Plate | x | | |
| Locating Plate Plain Washer | | x | |
| - Spring Washer | | x | |
| - Set Screw | | x | |
| Control Lever Spindle | | | x |
| Control Lever Flat Bar | | x | |
| -Flat Bar Washer | | x | |
| Control Lever Screw | | x | |
| Delivery Valve Seat | | | x |
| Cyclinder Head | x | | |
| Inlet Valve Guide | | | x |
| Oil Seal Ring For Valve | | | |
| Guide | | x | |
| Oil Seal Retaining Plate | | x | |
| Exhaust Valve Guide | | | x |
| Valve Spring | | | x |
| Valve Spring Carrier | | | x |
| Valve Cotters | | | x |
| Breather Assy | x | | |
| Cyclinder Head Gasket | | x | |
| Cyclinder Head Shim | | x | |
| Inlet Exhaust Valve | | | x |
| Inlet Valve | | | x |
| Exhaust Valve | | | x |
| Cyclinder Head Top Plate | x | | |
| Valve Push Rod | | | x |
| Fuel Pipe - Pump To Injector | x | | |
| Fuel Pipe Nut | x | | |
| Fuel Injector Assy | | | x |
| Oil Seal Ring for Injector | | x | |
| Fuel Injector Nozzle | | | x |
| Joint For Injector Sleeve | | x | |
| Fuel Injector Clamp | | | x |
| Fuel Pipe Head Nut | x | | |
| Fuel Leak Off Pipe | x | | |
| Leak Off Pipe Bush | | x | |

FIGURE 3.6.1(C'ont)

COMPONENT TREE OF AN AIR COOLED DIESEL ENGINE

| | | Self Manufacturing | Local Supply | Imports |
|---|---|---|---|---|
| EXHAUST OIL FUEL INJECTION SYSTEM | Inlet Valve Rocker Lever Bracket | x | | |
| | Valve Rocker Lever Bracket Circlip | | x | |
| | Valve Rocker Lever Bush | | | x |
| | Valve Rocker Lever | | | x |
| | Valve Rocker Lever Adjusting Screw | | x | |
| | Nut for Adjusting Screw | | x | |
| | Washer For Cylinder Head | | x | |
| | Nut for Cylinder Head Stud | | x | |
| | Fuel Injector Clamp Stud | | x | |
| | Nut for Clamp Stud | | x | |
| | Valve Rocker Lever Bracket Set Screw | | x | |
| | Spring Washer | | x | |
| | Exhaust Valve Rocker Lever Bracket | x | | |
| | Joint For Rocker Lever Bracket | | x | |
| | Joint For Cylinder Head Cover | | x | |
| | Cylinder Head Cover | | | x |
| | Decompressor Stud | | x | |
| | Decompressor Shaft Spring | | x | |
| | Decompressor Mills Pin | | x | |
| | Decompressor Stud Nut | | x | |
| | Decompressor Lever | | | x |
| | Oil Filler | | | x |
| | Joint For filler Cap | | x | |
| | Oil Filler Cap | | x | |
| | Fibre Washer For Cover | | x | |
| | Lifting Eye | x | | |
| | Plain Washer | | x | |
| | Spring Washer | | x | |
| | Nut For Cover | | x | |

FIGURE 3.6.1(C'ont)

COMPONENT TREE OF AN AIR COOLED DIESEL ENGINE

| | | Self Manufacturing | Local Supply | Imports |
|---|---|---|---|---|
| LUBRICATING SYSTEM | Lubricating Oil | | | |
| | Strainer | x | | |
| | Strainer End Cap | x | | |
| | End Cap Retaining Spring | | x | |
| | Cotter Pin | | x | |
| | Strainer Retaining Pin | x | | |
| | Oil Relief Valve Assy | x | | |
| | Lubricating Oil Pipe | x | | |
| | Support For Valve Body | x | | |
| | Gland Nut Packing Washer | | x | |
| | Feed Pipe Nut | | x | |
| | Lubricating Oil Pipe Bush | | x | |
| | Lubricating Oil Pipe | | | |
| | - Pump to TEE | x | | |
| | - TEE to Rocker | x | | |
| | Oil Pump Tappet | x | | |
| | "O" Ring For Tappet | | x | |
| | Circlip For Oil Pump Return Spring | | x | |
| | Washer For Return Spring | | x | |
| | Oil Pump Return Spring | | x | |
| | Oil Pump Assy | x | | |
| | "O" Ring For Suction Valve | | x | |
| | Lubricating Oil Drain Copper | | x | |
| | Copper Washer | | | |
| | Lubricating Pipe Joint | | x | |
| | Lubricating Oil Pipe | | | |

FIGURE 3.6.1(C'ont)

COMPONENT TREE OF AN AIR COOLED DIESEL ENGINE

| | | Self Manufacturing | Local Supply | Imports |
|---|---|---|---|---|
| FUEL SYSTEM | Fuel Filter Bracket Screw | | x | |
| | Fuel Filter Bracket | x | | |
| | Spring Washer | | x | |
| | Fuel filter Bracket Nut | | x | |
| | - Bracket Screw | | x | |
| | Plain Washer | | x | |
| | Spring Washer | | x | |
| | Fuel filter Bracket Nut | | x | |
| | Fuel Pipe Joint - Filter Cap | | x | |
| | Fuel Pipe Joint - Fuel Pump | | x | |
| | Fuel Pipe - Filter to Pump | x | | |
| | Bush for Fuel Pipe | | x | |
| | Pipe Connector | | x | |
| | Fuel Pipe Nut - Tank To Filter | | x | |
| | Fuel Pipe Plug Joint - Tank to Filter | | x | |
| | Fuel Pipe - Tank To Filter | x | | |
| | Swivel Union Plug | x | | |
| | Joint Washer For Swivel | | x | |
| | Filter Cap | | | x |
| | Filter Cap "0" Ring | | x | |
| | Filter Element Rubber Joint | | x | |
| | Filter Element | | x | |
| | Filter Rubber Joint | | x | |
| | Filter Washer | | x | |
| | Filter Spring | | x | |
| | Filter Rivet Screw | x | | |
| | Fuel Tank Block | | | x |
| | Fuel Tank | | | x |
| | Fuel Tank Strap Assy | | | x |
| | Fuel Tank bracket | | | x |
| | Fuel Tank Bracket Screw | | x | |
| | Fuel Tank Bracket Washer | | x | |
| | Fuel Tank Bracket Nut | | x | |
| | Extension Rubber Bush | | x | |
| | Fuel Leak Off Pipe | x | | |
| | Grommen for Lead Off Pipe | x | | |
| | Oil Filter | | | x |
| | Oil Filter Cap Joint | | x | |
| | Oil Filter Cap | | x | |
| | Spring Washer | | x | |
| | Fuel Tank Base Bolt | | x | |

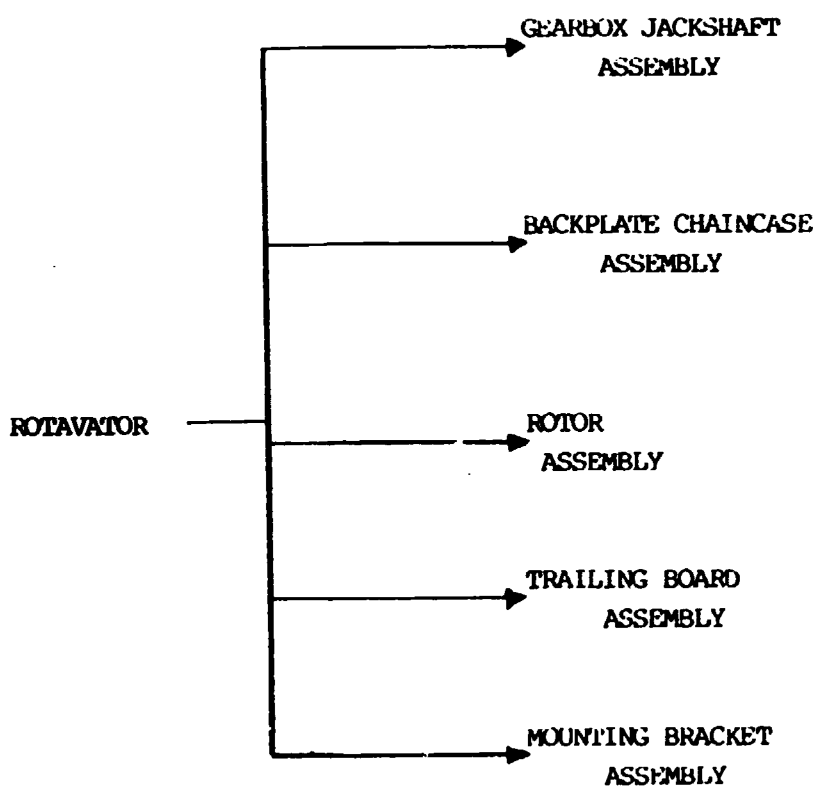
FIGURE 3.6.1(C'ont)

COMPONENT TREE OF AN AIR COOLED DIESEL ENGINE

| | | Self Manufacturing | Local Supply | Imports |
|---|---|---|---|---|
| AIR INTAKE EXHAUST STARTER SYSTEM | Air Cleaner Housing | | | x |
| | Air Cleaner Element | | x | |
| | Air Cleaner Adaptor Sleeve | | | x |
| | Air Cleaner Clip | | x | |
| | Inlet & Exhaust Manifold | x | | |
| | Manifold Set Screw | | x | |
| | Joint Manifold | | x | |
| | Exhaust Silencer Lock Nut | | x | |
| | Exhaust Silencer | x | | |
| | Starting Anchor Adaptor | | x | |
| | Starting Anchor Spring | x | | |
| | Starting Anchor Cotter Pin | | x | |
| | Starting Anchor High Impact Handle | | x | |
| | Starting Anchor Handle Shaft | x | | |
| | Gasket Set | | | x |
| | Hed Set | | | x |

FIGURE 3.6.2

COMPONENT TREE OF ROTAVATOR




SOURCE: COUPTESY OF HOWARD ALAT PERTANIAN SDN. BHD.

FIGURE 3.6.2

COMPONENET TREE OF ROTAVATOR (Con't)

| Assembly | Component | Parts Produced Locally | Parts Sub-Contracted or Purchased Locally | Parts Imported |
|---|---|---|---|---|
| GearBox Jackshaft Assembly | Gearbox Housing | | | x |
| | Pinion | | | x |
| | Input Shaft | | | x |
| | Bearing | | x | |
| | Spacer | | x | |
| | Circlip | | x | |
| | Oil Seal | | x | |
| | Nut Selflocking | | x | |
| | Crownwheel | | | x |
| | Bearing | | | x |
| | Oil Seal | | | x |
| | Spacer | | | x |
| | Jackshaft | | | x |
| | Gasket | | x | |
| | Jackshaft Housing | | | x |
| | Spring Washer | | x | |
| | Setscrew | | x | |
| | Gasket | | x | |
| | Bearing | | x | |
| | Sprocket | | | x |
| | Nut Selflocking | | x | |
| | Bearing | | x | |
| | Gasket | | x | |
| | Spring Washer | | x | |
| | Bolt | | x | |
| | Drain Plug | | | x |
| | Dipstick | | x | |
| | Washer Contact | | x | |
| | Setscrew | | x | |
| | Clutch Cover | | x | |
| | Shakeproof Washer | | | x |
| | Setscrew | | x | |

FIGURE 3.6.2

COMPONENET TREE OF ROTAVATOR (Con't)

| | | Parts Produced Locally | Parts Sub-Contracted or Purchased Locally | Parts Imported |
|---|---|---|---|---|
| **Backplate Chaincase Assembly** | Backplate | x | | |
| | Oil seal | | x | |
| | Bearing | | x | |
| | Circlip | | x | |
| | Sprocket | | | x |
| | Nut Selflocking | | x | |
| | Chain | | x | |
| | Chain Skid | x | | |
| | Split Pin | x | | |
| | Gasket | | x | |
| | Chaincase | | | x |
| | Setscrew | | x | |
| | Spring Washer | x | | |
| | Nut | x | | |
| | Adjusting Screw | x | | |
| | Level Plug | | x | |
| | Inspection Plug | | x | |
| | Sleeve | | | x |
| | O Ring | | x | |

FIGURE 3.6.2

COMPONENET TREE OF ROTAVATOR (Con't)

| | | Parts Produced Locally | Parts Sub-Contracted or Purchased Locally | Parts Imported |
|---|---|---|---|---|
| Rotor Assembly | Rotor Drive Shaft | | | x |
| | Rotor | x | | |
| | Spring Washer | | | x |
| | Setscrew | | | x |
| | O Ring | | x | |
| | Sleeve | | x | |
| | Protector | x | | |
| | Oil Seal | | x | |
| | Spacer | | | x |
| | Spacer Shim | | | x |
| | Stub Housing | x | | |
| | Setscrew | | | x |
| | Spring Washer | | x | |
| | Nut | | x | |
| | Bearing | | x | |
| | Nut selflocking | | x | |
| | Spacer | | | x |
| | O Ring | | | x |
| | End Cover | | x | |
| | Circlip | | x | |
| | Grease Nipple | | x | |
| | Weedcutter | | | x |
| | Backing Strip | | | x |
| | Spring Washer | | | x |
| | Setscrew | | | x |
| | Blade LH | | | x |
| | Blade RH | | | x |
| | Blade Bolt | | x | |
| | Spring Washer | | | x |
| | Nut | | | x |
| | Frame | x | | |

FIGURE 3.6.2

COMPONENET TREE OF ROTAVATOR (Con't)

| | | Parts Produced Locally | Parts Sub-Contracted or Purchased Locally | Parts Imported |
|---|---|---|---|---|
| Trailing Board Assembly | Trailing Board | x | | |
| | U Bolt | x | | |
| | Spring Washer | | x | |
| | Nyloc Nut | | x | |
| | Mounting Plate | x | | |
| | Plate | | | |
| | Setscrew | | x | |
| | Spring Washer | | x | |
| | Nut | | x | |
| | Adjusting Bracket | x | | |
| | Setscrew | | x | |
| | Nyloc Nut | | x | |
| | Pin | x | | |
| | Spring Clip | | x | |
| | Damper Spring | | | x |
| | Bolt | | x | |
| | Nyloc Nut | | x | |

FIGURE 3.6.2

COMPONENET TREE OF ROTAVATOR (Con't)

| | | Parts Produced Locally | Parts Sub-Contracted or Purchased Locally | Parts Imported |
|---|---|---|---|---|
| Mounting Bracket Assembly | Mounting Bracket | x | | |
| | U Bolt | x | | |
| | Spring Washer | | x | |
| | Nyloc Nut | | x | |
| | Strap | x | | |
| | Front Support | x | | |
| | Rear Support | x | | |
| | Setscrew | | x | |
| | Spring Washer | | x | |
| | Nyloc Nut | | x | |
| | Spacer | x | | |
| | Bolt | | x | |
| | Spring Washer | | x | |
| | Nyloc Nut | | x | |
| | Hitch Pin - Top | x | | |
| | Cotter Assembly | | x | |
| | Clevis Bracket | x | | |
| | Clamp Plate | x | | |
| | Spring Washer | | x | |
| | Nut | | | x |
| | Hitch Pin- Bottom | x | | |
| | Cotter Assembly | | x | |
| | Skid LH | x | | |
| | Skid RH | x | | |
| | Adjusting Bar | | | x |
| | Adjusting Stop | | | x |
| | Washer | x | | |
| | Setscrew | | x | |
| | Spring Washer | | x | |
| | Belleville Spring Washer | | x | |
| | Nyloc Nut | | x | |
| | Nut | | x | |

## FIGURE 3.6.3

## COMPONENT TREE OF BULLDOZER

dozer

| Assembly | Part | Parts being Produced Locally | Parts with Potential to be Produced Locally | Parts to be Imported |
|---|---|---|---|---|
| Engine Assembly | Engine | | | X |
| | Main Clutch & Pipe | | | X |
| | Tandem Pump | | | X |
| | Booster Lever | | | X |
| | Steering & Cooler Pipe | | | X |
| | Hydraulic Pump & Pipe | | | X |
| Steering Case | Steering Frame | | X | |
| | Steering Clutch | | | X |
| | Brake Assembly | | | X |
| | Valves | | | X |
| | Final Drive | | | X |
| | Transmission | | | X |
| | Underguard | | X | |
| Track Frame | Track Frame | | X | |
| | Roller Guards | | X | |
| | Recoil Spring | | | X |
| | Idler | | X | |
| | Track & Carrier Rollers | | X | |
| | Supports | | X | |
| Dashboard Frame | Panel Assembly | | X | |
| | Fuel Tank | | X | |
| | Levers | | X | |
| | Batteries | X | | |
| | Fender | | X | |
| | Frame | | X | |
| | Hydraulic Tank | | X | |
| | Pipings | | | X |
| Radiator Assembly | Radiator | | | X |
| | Radiator Guard | | X | |
| | Radiator Mask | | X | |
| | Radiator Cover | | X | |
| | Hoses | | X | |
| Working Attachments | Dozer Blade | X | | |
| | U-Frame | X | | |
| | Arm & Brace | X | | |
| | Canopy | X | | |

SOURCE: COURTESY OF UMW ENGINEERING SDN. BHD.

However, for the more sophisticated agricultural machinery such as tractors they are not even assembled, let alone manufactured in Malaysia. Their demand is generally met by the import of CBU products. This is a step behind that of Indonesia, where policies and incentives have been geared towards the assembly of tractors and manufacturing of engines.

### 3.6.6 Metal and Wood Working Machinery

In the case of wood and metal working machinery, the machine tools are generally satisfied by imports as well. The contribution made by the domestic metal-working machine tool industry is insignificant. On the other hand, there is relatively greater contribution from the wood working machinery manufacturers. There is relatively more manufacturing activity.

At present, most of the wood-working machinery parts can either be manufactured locally or acquired locally. The component tree of a wood working machinery is shown in Figure 3.6.4. All the component parts of the machinery can be obtained locally. While most of the parts are made locally, about $^{1}/_{5}$ of them is obtained from local traders who have previously imported them.

FIGURE 3.6.4

COMPONENT TREE OF SURFACE PLANER

AND JOINTER MACHINE

Surface Planer and Jointer Machine

| Component | Locally Made | Locally supply Imports |
|---|---|---|
| 1. Machine Frame | x | |
| 2. Bush Guard Lining | x | |
| 3. Bearing Cover | x | |
| 4. Working Table | x | |
| 5. Adjustable Table | x | |
| 6. Machine Steel, Screw Adaptor | x | |
| 7. Adjustable Guard Holder | x | |
| 8. Handle | x | |
| 9. Handle knob | x | |
| 10.Machine Steel key roller shaft | x | |
| 11.Machine steel cutter head | x | |
| 12.Shaft Guard | x | |
| 13.Working table adjuster | x | |
| 14.Machine steel handle | x | |
| 15.Working table adjuster guard | x | |
| 16.Mild steel plate | x | |
| 17.Mild steel polish shaft | x | |
| 18.Electric motor holder | x | |
| 19.Exit Saw-dust Plate | x | |
| 20.Belting Cover | x | |
| 21.Planer Blades | | x |
| 22.Bearing | | x |
| 23.Belting | | x |
| 24.Electric Motor | | x |
| 25.Machine Screws | | x |

SOURCE: COURTESY OF MAH CHEOK PUI FOUNDRY

### 3.6.7 Material Handling Machinery

There is practically no manufacturing of material handling machinery and equipment. The activities in this industry are mainly trading via a local agent. In the case of forklift trucks, their demand is basically met by CBU imports. However, there is potential for the manufacturing of simpler component parts locally. The component tree of a material handling machinery is illustrated in Figure 3.6.5.

In conclusion, the machinery sector in Malaysia is dependent on imports , be they as raw materials, component parts or manufacturing facilities. Moreover, local consumption of machinery is also mainly satisfied by imports. Statistics on input and imports in previous pages had highlighted this point. It is in this context the production capacity or production technology of the machinery sector is examined.

### 3.6.8 The Technology Tree

### 3.6.9 Production Process

The overall production process of the machinery sector in Malaysia may be summarised as follows.

Phase I : Importation and production of semi-finished and finished component. Metal sheets, plates and sections are imported or produced and are subsequently cut to required shapes and sizes, and machined.

FIGURE 3.6.5

COMPONENT TREE OF EXCAVATOR

| | Component | Item | Locally Made | Importers |
|---|---|---|---|---|
| EXCAVATOR | Operating Body | 1. Operator's Cabin | | x |
| | | 2. Operator's frame | | x |
| | | 3. Machinery and Machinery Components | | x |
| | | 4. Revolving frame | | x |
| | | 5. Counter Weight | | x |
| | Excavator Arm | 1. Arm | | x |
| | | 2. Link | | x |
| | | 3. Boom | | x |
| | | 4. Bucket | x | |
| | Wheels | 1. Carrier Roller | | x |
| | | 2. Sprocket | | x |
| | | 3. Bottom Roller | | x |
| | | 4. Front Idler | | x |
| | | 5. Track Frame | | x |
| | | 6. Track Shoes | | x |

Phase II: Assembling of the parts and components into machinery and equipment. The process includes fastening, welding, rivetting and bolting.

However, there is no distinct limit as to where the production process of the machinery firms commences. In other words, there is no production process uniformity. At one extreme,there are companies which are basically engaged in trading activity despite possessing the manufacturer licences while at the other end, are companies which attempt at greater degree of vertical integration.

To this extent, what may be an ancillary industry to one may not be so for another. Hence, it is more beneficial to study all the relevant industries and activities to the machinery sector.

Generally, despite the fact that the production activity of one firm differ from another, the activities that are relevent for subsequent discussion should include casting, forging, rolling, drawing, extrusion, sintering, pressing, electroplating, heat treatment and assembling works.

Machinery firms have one way or another incorporated these various activities, though in different combinations, in their production processes. Figure 3.6.6 shows an example of the manufacturing activity of a machinery company.

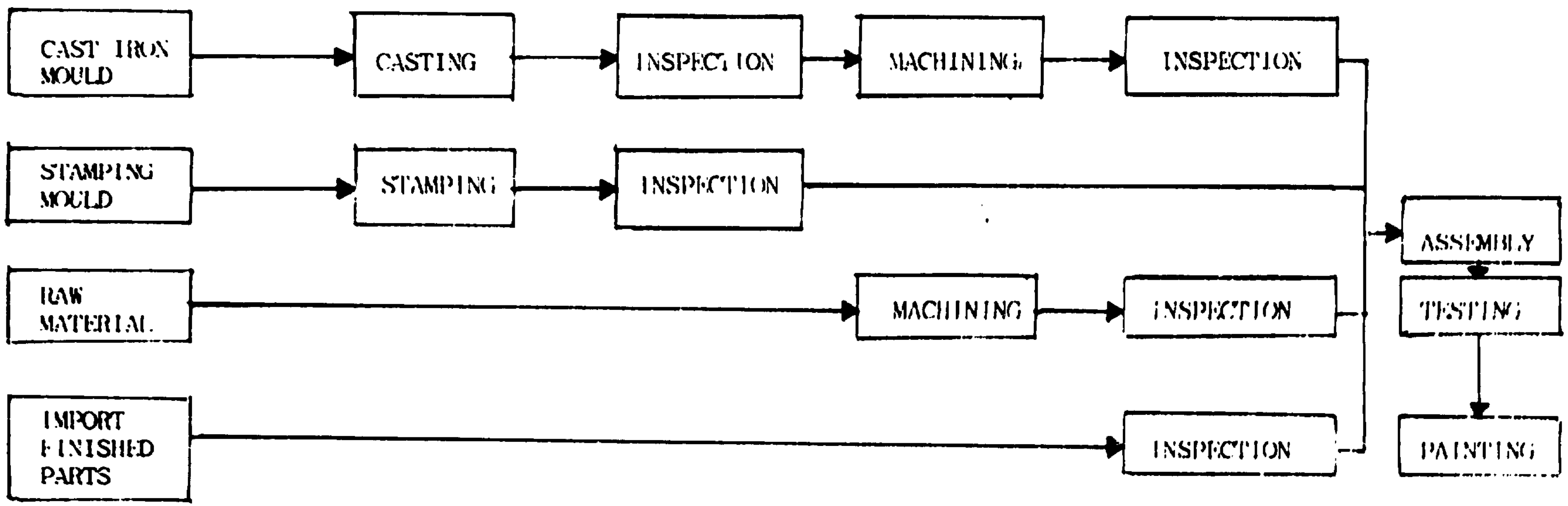
## 3.6.10 Production And Technological Infrastructure

At present, the technological infrastructure of the general machinery industry has two distinct characteristics. First, it is geared towards the provision of services and machinery to the resource based industries like rubber, oil palm, sawmill, tin mining, quarrying and construction sectors. It has only marginal links to the manufacturing and machinery sectors. From a MIDA sample study survey of ancillary and supporting firms, only about a quarter to a-half of the firms engaged in foundry, solid metal forming, sheet metal forming, metal cutting and surface treatment works respectively provide output and services to the machinery and engineering sector. Of exception is the joining or assembling activity which predominates the sector.

Secondly, machinery employed in the machinery sector is relatively older and less efficient when compared to the developed countries. There is a large market for used and reconditioned machinery. The manufacturing facilities are generally foreign and outdated. There are cases of machinery, made in the 1940s, being used in the manufacturing process. Nonetheless, there have been attempts by several firms to adopt more modern technology.

**FIGURE 3.6.6**

THE PRODUCTION PROCESS OF A MACHINERY COMPANY




Source : Lee Industries Sdn. Bhd.

The manufacturing or production of machinery relies heavily on ancillary or supporting firms for this intermediate inputs. Figure 3.6.7 shows the technological tree of the machinery industry. As can be observed in Table 3.6.1, the iron and steel products are the main input for the machinery sector. The bulk of these input is imported from abroad.

a) Conversion Plant

Before any production of iron or steel structural products can take place, the smelting of iron ores is necessary. A blast furnace is used to convert the ores to pig iron. In the process, the iron absorbs various amount of carbon, silicon, sulphur, phosphorus and manganese.

According to Chapman, the resultant molten iron can either be,

i) Casted in pig beds (sand moulds)

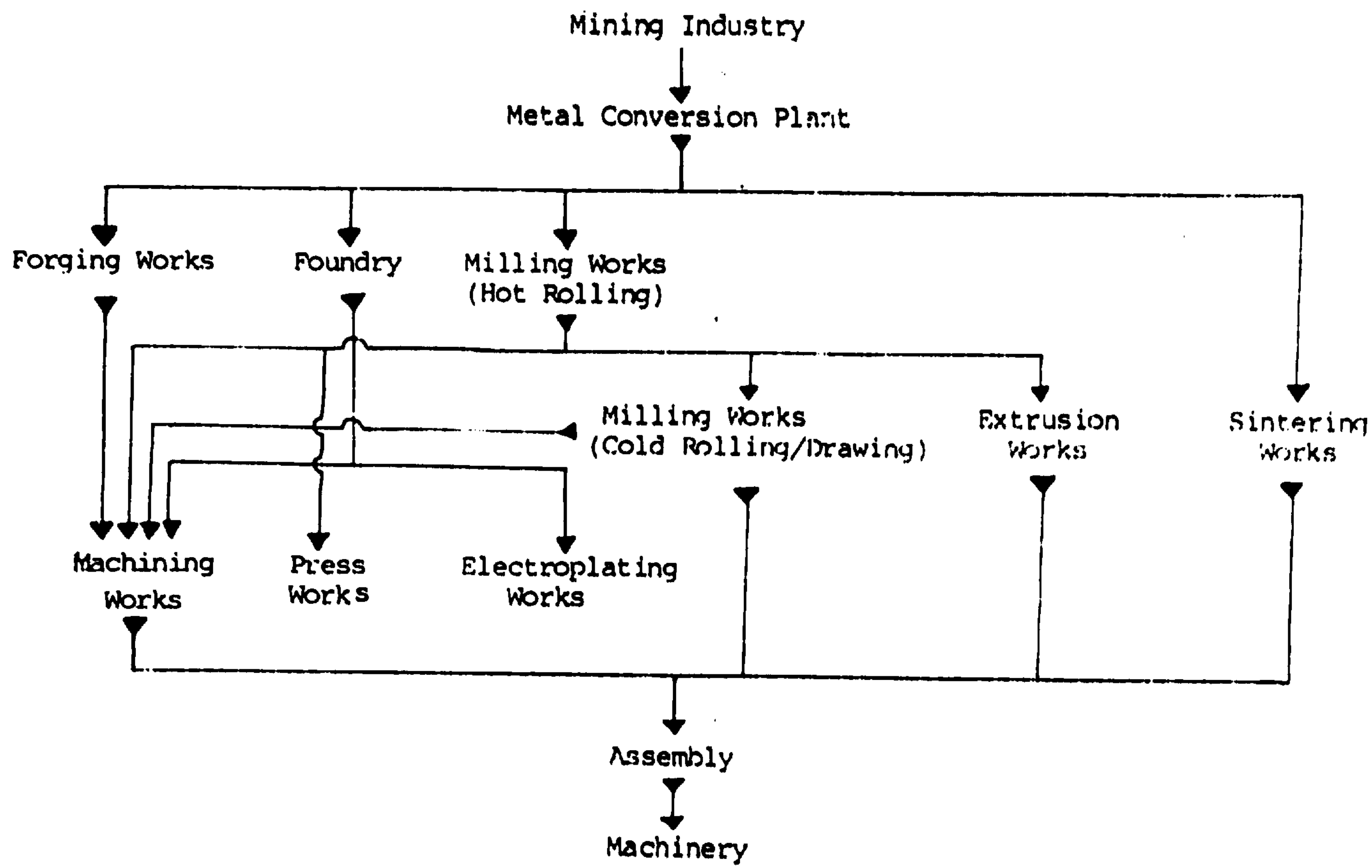
ii) Casted in pig-casting machines

iii) Transferred in hot mental ladles direct to an adjacent steel making process (this applies to composite iron and steel plants.

However, the pig iron is too crude a raw material for industrial usage. It has to be refined. Figure 3.6.8 shows the conversion process of pig iron to other forms of refined

FIGURE 3.6.7

TECHNOLOGY TREE OF THE MACHINERY INDUSTRY




SOURCE: ADAPTED FROM MISIF'S SUBMISSION ON THE INDUSTRIAL MASTERPLAN REPORT, 1984

TABLE 3.6.1

RAW MATERIALS USED IN THE MACHINERY SECTOR

| DESCRIPTION | COUNTRY OF ORIGIN |
|---|---|
| 1. Steel | i) Japan<br>ii) Malaysian Suppliers<br>iii) Korea, Australia |
| 2. Grey Cast Iron | Not Available |
| 3. Stainless Steel | i) Japan<br>ii) Australia, Singapore, Taiwan |
| 4. Aluminium | i) United States Of America<br>ii) Ghana |
| 5. Brass | Not Available |
| 6. Pig Iron | i) China<br>ii) Malaysia, Singapore |
| 7. Mild Steel | i) Japan<br>ii) Sweden |
| 8. Copper Rod | i) Australia<br>ii) Japan<br>iii) Taiwan |
| 9. Bronze | Not Available |
| 10. Cast Iron | Not Available |
| 11. Copper | Not Available |
| 12. Electro Galvanised Mild Steel Sheets | i) Japan<br>ii) Korea |
| 13. Steel Sheets | i) Japan<br>ii) Malaysia |
| 14. Foundry Coke | i) Malaysia<br>ii) Japan |

TABLE 3.6.1

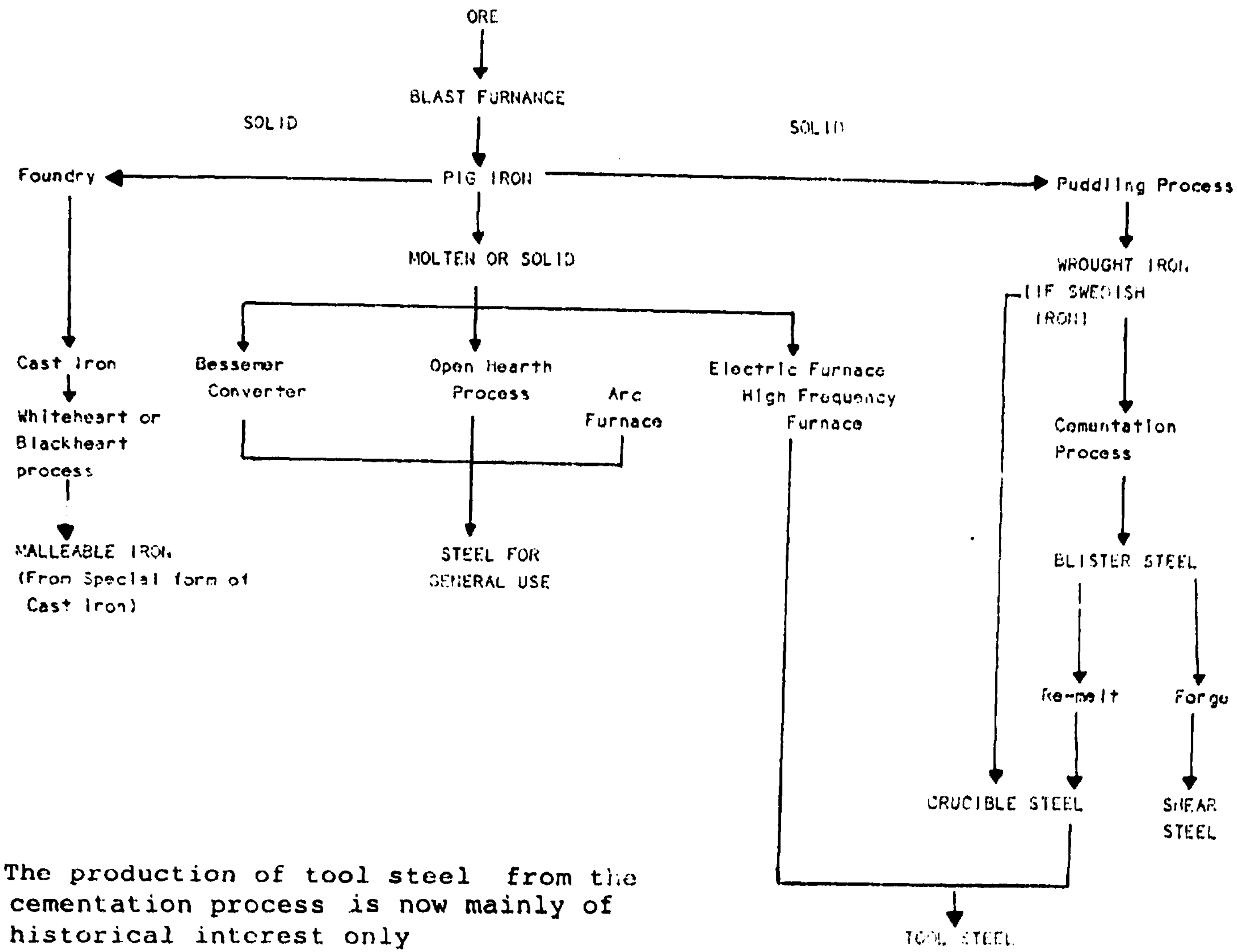
RAW MATERIALS USED IN THE MACHINERY SECTOR (Cont)

| DESCRIPTION | COUNTRY OF ORIGIN |
|---|---|
| 15. Aluminium Ingot | i) Canada<br>ii) USA<br>iii) UK |
| 16. Aluminium Sheets | i) Japan |
| 17. Zinc | i) Not Available |
| 18. Zinc Ingot | i) Australia |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

FIGURE 3.6.8

CONVERSION PROCESS OF PIG IRON




Note: The production of tool steel from the cementation process is now mainly of historical interest only

SOURCE: CHAPMAN, W.A.J., WORKSHOP TECHNOLOGY, PART ONE material. The application of these various materials to the engineering and machinery sector is illustrated in Tables 3.6.2, 3.6.3, 3.6.4, 3.6.5 and 3.6.6.

The smelting capacity of iron have existed in Malaysia a couple of decades ago. It has its origin in the discovery of iron deposits in Bukit Besi and coal in Batu Arang. However, due to the subsequent depletion of the resources in these areas the smelting activity died with it. The present smelting works are being carried out by Malayawata Steel Sendirian Berhad, and the on-going HICOM projects.

The former, which is a joint venture between Japanese and Malaysian capital, has an integrated mill whose capacity is relatively small by International Standard. It uses charcoal, rather than coal, for the blast furnace. HICOM has planned to produce pig iron, hot metal, sponge iron and steel ingots.

b) Foundry Works or Castings

In the machinery sector, the casting of metal into indicated shapes is important. In terms of materials received for working, castings are the next most common material after bars and sheets. As such, the foundry and pattern shop provide important supplementary activity within the machinery sector.

TABLE 3.6.2

RAW MATERAILS OF THE MACHINERY INDUSTRY

| MATERIAL | CONSTITUENT | | | | | | PROPERTIES | APPLICATIONS |
|---|---|---|---|---|---|---|---|---|
| A. PIG IRON | IRON ABSORBS VARYING AMOUNTS OF CARBON, SILICON, SULPHUR, PHOSPHORUS AND MANGANESE IN THE SMELTING PROCESS OF BLAST FURNACE | | | | | | a) CRUDE RAW MATERIAL<br>b) NOT SUITABLE FOR MAKING CASTINGS WITHOUT SOME DEGREE OF REFINING | a) TO BE CONVERTED INTO OTHER TYPES OF METAL<br>b) RAW MATERIAL FOR FURNACE |
| | IRON % | CARBON % | SILICON % | SULPHUR % | PHOSPHORUS % | MANGANESE % | | |
| 1) NO.1 IRON | 92 | 3.7 | 2.8 | 0.05 | 0.8 | 0.65 | | |
| 2) NO.3 IRON | 92.5 | 3.5 | 2.5 | 0.05 | 0.75 | 0.7 | | |
| 3) WHITE IRON | 94.2 | 3.1 | 1.0 | 0.3 | 0.9 | 0.5 | | |

SOURCE: CHAPMAN, W.A.J. (1967), WORKSHOP TECHNOLOGY, PART ONE

## TABLE 3.6.3

### RAW MATERAILS OF THE MACHINERY INDUSTRY

| MATERIAL | CONSTITUENT | | | | | | PROPERTIES | APPLICATIONS |
|---|---|---|---|---|---|---|---|---|
| B. GREY CAST IRON | SMALLER AMOUNTS OF CARBON, SILICON, PHOSPHORUS, SULPHUR AND MANGANESE | | | | | | a) CHEAP<br>b) EASILY MACHINED<br>c) USED WIDELY FOR MAKING CASTINGS OF PARTS HAVING INTRICATE SHAPES BECAUSE OF ITS FLUIDITY WHEN IN MOLTEN CONDITION<br>d) BRITTLE AND WEAK IN TENSION<br>e) HARDWEAVING AGAINST KNOCKS OR OTHER DAMAGES | a) BEDS OF MACHINERY<br>b) SLIDES OF MACHINERY<br>c) BASES OF MACHINERY<br>d) BODIES OF ELECTRICAL MACHINES<br>e) CYLINDERS OF ENGINES<br>f) BEDS OF ENGINES<br>g) LIGHT SECTION OF MACHINERY<br>h) SWITCH BOXES |
| | IRON % | CARBON % | SILICON % | SULPHUR % | PHOSPHORUS % | MANGANESE % | | |
| CAST IRON FOR ; | | | | | | | | |
| 1) LIGHT SECTION MACHINERY | 93.65 | 3.2 | 2.2 | 0.1 | 0.35 | 0.5 | | |
| 2) HYDRAULIC CYLINDER | 94.45 | 3.2 | 0.9 | 0.1 | 0.35 | 1 | | |
| 3) LORRY CYLINDER | 93.46 | 3.3 | 2.1 | 0.09 | 0.15 | 0.9 | | |
| 4) SWITCH BOXES | 91.6 | 3.5 | 2.8 | 0.1 | 1.2 | 0.8 | | |

SOURCE: CHAPMAN, W.A.J. (1967), WORKSHOP TECHNOLOGY, PART ONE

TABLE 3.6.4

RAW MATERAILS OF THE MACHINERY INDUSTRY

| MATERIAL | CONSTITUFNT | PROPERTIES | APPLICATIONS |
|---|---|---|---|
| C. ALLOY CAST IRONS | | a) SIMILAR CASTING ADVANTAGE OF ORDINARY CAST IRON<br>b) SUITABLE FOR SPECIAL PURPOSES | |
| 1) ACICULAR IRON | HAS NICKEL AND MOLYBDENUM IN ITS COMPOSITION | | a) CAST CRANKSHAFTS |
| 2) SPHEROIDAL IRON | GRAPHITE CONTENT IS CONVERTED FROM A FLAKY TO A SPHEROIDAL FORM BY THE ALLOYING OF A SMALL AMOUNT MAGNESIUM OR CERIUM | a) HIGH TENSILE STRENGTH<br>b) A TOUGH METAL WHICH CAN BE TWISTED AND BENT | a) PARTS WHICH REQUIRES A TOUGH METAL WHICH CAN BE TWISTED OR BENT |

SOURCE: CHAPMAN, W.A.J. (1967), WORKSHOP TECHNOLOGY, PART ONE

TABLE 3.6.5

RAW MATERAILS OF THE MACHINERY INDUSTRY

| MATERIAL | CONSTITUENT | PROPERTIES | APPLICATIONS |
|---|---|---|---|
| D. WROUGHT IRON | WROUGH IRON IS THE NEAREST APPROACH TO PURE IRON. CHEMICAL ANALYSIS OF THE METAL SHOW AS MUCH AS 99% OF IRON. | a) EASILY FORGED<br>b) ABLE TO WITHSTAND BEING DOUBLED UPON ITSELF WITHOUT THE OTHER SIDE CRACKING AT THE BEND<br>c) DUCTILE<br>d) ABLE TO WITHSTAND SUDDEN AND EXCESSIVE SHOCK LOADS WITHOUT PERMANENT INJURY | a) CHAINS<br>b) CRANE HOOKS<br>c) RAILWAY COUPLINGS |

| IRON % | CARBON % | SILICON % | SULPHUR % | PHOS-PHORUS % | MAN-GANESE % | SLAG % |
|---|---|---|---|---|---|---|
| 98.6 TO 99.53 | 0.02 | 0.12 | 0.018 | 0.22 | 0.02 | 0.07 TO 1.0 |

SOURCE: CHAPMAN, W.A.J. (1967), WORKSHOP TECHNOLOGY, PART ONE

## TABLE 3.6.6

RAW MATERIALS OF THE MACHINERY INDUSTRY

| MATERIAL | CONSTITUENTS | PROPERTIES | APPLICATIONS |
|---|---|---|---|
| E. STEEL | STEEL IS FUNDAMENTALLY AN ALLOY OF IRON AND CARBON, WITH THE CARBON CONTENT VARYING UP TO 1.5%, WHILE CAST IRON IS AN ALLOY OF THESE TWO ELEMENTS WITH THE CARBON CONTENT RANGING FROM ABOUT 2% TO 4.5% | a) STRONG<br>b) CAN BE HARDENED<br>c) ABLE TO WITHSTAND TENSION AND BENDING LOAD | |
| 1) DEAD MILD STEEL | CARBON CONTENT RANGES FROM 0.1 TO 0.125% | | a) WIRE STEEL<br>b) THIN SHEETS<br>c) SOLID DRAWN TUBES |
| 2) MILD STEEL | CARBON CONTENT RANGES FROM 0.15 TO 0.3% | | a) BOILER PLATES<br>b) BRIDGE WORK<br>c) STRUCTURAL SECTIONS<br>d) DROP FORGINGS<br>e) GENERAL WORKSHOP PURPOSES |
| 3) MEDIUM CARBON STEEL | a) CARBON CONTENT RANGES FROM 0.3 TO 0.5% | | a) AXLES<br>b) DROP FORGINGS<br>c) HIGH TENSILE TUBES AND WIRE<br>d) AGRICULTURAL TOOLS |
| | b) CARBON CONTENT RANGES FROM 0.5 TO 0.7% | | a) SPRINGS<br>b) LOCOMOTIVE TYRES<br>c) LARGE FORGING DIES<br>d) WIRE ROPES<br>e) HAMMERS<br>f) SNAPS FOR RIVETERS |

SOURCE: CHAPMAN, W.A.J. (1967), WORKSHOP TECHNOLOGY, PART ONE

## TABLE 3.6.6 (Cont)

RAW MATERIALS OF THE MACHINERY INDUSTRY

| MATERIAL | CONSTITUENT | PROPERTIES | APPLICATIONS |
|---|---|---|---|
| 4) HIGH CARBON STEEL | a) CARBON CONTENT RANGES FROM 0.7 TO 0.9% | | a) SPRINGS<br>b) SMALL FORGING DIES<br>c) SHEAR BLADES<br>d) COLD SETTS<br>e) WOOD CHISELS |
| | b) CARBON CONTENT RANGES FROM 0.9 TO 0.11% | | a) COLD CHISELS<br>b) PRESS DIES<br>c) PUNCHES<br>d) SCREWING DIES<br>e) WOODWORKING TOOLS<br>f) AXES<br>g) PICKS |
| | c) CARBON CONTENT RANGES FROM 1.1 TO 1.4% | | a) RAZORS<br>b) HAND FILES<br>c) DRILLS<br>d) GAUGES<br>e) METAL-CUTTING TOOLS |

SOURCE : CHAPMAN, W.A.J. (1967), WORKSHOP TECHNOLOGY, PART ONE

To produce a casting, molten metal is poured into a mould which is made to the shape of the structure required. There are two kinds of casting - die and sand casting. In die casting, the mould is made of metal. In sand casting, it is made in sand. The form is obtained from the wooden pattern of the mould. The making of the pattern requires a highly skilled craftsman or pattern maker. He has to interpret a drawing and carve the exact pattern for the solid shape. In the engineering industry, sand casting is more commonly employed. The conversion of pig iron to cast iron takes place in a small blast furnace called the foundry cupola. The production flow of iron and steel material is illustrated in Figure 3.6.8.

The MIDA survey estimated that there are 160 foundries in existence in Malaysia. Of this, 130 foundries are producing grey iron casting. Nonetheless, from the MIDA sample survey of ancillary and supporting industries, only a quarter (6 out of 24 foundries sample) of the foundries produce products for the engineering and machinery sector.

About half the foundries sample produce components for the quarrying and the mining industry. Examples include gravel and water pumps.

Table 3.6.7 shows a sample of the firms engaging in foundry or casting works. Their technology is also documented.

TABLE 3.6.7

SAMPLE STUDY OF THE PRODUCTION ACTIVITIES* WITHIN THE MACHINERY SECTOR PENINSULAR MALAYSIA

| NAME OF COMPANY | FORGING WORKS | FOUNDRY WORKS | MILLING WORKS/ HOT/COLD ROLLING/DRAWINGS | EXTRUSION PLANT/WORKS | SINTERING WORKS | MACHINING WORKS | PRESS WORK | ELECTRO-PLATING | ASSEMBLING, WELDING, RIVETTING, TONING | HEAT TREATMENT | REFERENCE TABLES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MALAYSIA RADIATORS | | | X | | | X | X | | X | | TABLE 3.6.8 |
| UNITED INDUSTRIES | | | X | | | X | X | | X | | TABLE 3.6.9 |
| FED. IRON WORKS | | | X | | | | X | X | X | | TABLE 3.6.10 |
| KHONG HING ENGINEERING | | | X | | | X | X | | | | TABLE 3.6.11 |
| CHAN FATT ENGINEERING | | | X | | | X | | | X | | TABLE 3.6.12 |
| NAM FATT ENGINEERING | | | X | | | X | | | X | | TABLE 3.6.13 |
| UNITED BOLT & NUT | X | | X | | | X | X | | | | TABLE 3.6.14 |
| LEE BING HON ENGINEERING | | | X | | | X | | | X | | TABLE 3.6.15 |
| GERMAN MALAYSIAN PRECISION ENGINEERING | | | | | | X | | X | | | TABLE 3.6.16 |
| TECHNOKRAF ENGINEERING | | | X | | | X | | | X | X | TABLE 3.6.17 |
| GAJRA GEARS MS | | | X | | | X | | | | X | TABLE 3.6.18 |
| UMW ENGINEERING | | | X | | | X | X | | X | | TABLE 3.6.19 |
| YEE WENG ENGINEERING | | | X | | | X | | | | X | TABLE 3.6.20 |
| TECHNICON SDN. BHD. | | | | | | X | | | | | TABLE 3.6.21 |
| AMBADI ENGINEERING | | | X | | | X | X | X | X | X | TABLE 3.6.22 |
| WAHAB ENGINEERING | | X | X | | | X | X | | X | | TABLE 3.6.23 |
| PERUSAHAAN BESI | | X | | | | X | | | X | | TABLE 3.6.24 |
| FOONG SEONG FOUNDRY | | X | | | | X | | | X | | TABLE 3.6.25 |
| KWONG LEE YOON FOUNDRY | | X | X | | | X | | | | X | TABLE 3.6.26 |
| DE CONSOLIDATED WORKS | X | | X | | | X | | | | | TABLE 3.6.27 |
| PAN ALLUMINIUM SERVICES | | | | | | | | X | | | TABLE 3.6.28 |
| YONG LIANG ELECTRO-PLATING & SIGN, CRAFT | | | | | | | | X | | | TABLE 3.6.29 |
| EURAKO INDUSTRIES | | | | | | | | | X | | TABLE 3.6.30 |
| TASEK IRON STEEL FOUNDRY | | X | | | | | | | | X | TABLE 3.6.31 |
| TOONG SENG FOUNDRY | | X | | | | | | | | | TABLE 3.6.32 |
| ALUMINIUM CO. OF M'SIA | | | X | X | | | | | | X | TABLE 3.6.33 |

* FOR A DETAIL OF THE PRODUCTION TECHNOLOGY OF EACH COMPANY, REFER TO THE REFERENCE TABLE.

SOURCE : MIDA DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA

# TABLE 3.6.8

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT, PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 19[illegible]

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY (PER ANNUM) | APPLICATION | ITEM | SOURCES | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPERATIONS | DESCRIPTION | QTY. | | |
| Malaysia Radiators Sdn. Bhd. | 44 | 40% (Foreign) (India) | Factory 699 Sq. m | Header Plate | 15000pc | For Radiat Core | Copper Brass strips | Japan/ France | Singapore Australia | Sheet Metal Forming | Cutting Blanking Deep Drawing Shaping (bending Forming) | Joining Technique | Welding Soft Soldering Brazing | Hydraulic Press | 1 | Micrometer (0-50mm) | About $1 million Investment for 1982/83. |
| | | | | Header | 7500pc | For Radiat | Brass Sheets | Japan/ France | | | | | | Eccentric Press | 2 | Vernier Calipers (0-300mm) | Expansion to 15,000 radiators per year |
| | | | | Support | 7500pc | For Radiat | | Japan | | | | | | Shearing M/C | 1 | | |
| | | | | Tube | 1.5mil pc | For Radiat Core | CCA Sheets | Singapore | | | | | | Bending M/C | 1 | Gauges | |
| | | | | Fin | 1.5mil pc | For Radiat Core | Solder | | | | | | | Tube Forming M/C | 1 | Pressure Test Rigs | |
| | | | | Radiator Assembling | 3600pc | Automotive & Industrial Engines | | | | | | | | Fin Rolling M/C | 4 | Vernier Height Gauge (0-300mm) | |
| | | | | Radiator Core | 7500pc | Radiator | | | | | | | | Sport Welding M/C | 1 | | |
| | | | | | | | | | | | | | | Arc Welding Transformer | 1 | | |
| | | | | | | | | | | | | | | Baking Oven | 1 | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.9

MALAYSIA : MACHINERY ANCILLARY SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT , PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES , [illegible]

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY (PER ANNUM) | APPLICATION | ITEM | SOURCES | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPERATIONS | DESCRIPTION | QTY. | | |
| United Industries Sdn. Bhd. | 129 | 100% (Malaysian) | Factory - 16,198 sq. m. | Exhaust Muffler<br><br>Exhaust Pipe | [illegible],000 Pieces<br><br>[illegible],000 Pieces | Vehicles, Industries Use<br><br>Vehicles, Industries Use | Steel Sheets | Japan | Hong Kong, Australia | Sheet Metal Forming | Cutting, Blanking, Deep Drawing Shaping: Bending, Forming, Rolling | Joining Technique | Welding (Gas, Electrodes, Spot, Seam, Inert Gas) Soft Soldering | Hydraulic Press<br><br>Inclinable Power Press<br><br>Power Press<br><br>Carbon Dioxide Welding Machines<br><br>Welding Machines<br><br>Spot Welding Machines<br><br>Seam Welding Machines | 7<br><br>15<br><br>31<br><br>14<br><br>21<br><br>11<br><br>4 | - | Investment Of $2.5 Million For A Pipe Forming Line In 1982. For 1983, $2 Million To Be Invested In A New Machine To Boost Production By 30% Yearly |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.10

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT , PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1982

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY (PER ANNUM) | APPLICATION | ITEM | SOURCES | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPERATIONS | DESCRIPTION | QTY. | | |
| Federal Iron Works Sdn. Bhd. | 367 | 100% Foreign (Singapore/ Japan) | Workshop | LPG Cylinders | 360,000 pc. | L.P. Gas Container, Fire Fighting. | Cold Rolled Steel Sheet/ Coils. | Japan | Hong Kong Australia Singapore Indonesia Philip- Pines | Sheet Metal Forming | Shearing, Blanking, Bending, Rolling, Pressing Deep - Drawing | Surface Treatment | Hot Dip Galvanizing. | Hydraulic Presses Japan/ Malaysia 1972/75 | 3 | Hardness Tester (China 1981) | - |
| | | | | Portable Fire Extin- guishers | 50,000 pc. | Roofing And Industrial Application | Extin- guisher Headcaps/ Fittings. | U.K./ Germany/ Australia/ Japan | | | | Joining Technique | Electrode Welding | Shear (LVD/1979) | 1 | Universal Testing Machine (Japan 1972) | |
| | | | | Galvanized Sheets | 50,000 t. | | Dry Powder. | U.K./ Germany | | | | | Inert Gas Welding | Mechanical Presses Japan/ China 1972/81 | 6 | Roll Forming Machines (LVD Belgium, 1974) | |
| | | | | | | | Extin- guisher Chemicals. | U.K./ Japan | | | | | | Continuous Galvanizing Lines To Galvanize Steel Sheets In Coils | | Coat Mass Testing Equipment (Malaysia) | |
| | | | | | | | Zinc Ingots | Australia | | | | | | Submerged Arc Welding Machines (Osaka Transformer & LINDE) | 5 | Radio Graphic Unit (Phillips 1972) | |
| | | | | | | | | | | | | | | MIG Welding Machines (1971/1980) (SAFMIG/ LINDE) | 6 | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.11

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT, PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1982

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY (PER ANNUM) | APPLICATION | ITEM | SOURCES | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPERATIONS | DESCRIPTION | QTY. | | |
| Kwong Hing Engineering Company | 19 | Malaysian | Build-Up (Area = 595 Sq. m) | Steel Body | 10 Units | Agri-Cultural Trailers, | Steel | Malaysian Supplies | - | Sheet Metal Forming | Cutting (Shearing) Shaping; Bending, Rolling, Forming/ Pressing | Metal Cutting | Turning, Shaping, Drilling, Counter Sinking, Milling, Grinding, Honing, Sawing, Planing, Tapping | Hydraulic Press | 1 | - | - |
| | | | | Fuel Tanks | | | | | | | | | | | | | |
| | | | | Agricultural Trailers | 50 Units | Diesel Engines | | | | | | | | Brake Press (1219x2438 mm.) | 1 | | |
| | | | | Engine Baseplate | 300 Units | Agri-Cultural Use | | | | | | | | Guillotine (Shear) Machines (1829 mm.) | 1 | | |
| | | | | Water Tanks | 600 pc. | Engines | | | | | | | | | | | |
| | | | | | 100 pc. | Low Cost Houses | | | | | | | | Rolling Machine (1829 mm.) | 1 | | |
| | | | | | | | | | | | | | | Lathes (Center) | 3 | | |
| | | | | | | | | | | | | | | Milling Machines | 1 | | |
| | | | | | | | | | | | | | | Shaping Machines | 1 | | |
| | | | | | | | | | | | | | | Planer | 1 | | |
| | | | | | | | | | | | | | | Drilling Machines | 1 | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.12

MALAYSIA . MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT , PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1982

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS: ITEM | PRODUCTS: QUANTITY (PER ANNUM) | PRODUCTS: APPLICATION | MATERIAL: ITEM | MATERIAL: SOURCE | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES: TECHNIQUE | MAIN PRODUCTION PROCESSES: OPERATIONS | SECONDARY PRODUCTION PROCESSES: TECHNIQUE | SECONDARY PRODUCTION PROCESSES: OPERATIONS | MANUFACTURING FACILITIES: DESCRIPTION | MANUFACTURING FACILITIES: QTY. | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chan Fatt Engineering | 10 | 100% (Malaysian) | Workshop = 64 Sq. m | Water Tanks | N.A. | - | Mild Steel | Japan | - | Joining Technique | Welding (Gas, Electrode) | Surface Treatment | Painting | Generator (Hobart, USA) | 2 | - | - |
| | | | | Trailers | | | | | | | | | | Generator (Elin, UK) | 1 | | |
| | | | | Maintenance Services | | | | | | | | | | Generator (USSR) | 1 | | |
| | | | | | | | | | | | | | | Transformer (Holland) | 2 | | |
| | | | | | | | | | | | | | | Rectifier (USSR) | 1 | | |
| | | | | | | | | | | | | | | Lathe Machines (China, England) | 5 | | |
| | | | | | | | | | | | | | | Milling Machines (Japan) | 1 | | |
| | | | | | | | | | | | | | | Shapers (England, Japan, India) | 3 | | |
| | | | | | | | | | | | | | | Drilling Machines (China, England) | 3 | | |
| | | | | | | | | | | | | | | Drilling Machines (Poland) | 1 | | |
| | | | | | | | | | | | | | | Saw | 2 | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.13

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT , PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1982

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY (PER ANNUM) | APPLICATION | ITEM | SOURCES | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPERATIONS | DESCRIPTION | QTY. | | |
| Nam Fatt Engineering (SEA) Sdn. Bhd. | 125 | 100% (Malaysian) | Production Shop = 9000 Sq. m | Steel Structure | N.A. | - | Carbon Steel | N.A. | Indonesia | Joining Technique | Welding (Electric, Inert Gas) | - | - | Overhead Travelling Crane | 9 | - | - |
| | | | | Palm Oil Mill Equipment | | | Structural Steel | Japan | Papua New Guinea | | | | | Electric Welding Sets | 40 | | |
| | | | Workshop = 3000 Sq. m | | | | Steel Plates | Japan | | | | | | Guillotine Shear | 1 | | |
| | | | | | | | | | | | | | | Folding & Bending Machines | 1 | | |
| | | | | | | | | | | | | | | Universal Metal Worker | 4 | | |
| | | | | | | | | | | | | | | Jiffy Cutter | 1 | | |
| | | | | | | | | | | | | | | Column Drill | 2 | | |
| | | | | | | | | | | | | | | Auto-Submerge Arc Welder | 2 | | |
| | | | | | | | | | | | | | | Self-Pinching Bending Roller | 1 | | |
| | | | | | | | | | | | | | | Plate Roller | 2 | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.14

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT , PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1982

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY (PER ANNUM) | APPLICATION | ITEM | SOURCES | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPERATIONS | DESCRIPTION | QTY. | | |
| United Bolt & Nut Sdn. Bhd. | 95 | 100% (Malaysian) | Production Shop = 2323 Sq. m | Bolts & Nuts (JIS G 3505) | 1363t | Automotive, Engineering And Construction | Wire Rod | Japan | United Kingdom | Solid Metal Forming | Cold Forming | - | - | Nut Press | 11 | - | - |
| | | | | | | | | | Sri Lanka | | Hot Forging | | | Nut Former | 8 | | |
| | | | | | | | | | Kenya | | Wire Drawing | | | Nut Tapper | 25 | | |
| | | | | | | | | | Mauritius | | | | | Bolt Form | 1 | | |
| | | | | | | | | | Indonesia | | | | | Header | 11 | | |
| | | | | | | | | | Australia | | | | | Trimmer | 15 | | |
| | | | | | | | | | | | | | | Roller | 14 | | |
| | | | | | | | | | | | | | | Wire Drawing | 5 | | |
| | | | | | | | | | | | | | | Straightening | 2 | | |
| | | | | | | | | | | | | | | Friction Press | 3 | | |
| | | | | | | | | | | | | | | Lathes | 5 | | |
| | | | | | | | | | | | | | | Shaper | 1 | | |
| | | | | | | | | | | | | | | Vertical Milling | 1 | | |
| | | | | | | | | | | | | | | Drills | 2 | | |
| | | | | | | | | | | | | | | Press | 6 | | |
| | | | | | | | | | | | | | | Thread Cutting | 3 | | |
| | | | | | | | | | | | | | | Shearing | 7 | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.15

MALAYSIA : MACHINERY AN[illegible]/SUPPORTIN[illegible] - MAJOR MATERIAL INPUT , P[illegible]TION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1982

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS: ITEM | PRODUCTS: QUANTITY (PER ANNUM) | PRODUCTS: APPLICATION | MATERIAL: ITEM | MATERIAL: SOURCES | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES: TECHNIQUE | MAIN PRODUCTION PROCESSES: OPERATIONS | SECONDARY PRODUCTION PROCESSES: TECHNIQUE | SECONDARY PRODUCTION PROCESSES: OPERATIONS | MANUFACTURING FACILITIES: DESCRIPTION | MANUFACTURING FACILITIES: QTY. | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lee Bing Hon Engineering Works | 17 | 100% (Malaysian) | Land = 1040 Sq. m.<br>Workshop = 450 Sq. m. | Gear P[illegible]<br>Gear [illegible]<br>Au[illegible] B[illegible] Type Pre[illegible]<br>[illegible] Ar[illegible] Rew[illegible] [illegible] | 300pc<br>80-100pc<br>10<br>3 | [illegible]<br>[illegible] Mining Industry<br>[illegible] Type<br>Newspaper Press | Steel<br>Brass<br>Bronze<br>Aluminium<br>Cast Iron | Malaysia<br>-<br>-<br>-<br>- | - | Metal Cutting | Turning<br>Shaping<br>Drilling<br>Milling<br>Hobbing<br>Grinding<br>Gear Cutting<br>Horizontal Borer | Joining Technique | Welding (Gas, Electrode, Spot, Seam)<br>Brazing | Gear Planer (1959)<br>Gear Sharper (1958)<br>Gear Hobbing m/c (1963)<br>Bevel Gear Generator (1965)<br>Lathe (1940)<br>Lathe (1963)<br>Horizontal Borer (1964)<br>Vertical Borer (1963)<br>Radial Drill (1965)<br>Slotting M/C (1955)<br>Planer (1958)<br>Grinder (1965)<br>Welding Set (1970,72,80) | 2<br>4<br>5<br>2<br>2<br>4<br>3<br>2<br>2<br>2<br>1<br>2<br>3 | Rockwell Hardness Tester<br>Gear Tooth Vernier Calipers<br>Gear Pitch Gauge<br>Dial Indicator<br>Vernier Calipers<br>Micrometer<br>Combination Set Square | - |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.16

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT , PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1987

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDING | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY PER ANNUM | APPLICATION | ITEM | SOURCE | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPERATIONS | DESCRIPTION | QTY. | | |
| German-Malaysian Precision Engineering Sdn. Bhd. | 40 | 1/3 M'sian 2/3 Foreign | Production Area = 1030 Sq. m Total Area = 1300 Sq. m | Auto Lathe And Milling Produced Components | N.A | Hydraulic, Shipping, Automotive, Machine-Construction Industries | Steel & Non-Ferrous Materials | N.A | West Germany ASEAN Countries USA | Metal Cutting | Auto Lathe Milling Sawing Assembly Drilling | Surface Treatment | Galvanising Operations | Traub Auto Lathe Boley Spinner Weiler Bridgeport Emco Tool Grinding Galvanising Line | N.A | Profile Projector. Corda Tester Auto Roughness Tester Fullset Of Gauges Galvanic Testing Equipment | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.17

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT , PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1987

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY (PER ANNUM) | APPLICATION | ITEM | SOURCES | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPERATIONS | DESCRIPTION | QTY. | | |
| Technocraft Engineers | 44 | 100% Malaysian | Production Area = 1300 Sq. m | Machine Parts<br>Gear Sprockets<br>Shafts<br>Pulley<br>Cams<br>Moulds<br>Flats<br>Knifes | N.A | Replacements for Local Industry | Steel<br>Bronze<br>Brass<br>Aluminium<br>Fibre,<br>Plastics | - | - | Metal Cutting | Turning<br>Shaping<br>Drilling<br>Counter-Sinking<br>Reaming<br>Milling<br>Broaching<br>Hobbing<br>Grinding<br>Honing<br>Sawing<br>Tapping<br>Sand-Blasting | Joining Technique<br>Tool Making | Shrink-Fitting<br>Welding (Gas, Electrode)<br>Own Tool Making & Design | Lathe (1974),<br>Milling Machines,<br>Bevel Gear Hobbers,<br>Gear Shaper,<br>Gear Generator,<br>Hacksaw, Bandsaws, Circular Cut-Off Saw,<br>Turret Lathe,<br>Grinders,<br>Metal Cutting & Filling Machines<br>Sand Blasting Plant,<br>Bench Drill<br>Tapping Machines<br>Slotting Machines<br>Liquid Nitrogen Cavatr<br>Arc Welding Set<br>Portable Welder<br>Borer (Table & Floor)<br>Planer<br>Heat Treatment Furnance | 9<br>4<br>6<br>7<br>1<br>4<br>2<br>10<br>1<br>1<br>3<br>1<br>2<br>1<br>1<br>1<br>2<br>1<br>3 | Rockwell Hardness Tester | Own Tool Making and design facilities.<br>Tool tolerances + 0.01 mm |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.18

[illegible]

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS: ITEM | PRODUCTS: QUANTITY (PER ANNUM) | PRODUCTS: APPLICATION | MATERIAL: ITEM | MATERIAL: SOURCES | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES: TECHNIQUE | MAIN PRODUCTION PROCESSES: OPERATIONS | SECONDARY PRODUCTION PROCESSES: TECHNIQUE | SECONDARY PRODUCTION PROCESSES: OPERATIONS | MANUFACTURING FACILITIES: DESCRIPTION | MANUFACTURING FACILITIES: QTY. | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sajra Gears MS Sdn. Bhd. | [illegible] | 31.25% (M'sian)<br>68.75% Foreign (India) | Total Factory Area = 3,813 sq. m | Crown Wheels & Pinions | 60,[illegible] Sets | Automotive Vehicles, Tractors & Industrial Applications | Steel | N.A. | Pakistan, India, Australia, Thailand, S'pore, Indonesia, U.K., Sri Lanka, New Zealand, etc. | Metal Cutting | Turning, Drilling, Milling, Hobbing, Grinding, Lapping, Tapping, Gear Cutting Spiral Bevel & Hypoid Gear Cutting | Heat Treatment<br>Tool Making | N.A.<br>Jigs & Fixtures, Material of Stainless Steel & Mild Steel | Lathe | 3 | Hardness Testing Machinery | |
| | | | | | | | | | | | | | | Multi Spindle Drilling & Tapping Machineries | 3 | Gleason Tester | |
| | | | | | | | | | | | | | | Straightening Press, [illegible], Sharpener, Lapper, Finisher & Generator | 6 | Tooth Spacing Tester<br>Rolls Carbon Determination | |
| | | | | | | | | | | | | | | Universal Gear Machinery | 1 | Cutter Inspection Machinery | |
| | | | | | | | | | | | | | | Grinding Machinery | [illegible] | Micrometer & Gauges | |
| | | | | | | | | | | | | | | Carburising Furnace | [illegible] | | |
| | | | | | | | | | | | | | | Milling & Quenching Machineries | [illegible] | | |
| | | | | | | | | | | | | | | Tempering & Hardening Furnaces | 2 | | |
| | | | | | | | | | | | | | | Induction Heater | 1 | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.19

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT , PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1982

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS: ITEM | PRODUCTS: QUANTITY (PER ANNUM) | PRODUCTS: APPLICATION | MATERIAL: ITEM | MATERIAL: SOURCE | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES: TECHNIQUE | MAIN PRODUCTION PROCESSES: OPERATIONS | SECONDARY PRODUCTIO PROCESSES: TECHNIQUE | SECONDARY PRODUCTIO PROCESSES: OPERATIONS | MANUFACTURING FACILITIES: DESCRIPTION | MANUFACTURING FACILITIES: QTY. | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UMW Engineering Sdn. Bhd. | 302 | 100% (Malaysian) | Production Shop = 1110 Sq. m | Bulldozer Blades | 360pc | Earth Moving M/C | Steel | Japan | Singapore, Brunei | Metal Cutting | Turning, Shaping, Drilling, Counter-Sinking, Milling, Grinding, Honing, Electro-Machining, Sawing, Tapping | Joining Technique | Rivetting; Welding (gas, Electrode, Inert Gas) | Boring M/C | 2 | Hardness Tester (Rockwell, Brinell & Vickers) | Investments in Automatic welding Equipment & Programmable Cutting M/C to Improve Productivity |
| | | | Assembly Shop = 2750 Sq. m | U Frames | 360pc | Earth Moving M/C | | | | | | | | Drilling M/C | 2 | | |
| | | | | | | | | | | | | Tool Making | Fixtures, Templates, Jigs. | Radial Drilling M/C | 1 | Torque Wrenches, 100 to 6500 lb/in & | |
| | | | Reconditioning Shop = 4730 Sq. m | Buckets | 1500pc | Excavators | | | | | | | | Lathe M/Cs | 10 | | |
| | | | | | | | | | | | | | Tool Tolerance ± 0,001 mm | Hydraulic Press | 1 | Micro-Meter | |
| | | | Chrome Shop = 250 Sq. m | Bulldozer Parts | 50 Units | Earth Moving M/C | | | | | | | | Cutting M/C | 1 | Surface Roughness Gauge | |
| | | | | | | | | | | | | | Tool Material: Mild Steel, High Tensile Steel | Sub-Merged Welding M/C | 1 | | |
| | | | | Compaction Roller Parts | 200 Units | Earth Compaction | | | | | | | | Boring M/C | 1 | Bevel Instruments | |
| | | | | | | | | | | | | | | Multi Drill Tapper | 1 | Precision Squares | |
| | | | | | | | | | | | | | | Lathe M/C | 9 | | |
| | | | | | | | | | | | | | | Bia Type Universal | 2 | | |
| | | | | | | | | | | | | | | Milling M/C | 2 | | |
| | | | | | | | | | | | | | | Grinding M/C | 2 | | |
| | | | | | | | | | | | | | | Press (Hydraulic) | 1 | | |
| | | | | | | | | | | | | | | Rolling M/C | 2 | | |
| | | | | | | | | | | | | | | Press | 1 | | |
| | | | | | | | | | | | | | | Semi-Automatic Welding M/C | 22 | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.20

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT , PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1982

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY (PER ANNUM) | APPLICATION | ITEM | SOURCES | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPERATIONS | DESCRIPTION | QTY. | | |
| Yee Wong Engineering Works | 15 | 100% (Malaysian) | Production Shop + 700 Sq. m | Piston Pump | 20pc | Soil Investigation | Steel | N.A | - | Metal Cutting | Turning<br>Shaping<br>Drilling | Heat Treatment | Heat Treatment | Big Lathe (1982,'70,'81) | 3 | Micro-meter | Own Tool Making & Design Facilities |
| | | | | | | | Bronze | N.A | | | Counter-Sinking | Tool Making | Own Tool Design | Small Lathe | 5 | Vernier Calipers | To buy a CNC Lathe in 1982 |
| | | | | Accessories & Parts For Soil Drilling & Testing | N.A | Soil Investigation | Brass | N.A | | | Reaming<br>Milling | | | Turret Lathe | 2 | Hardness Tester | |
| | | | | | | | Cast Aluminium | N.A | | | Hobbing<br>Grinding | | | Gear Hobber | 1 | | |
| | | | | | | | | | | | Sawing<br>Tapping<br>Slotting | | | Bevel Gear Shaper | 2 | | |
| | | | | | | | | | | | | | | Gear Shapper | 1 | | |
| | | | | | | | | | | | | | | Vertical Milling | 1 | | |
| | | | | | | | | | | | | | | Horizontal Milling | 1 | | |
| | | | | | | | | | | | | | | Radial Drill | 1 | | |
| | | | | | | | | | | | | | | Shaping M/C (1968) | 1 | | |
| | | | | | | | | | | | | | | Furnace (1980) | 1 | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.21

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT , PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1982

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY (PER ANNUM) | APPLICATION | ITEM | SOURCES | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPERATIONS | DESCRIPTION | QTY. | | |
| Teknicon Sdn. Bhd. | 23 | 100% (Malaysian) | Factory Area 669 Sq. m | Process Equipment & Vessels | - | Industrial & Commercial | Steel | Japan, | - | Metal Cutting | Grinding | - | - | Shear Cutter | 1 | - | - |
| | | | | | | | | Korea, | | | Sawing | | | | | | |
| | | | | Pipe Installations | | | | Australia. | | | Tapping | | | Plasma Cutter | 1 | | |
| | | | | Mild Steel & Stainless Steel Pressure Vessels & Storage Tanks | | | | | | | | | | Bender | 1 | | |
| | | | | PVC, PP, PE Tanks & Equipment | | | | | | | | | | | | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.22

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT , PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1982

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS: ITEM | PRODUCTS: QUANTITY (PER ANNUM) | PRODUCTS: APPLICATION | MATERIAL: ITEM | MATERIAL: SOURCES | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES: TECHNIQUE | MAIN PRODUCTION PROCESSES: OPERATIONS | SECONDARY PRODUCTION PROCESSES: TECHNIQUE | SECONDARY PRODUCTION PROCESSES: OPERATIONS | MANUFACTURING FACILITIES: DESCRIPTION | MANUFACTURING FACILITIES: QTY. | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ambadi Engineering Bhd. | 96 | 1.86% Foreign (India) | Production Shop & Administrative Office = 1,530 sq. m<br>Canteen = 245 sq. m | Motorcycle, Industrial & Bicycle Chains | 300,000 Units (50% Capacity) | Motorcycle, Bicycle, & Industrial Drives | Cold Rolled Alloy & Carbon Steel, Cold Drawn Open Hearth Alloy Steel Wire, Cold Rolled Bright Finished Alloy & Spring Steel Strip | Japan, West Germany | - | Sheet Metal Forming | Blanking & Piercing, Forming & Pressing, Deep Drawing, Centerless Binding | Metal Cutting | Machining, Spinning, Polishing & Tubes Manipulation | Mechanical Press<br>Wire Cutting | 12<br>2 | Hardness Testing Machinery<br>Tensile Testing Machinery | Material Handling Facility, 2 Ton Forklifts, 1 1/2 Pallet Trucks, |
| | | | | Clutch Plate Pressed, Heat Treated & Assembled Parts | 20,000 Units (20% Capacity) $0.2 Million (13% Capacity) | Engineering Industry, Hardware & Components, Building Hardware | | | | | | Heat Treatment | Hardening (Oil), Case Hardening, Tempering, Carbo Nitriding, Annealing | Tube Manipulation<br>Tube Cutting, Frazing<br>Tumbling Stations | 1<br>2<br>4 | Life Test Machinery<br>Length Measuring Set | Chemical Lab For Analysis Of Plating Chemicals |
| | | | | Electrical Stamped Parts | N.A. | Electrical Appliances | | | | | | Surface Treatment | Bright, Semi-Bright & Trinickel, Zinc Plating, Copper Plating, Blackening & Color Passivation | Rotary Furnace<br>Electro - Plating Plant<br>Zinc Plating Barrel | 3<br>1<br>2 | PH Meter<br>Chemical Weighing Balance | |
| | | | | Electro - Plating | N.A. | Various Protective Finishes | | | | | | Joining Technique | Semi - Automatic Assembly Of Components Involving Press Fit & Rivetting | Centerless Grinder<br>Block Builder, Assembler, Rivetter, Preloader, Former | 1<br>12 | | |
| | | | | | | | | | | | | Tool Making | Tool Room Work | | | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.23

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT , PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1987

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS: ITEM | PRODUCTS: QUANTITY (PER ANNUM) | PRODUCTS: APPLICATION | MATERIAL: ITEM | MATERIAL: SOURCES | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES: TECHNIQUE | MAIN PRODUCTION PROCESSES: OPERATIONS | SECONDARY PRODUCTION PROCESSES: TECHNIQUE | SECONDARY PRODUCTION PROCESSES: OPERATIONS | MANUFACTURING FACILITIES: DESCRIPTION | MANUFACTURING FACILITIES: QTY. | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] Engineering [illegible] Bhd. | [illegible] | 100% Malaysian | Machine Shop = [illegible] Sq. m | Pumps Casings & parts | 400 t | Tin Mining Industry | Pig Iron | China | - | Foundries/ Castings | Sand Casting | Metal Cutting | Turning, Shaping, Drilling, Milling Grinding | Cold-Blast Cupola | 1 | - | - |
| | | | | | | | Foundry Coke | Japan | | | | | | Oil Fired Crucible | 3 | | |
| | | | Foundry = [illegible] Sq. m | Aluminium Tile Pallets | 50t | Roof Tile Manufacturing | Mild Steel Scraps | Malaysia | | | | Surface Treatment | Painting | Lathes | 6 | | |
| | | | Office = [illegible] Sq. m | Bronze Impellers | 50t | Tin Mining Industry | Assorted Mild Steel Material | Malaysia | | | | Joining Technique | Electrode Welding | Milling Machine | 2 | | |
| | | | | Skid Tanks | 50 units | Mining Engines & Generator | | | | | | | | Band Saw | N.A. | | |
| | | | | | | | | | | | | | | Drilling Machine | 4 | | |
| | | | | Skid Tanks (diesel) | 20 units | Industrial Uses | | | | | | | | Surface Grinder | 7 | | |
| | | | | | | | | | | | | | | Shaping Machine | 2 | | |
| | | | | | | | | | | | | | | Power Press | 1 | | |
| | | | | | | | | | | | | | | Welding Set | 4 | | |
| | | | | | | | | | | | | | | Semi-Automatic Wire Welding Set | 2 | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.24

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1982

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY (PER ANNUM) | APPLICATION | ITEM | SOURCES | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPERATIONS | DESCRIPTION | QTY. | | |
| Perusahaan Besi Sdn. Bhd. | 187 | 0.1% Foreign (Singapore) | Factory = 269 Sq. m | Cast Iron Pipe & Fittings | 4096mt | Housing Industry | Grey Cast Iron | N.A | - | Foundries/ Castings | Green Sand Casting | Metal Cutting | Turning, Shaping, Drilling, Grinding, Lapping, Sawing | Induction Furnace (Australia 1973) | 2 | Hydraulic Loading Test m/c | - |
| | | | Canteen = 13 Sq. m | Cast Iron Manhole Covers & Frames (BS497) | 144mt | Vehicles, Machinery, Equipment & Machinery Parts | Cast Steel | N.A | | | Carbon Dioxide Sand | | | Centrifugal Pipe Casting Machine | 1 | Carbon Determinator | |
| | | | | | | | | | | | Centrifugal Casting | | | Moulding Machine | 1 | Thermo-electrometer | |
| | | | | | | | | | | | | Joining Technique | Welding (Gas & electric) | Sand Mixer | 5 | Water Pressure Test m/c | |
| | | | | | | | | | | | | | | Lathes | 1 | | |
| | | | | | | | | | | | | | | Drilling Machine | 3 | | |
| | | | | | | | | | | | | | | Saw | 2 | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.25

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT, PRODUCTION TECHNOLOGY AND PRODUCTS OF SELE[illegible] [illegible]OMPANIES, 1987

| NAME OF COMPANY | NO. OF EMPLOYEES | OWNERSHIP | BUILDINGS | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY (PER ANNUM) | APPLICATION | ITEM | SOURCE | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPERATIONS | DESCRIPTION | QTY. | | |
| Foong Seong Foundry Sdn. Bhd. | 40 | 100% (Malaysian) | Machining workshop = 5273 Sq. m<br>Production Workshop = 2296 Sq. m | Gravel Pump Parts and Mining Equipment | 240t | For Tin Mining Industry | Grey Cast Iron | N.A | - | Foundries/Castings | Sand Casting Without Synthetic Resin | Metal Cutting | [illegible] | Cupola (1960) | 1 | - | - |
| | | | | Industrial Machinery and Parts | N.A | N.A | | | | | | | | Centre Lathe (China, 1966,1968) | 3 | | |
| | | | | | | | | | | | | | | Radial Drill Machine (Japan, 1945) | 1 | | |
| | | | | | | | | | | | | | | Radial Drill Machine (Korea, 1972) | 1 | | |
| | | | | | | | | | | | | | | Planning Machine (England, 1948) | 1 | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.26

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT, PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1987

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS: ITEM | PRODUCTS: QUANTITY (PER ANNUM) | PRODUCTS: APPLICATION | MATERIAL: ITEM | MATERIAL: SOURCES | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES: TECHNIQUE | MAIN PRODUCTION PROCESSES: OPERATIONS | SECONDARY PRODUCTION PROCESSES: TECHNIQUE | SECONDARY PRODUCTION PROCESSES: OPERATIONS | MANUFACTURING FACILITIES: DESCRIPTION | MANUFACTURING FACILITIES: QTY. | TEST-EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kwong Lee Yoon Foundry Sdn. Bhd. | 238 | 100% (Malaysian) | Pattern Shop & Store = 1208 sq. m | Quarry Parts | 500mt | Quarry Industry | Grey Cast Iron | N.A | Singapore<br>Indonesia<br>Hong Kong | Foundries/ Castings | Sand Casting With Synthetic Resin | Metal Cutting | Turning<br>Shaping | Induction Furnace | 2 | Spectro-Meter (lab test) | Installation of Electric Heat Treatment Furnace of 16t Max Capacity |
| | | | | Dredge Parts | 700mt | Tin Mining Industry | | | | | | | Drilling | Horizontal Boring M/C | 2 | X-Ray M/C | |
| | | | Machine Shop = 1694 sq. m | Pump & Pump Parts | 1400mt | Tin Mining Industry | Cast Steel | N.A | | | | | Counter-Sinking | Radial Drilling M/C | 4 | Hardness Tester | |
| | | | Cast Iron Foundry = 2187 sq. m | | | | SG Iron | N.A | | | | | Reaming | Shaping M/C | 3 | Tensile Testing M/c | |
| | | | Cast Steel Foundry = 1322 sq. m | Palm Oil Mill Parts | 80mt | Palm Oil Industry | Mn Steel | N.A | | | | | Milling | High Speed Lathe | 1 | Sand Testing Equipment | |
| | | | | Engineering Spares | 300mt | General Engineering | | | | | | | Hobbing<br>Grinding | Plano Miller | 1 | Electronic Temperature Control For Heat Treatment Furnace | |
| | | | | Earth Moving Parts | 70mt | Earth Moving Industry | | | | | | | Lapping | 10' Geared Lathe | 1 | | |
| | | | | | | | | | | | | | Tapping | 8' geared Lathe | 1 | | |
| | | | | | | | | | | | | Heat Treatment | Annealing | Planer | 1 | | |
| | | | | | | | | | | | | | Tempering<br>Air-Hardening | Heat Treatment Furnace (oil fired) | 2 | | |
| | | | | | | | | | | | | | Hot Quenching | Shot Blast M/C | 1 | | |
| | | | | | | | | | | | | | | (CM Modena) | 1 | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.27

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT , PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1982

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY (PER ANNUM) | APPLICATION | ITEM | SOURCES | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPERATIONS | DESCRIPTION | QTY. | | |
| De Consolidated (Metal) Works Sdn. Bhd. | 112 | 100% (Malaysian) | Production Shop = 5600 Sq. m | Bolts & Nuts | 1800m/t | Construction | Mild Steel Wire Rod | Japan | - | Solid Metal Forming | Press Forging | Metal Cutting | Turning<br>Shaping<br>Drilling | Cold Heading M/C | 12 | Vernier Caliper | - |
| | | | | Steel Wire | 50m/t | Construction | | | | | Drawing :<br>a) Wire<br>b) Shaped Rod | | Milling<br>Grinding | Nut Forming M/C | 4 | Micrometer | |
| | | | | Rivet | 60m/t | Construction | | | | | | | Honing<br>Electro- | | | High Gauge | |
| | | | | Die | 3500pc | Own Use | | | | | | | Machining | Wire Drawing M/C | 3 | Gauges | |
| | | | | Wood Screws | N.A | Furniture And Wooden Products | | | | | Rolling | | Sawing<br>Tapping | Hot Forging M/C | 6 | Surface Plate | |
| | | | | | | | | | | | | | | Lathe M/C (Centre) | 4 | | |
| | | | | | | | | | | | | | | Shaping M/C | 2 | | |
| | | | | | | | | | | | | | | Milling M/C | 1 | | |
| | | | | | | | | | | | | | | Drilling M/C | 2 | | |
| | | | | | | | | | | | | | | Grinding M/C | 2 | | |
| | | | | | | | | | | | | | | Power Hachsaw | 1 | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

## TABLE 3.6.28

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT , PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1982

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY (PER ANNUM) | APPLICATION | ITEM | SOURCE | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPERATIONS | DESCRIPTION | QTY. | | |
| Pan Aluminium Services Sdn. Bhd. | 20 | 100% Malaysian | Production Shop : Chrome/ Zinc = 1400 Sq. m<br>Aluminium Anodizing = 2100 Sq. m | Anodizing Of Aluminiums Extrusions & Products<br>Zinc/Chrome Coating Of Steel & Brass Parts | - | Archi-Tectural Use | Chrome, Copper, Nickel | - | - | Surface Treatment | Electro-Plating<br>Passivating<br>Anodizing<br>Degreasing<br>Pickling | - | - | Aluminium Anodizing, Nickel, Chrome, Zinc | - | - | - |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

## TABLE 3.6.29

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT , PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 198[illegible]

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY (PER ANNUM) | APPLICATION | ITEM | SOURCE | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPEARTIONS | DESCRIPTION | QTY. | | |
| Yong Liang Electro-Plating & Sign Crafts | 8 | 100% Malaysian | Production Shop = 200 Sq. m | Coating Of Steel Parts | - | - | Chrome, Zinc, Nickel | | - | Surface Treatment | Electro-Plating<br>Hard Chrome-Plating<br>Chrome Plating<br>Degreasing | - | - | - | - | - | - |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.30

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT , PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1982

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY (PER ANNUM) | APPLICATION | ITEM | SOURCE | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPERATIONS | DESCRIPTION | QTY. | | |
| Eurato Industries Sdn. Bhd. | 32 | 100% (Malaysian) | Factory - 1190 Sq. m | Steel Welded Products | N.A. | - | Mild Steel | - | - | Joining Technique | Welding (Electrode, Spot, Seam, Inert Gas) | - | - | Lincoln Arc Welding Set | 6 | - | - |
| | | | | | | | Stainless Steel | | | | | | | Arc Welding Converter | 3 | | |
| | | | | Plastic Welded Products | | | Plastic | | | | | | | National Gas TUNG DC 300 | 2 | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

## TABLE 3.6.31

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1982

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS ITEM | PRODUCTS QUANTITY (PER ANNUM) | PRODUCTS APPLICATION | MATERIAL ITEM | MATERIAL SOURCES | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES TECHNIQUE | MAIN PRODUCTION PROCESSES OPERATIONS | SECONDARY PRODUCTION PROCESSES TECHNIQUE | SECONDARY PRODUCTION PROCESSES OPERATIONS | MANUFACTURING FACILITIES DESCRIPTION | MANUFACTURING FACILITIES QTY. | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tasek Iron Steel Foundry Sdn. Bhd. | 40 | 100% (Malaysian) | Casting Shop Heat Treatment/ Fettling/ Stores | Quarry Spares (BS 592) | 300t | Quarry Industry | Grey Cast Iron | - | - | Foundries/ Castings | Sand Casting (Sodium Silicate) | Heat Treatment | Stress Relieving | Induction Furnace | 1 | Strolein Carbon/ Sulphur | - |
| | | | | Dredge Spares (BS 592) | 300t | Tin Dredging Industry | Alloy Cast Iron | | | | Carbon Dioxide Process | | Hardening Water, Air | Heat Treatment Facilities | 1 | Dye Penetrant | |
| | | | | Engineering Spares (BS 592) | 300t | Engineering Industry | Manganese Steel | | | | Pep-set Self-Setting Sand | | Tempering | Sand Mixer (BMM 1980) | 1 | | |
| | | | | Pump Parts | 300t | Tin Mining Industry | | | | | | | | | | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.32

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT., PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1982

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY (PER ANNUM) | APPLICATION | ITEM | SOURCES | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPERATIONS | DESCRIPTION | QTY. | | |
| Toong Seng Foundry | 9 | 100% (Malaysian) | Production Shop = 610 sq. m | Wood-working Machinery | 80t | Wood-working industry | Grey Cast Iron | N.A | - | Foundries/Casting | Sand Casting Without Sym.hetic Resin | - | - | Iron Blast Furnace (Malaysia, 1972) | 1 | - | - |
| | | | | All Types Of Cast Iron Work | N.A | N.A | | | | | | | | | | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

# TABLE 3.6.33

MALAYSIA : MACHINERY ANCILLARY/SUPPORTING ACTIVITIES - MAJOR MATERIAL INPUT , PRODUCTION TECHNOLOGY AND PRODUCTS OF SELECTED COMPANIES, 1982

| NAME OF COMPANY | NO. OF EMPLOYEE | OWNERSHIP | BUILDINGS | PRODUCTS | | | MATERIAL | | COUNTRIES EXPORTED TO | MAIN PRODUCTION PROCESSES | | SECONDARY PRODUCTION PROCESSES | | MANUFACTURING FACILITIES | | TEST EQUIPMENT | OTHER INFORMATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ITEM | QUANTITY (PER ANNUM) | APPLICATION | ITEM | SOURCES | | TECHNIQUE | OPERATIONS | TECHNIQUE | OPERATIONS | DESCRIPTION | QTY. | | |
| Aluminium Company of Malaysia Bhd. | 683 | 55.1% (Malaysian)<br>40.0% (Canadian)<br>(4.9%) (Others) | N.A | Aluminium Extrusions | - | Architectural, Transport, Agricultural, And General Engineering | Aluminium Ingots | Mainly Canada | Singapore<br>Hong Kong<br>Sri Lanka<br>Pakistan<br>Brunei | Solid Metal Forming | Extrusion Rolling | Surface Treatment<br>Tool Making | Anodising<br>Extrusion Die Making | DC Ingot Casting<br>Hot Rolling Line<br>Cold Rolling Mills<br>Steel Corrugating M/C<br>Extrusion Presses<br>Anodising Line<br>Extrusion Die Making Facilities<br>Salt Bath Heat Treatment Line | N.A. | Complete Laboratory Equipment For Quality Control Of Aluminium Products Manufactured Locally Including Physical and Chemical Testings and Metallography | A Modern M$120 million Sheet and Foil Expansion Project is currently being undertaken at Bukit Raja Industrial Estate, Kelang. Sheet Production is anticipated to commence early 1983 and foil production by Fourth Quarter 1983. |
| | | | | Aluminium Sheet Products (Flat Sheet, Circles, Coils, Slugs And Roofing Sheets) | | Roofing, Collapsible Tubes, Utensils And General Engineering | | | | | | | | | | | |

SOURCE: DIRECTORY OF ANCILLARY AND SUPPORTING INDUSTRIES IN MALAYSIA, MIDA

Sand castings is the predominant activity of the local foundry works. There is limited die-casting activity. Generally castings are limited to the simplier machinery components. This can be attributed to the lack of pattern designing skill. Because of the poor maintenance of the dies in the factory, the quality of the produced parts is suspected.

The cupola and induction furnaces are important features of the foundry manufacturing facility. This technology is acquired both locally as well as from abroad.

The production capacity of foundries are under-utilised at present. According to a recent survey on the iron and steel industry in Malaysia, the foundry industry is found to have a capacity utilisation of less than half its full capacity. This excess local capacity is partly due to the domestic preferential demand for imported castings.

c) Die and Mould Making

There is a general shortage of pattern designing skill in the industry. In making a casting, the first step is that of making the pattern of the mould. Dies making is not only limited to casting works but is also applicable to forging, extrusion and drawing activities.

As such, highly skilled pattern makers are required for quality works. He has to interpret a drawing into the solid shape it represents. The process of cutting these impressions requires both the skill and patience to do accurate work as well as a thorough knowledge of all the classes of bench and machine tool technique. The inadequecy at this technical level weakens the die and mould making capability in the country.

d) <u>Heat Treatment</u>

Heat treatment is an important activity within the machinery sector. It is meant to give the metal a particular quality. Different treatments give different properties to the metal. Chapman classified them into,

i) Annealing - to soften the metal

ii) Hardening - to harden it to resist wear, or to enable it to cut other metals

iii) Tempering - to remove some of the extreme brittleness caused by hardening

iv) Normalising - to refine the structure after it has been distorted by hammering or working when in the cold state

In addition, there are also other treatments which serve other purposes. For example, there are treatments to toughen metal to withstand shock, to toughen soft steel to prevent tearing when machined and to increase the strength of special steel.

Heat treatment facilities require a furnace and temperature measuring instrument within the furnace.

In Malaysia, heat treatment is limited and poor. Table 3.6.7 shows the firms engaging in heat treatment works. Heat treatment is mainly applied for hardening and tempering of machinery parts and machine tools. It is common for these firms to be also engaged in complement activities such as milling and machining. Heat treatment for stress relieving and annealing is relatively less common.

Generally, there is a need to improve on the process of heat treatment to ensure quality products. Heat treatment works with the appropriate controlling facilities is essential for the further development of the machinery sector.

e) Forging

The workshops forging of metals is impotant for 2 reasons,

i) strenghtens metal (refer to heat treatment)

ii) it may save time and expenses

The required shape of the metal for further working can be structured by either forging the metal to a shape close to the finished one or cutting the metal from the solid to the required shape. When compared to the latter method forging reduces machining time and avoids metal wastage.

There are 3 types of forging :

i) Hand forging
ii) Machine forging and
iii) Drop forging

While the first process is for small scale activity, the two latter processes are geared for mass production of similar articles. Table 3.6.34 illustrates the facilities utilised.

At present, forging is an undeveloped activity in Malaysia. Its industrial contribution is insignificant. This state of affair is illustrated in Table 3.6.7.

Existing production work are mainly press forging and hot forging. The forging activity of the firms is related to simple solid metal forming, and is often complemented by

TABLE 3.6.34

TYPES OF FORGING

| TYPES OF FORGING | FORGING FACILITIES | JOB |
|---|---|---|
| Hand forging | a) Blacksmith's forge (consisting of a hearth, twyere, blower)<br>b) anvil<br>c) hand hammer<br>d) sledge hammer<br>e) chisels<br>f) fullers<br>g) swages<br>h) punches<br>i) drifts<br>j) tongs | Small work |
| Machine forging | a) power hammer<br>b) swages<br>c) ring<br>d) necking tools<br>e) vee tools<br>f) cutters | Large quantity production of similar articles and large forgings |
| Drop forging | a) 2 dies (each with half the impression) | Large quantity of production of similar shaped component whose mechanical properties required are such that casting would not be suitable |

manufacturing facilities like nut forming machine, drilling machine, bolting forming machine and thread cutting machine.

The requirements of forged parts are basically met by imports. Such is the importance of forging works that more concerted development effort is required in order to promote this activity. Otherwise, it will become a serious obstacle for the future development of the machinery sector.

f) Milling/Rolling/Drawing

There are basically 3 types of milling activities; the hot rolling, cold rolling and drawing works. According to Chapman, hot rolling involves hot works which causes the metal to undergo plastic deformation when it is above the lower critical temperature. Hot working is also used in forging and presswork. On the other hand, cold working has similar process as hot working except that the metal is below the lower critical temperature. Cold working renders the metal harder and more brittle. The work occurs when metal is cold rolled, drawn into wire, drawn into cups, cold headed, bent cold and so on. These milling processes are suitable only to wrought iron and steel. It is not applicable to cast iron as the material is too brittle to undergo plastic deformation

In hot rolling, the input are steel ingots and the transformation process they undergo is shown below,

Steel ingots---→Blooming mill----→ Blooms---→ Cutting---→Rerolling---→Billets and Bars

All steel products in the form of bars or sheets (having a non-polished reddish-blue surface), has been hot rolled.

In cold rolling, the raw material is the hot rolled strip from the hot rolling mill. When the steel strip has to be blanked and formed in presses, it has to go through the process of cold rolling. Because the cold metal has a relatively higher resistance to reduction than a hot metal, the pressures exerted by the cold rolls are necessarily greater. The purposes of cold rolling are,

i) To secure an improved surface finish

ii) To obtain smaller and more uniform thickness than is possible in hot rolling

iii) To give the metal improved physical properties by combining the cold work of rolling with suitable heat treatment

In cold drawing, the raw materials for drawing is black rolled bar from the hot rolling mill. Wire and bright bars can be drawn to very close limits as regards to size and roundness. All wire product is made by cold drawing through dies. Bright drawn bars are also made from this process. They are the materials for the manufacturing of parts on the capstan, turret and automatic lathes.

At present, iron and steel products such as metal bars (round, deformed and flat) and wire rods (light section and low carbon) are presently been produced by the existing 8 mills in the country. The production process of the mills is dependent on imported billets and re-rollable plates. The output from these mills are channelled mainly into the construction and wire product industry. The production process of firms engaged in milling/rolling/ drawing is illustrated in Table 3.6.7. Besides rolling and drawing, the production activities of these firms are complemented by steel coils slitting and plates shearing.

Currently, the local demand for flat steel product is met mostly by imports. This extents to cold and hot worked sheets and coils, structural steel shapes, bars and wire products. And this is not solely a question of inadequate technology. In fact, steel mills in Malaysia use relatively new production technology but have excess capacity. According to the recent report on the iron and steel industry in Malaysia, the manufacturing of steel bars is only at 50%-70% production capacity. In addition, there is also excess capacity in the production of wire and wire products.

g) <u>Extrusion Works</u>

This is basically a solid metal forming activity. This process involves the production of rods and tubes by forcing material through a die by means of a ram.

In Malaysia, extrusion activities is undeveloped. Table 3.6.7 shows some firms producing extrusions. Some of the production technology utilised are extrusion presses, machines and dies. Some of them have extrusion die making facilities incorporated into their production technology. Currently, products from this activity are geared mainly for the construction industry. The further development in extrusion works had been planned but is aimed mainly at serving the automobile industry.

h) <u>Sintering</u>

The lack of documentation in this area of work suggests an undeveloped industry. The production activity involves the heating of a mixture of powdered metal to the melting point of its constituent metal of mixture which has the lowest melting point. The harder particles in the mixture will be bound together by the melted metal. Sometimes, this process is carried out under pressure.

At present, the planned sintering plant of HICOM projects in Malaysia is oriented towards the automobile industry. Some of the iron and steel products to be produced are gear and sprocket blanks, bearings, clutch parts and the like. Nonetheless, this is potentially an important ancillary industry to the machinery sector.

i) Machining

In machining works, substantial capital is invested in cutters, cutting tools, drills and various other cutting tool equipment.

Although this is a prevalent activity within the machinery sector in Malaysia, the machining work is generally poor. General purpose machine tools are commonly used. The imported machinery comes mainly from China, England and India.

Table 3.6.7 shows the companies engaging in machining works. The industry seldom employ numerically controlled machines. In addition, production machines such as semi-automatic and automatic turret lathes are not employed in the work. Moreover, finishing operation such as precision grinding is absent. It lacks quality control activities as a whole.

j) <u>Tool Making</u>

Generally, the tool making capacity is poor. The manufacturing of special tooling and cutters is not feasible because of limited tool design capability and a lack of properly equipped tool rooms with precision machining facilities. This is also applicable to die making. If machining activities is to be improved upon, the technology at this level has to be upgraded.

k) <u>Pressworks</u>

The hot plastic steel may be shaped in several ways. The shaping can be done by blows from either a hammer or drop stamp. Alternatively, a hydraulic press may be employed.

Currently, the sheet metal forming capability exists to the extent of producing simple parts (For example, housings and bodies for electronic and audio equipment). The technology for the presswork comprises of simple dies and outdated presses. The power press is the most commonly utilised equipment. Countries from which they are imported are China, Japan and India. The other presses in used are the hydraulic, mechanical and friction presses.

Table <u>3.6.7</u> snows the companies carrying out press works.

l) Electroplating

Electroplating is an important feature of surface treatment in Malaysia. The others being anodizing and decreasing work. This is a relatively specialised production process. Firms which engage in metal surface treatment works as their main production activity seldom involve in any secondary production works.

Table 3.6.7 shows a couple of companies carrying out electroplating works. The common activity is zinc and chrome coating. However, it is doubtful if they can provide quality works for precision engineering parts. (For example, hard chromium plating on hydraulic cylinder bores, piston rods, shock absorbers and so on). Hence, the provision of electroplating services needs to be expanded.

m) Assembly

This area of work focuses on joining component parts of the machinery. This include fastening, rivetting, bolting and welding. The assembly capability exist in the sector. (Table 3.6.7). The products produced within the machinery sector have reasonable quality welding works. Nevertheless, there are companies whose welding works are below standard.

Generally, in terms of precison welding and welding of machine parts, the basic know how is present. The types of welding that are carried out include gas, electrode, spot and scan welding.

### 3.6.11 Quality Control

At this final stage of the production process, quality control in terms of method used is inadequate. A substantial amount of quality control activities is visual rather than through the deployment of sophisticated and more accurate testing equipment. At best, simple testing equipment like electric hardness testing machines, manual levelling and balancing machinery are utilised.

### 3.6.12 Research and Development

On the whole, the machinery sector hardly has any solid industrial research and development base. By and large, the research and development activity is limited. This state of affair can be attributed to the lack of government and private sector understanding of the machinery sector. In this respect, it becomes pertinent to foster better link between the Government and the machinery manufacturers with regards to future development activities.

Presently, the existing research and development activities focused mainly on the agricultural machinery and equipment. This effort is shouldered mainly by the Machinery Division of MARDI (the Malaysian Agricultural Research and Development Institute) and the DOA (Department of Agriculture) and to a lesser extent, by the private sector.

Table 3.6.35 shows the research and development policies of some of the machinery companies.

### 3.6.13 Technological Trend of the Machinery Sector In The World

#### a) Production Technology

Today, robots are more widely used in the manufacturing of machinery all over the world. Activities in which robots have been utilised include,

i) Die casting
ii) Spot welding
iii) Arc welding
iv) Forging
v) Heat treatment
vi) Press transfer
vii) Machine tool loading
viii) Shell casting

According to some analysts, there will be 14,000 robots in use worldwide by 1990. Possibly by then, robots will have artificial "sight" and "touch". They are being developed now. Wider robot usage is predicted in areas such as welding and assembly.

TABLE 3.6.35

RESEARCH AND DEVELOPMENT POLICIES OF

SELECTED COMPANIES

| COMPANY | PRODUCTS | RESEARCH AND DEVELOPMENT ACTIVITIES |
|---|---|---|
| Syarikat Lee Industries | a) Air-cooled Diesel Engines<br>b) Concrete Mixer<br>c) Water pumps | a) 5 personnels<br>b) Annual allocation of 2% on Total Sales Value |
| Yanmar (M) Sdn. Bhd. | a) Stationery Diesel Engines<br>b) Marine Diesel Engines | None |
| Howard Alat Pertanian Sdn. Bhd. | a) Agricultural machinery | a) 2 main personnels, 4 associates<br>b) no fixed regular allocation; allocation only when deemed necessary |
| Mah Cheok Pui Foundry | a) Woodworking machinery | None |
| Malaysian Guage And Tool Bhd. | a) Saw blades<br>b) Metal cutting tools<br>c) Electronic components | None |
| UMW Engineering Bhd. | a) Heavy Engineering | None |

In areas of metal forming, 4 different metal forming processes have been developed. They are,

i) Automatic open die forging
ii) Hot isostatic pressing
iii) Disc ring rolling
iv) Multi ram precision forging

These processes can work more effectively than the conventional forming in small batch production.

In machining technology, there have also been recent innovations. In the automation arena, numerically controlled metal-working machines have been introduced into the capital goods market. They are ran by a computer-generated punch types. They evolved as a result of the tediousness and diffculty encounted when performing quick and accurate metal cutting by traditional methods on smaller and finer tolerances machine parts.

Also, there has been the development of laser as a general engineering "machine tool". So far, the laser "machine tool" that has been developed is capable of tackling two dimensional work. The trend now is moving towards the development of laser tool for working on 3-D components. An example of laser machining center is the IMS 500. It is an integrated machining system for welding, drilling and cutting. In this single unit, the laser, CNC system and work chamber are combined together.

For manually operated machine, there has also been some innovations. An example is the machining cell complex. It has been developed to combine drilling, boring, milling and turning operations. It consists of 3 heads; each modularly designed to machine a work piece in every direction by changing the checking positions and the machining units. One of the heads can rotate at its column and pass the finished part to a measurement cell or the next machining complex. In this way, handling of workpieces becomes very simple and flexible without any special robots.

b) <u>Product Technology</u>

The keener competitiveness within the machinery industry has resulted in the production of higher efficient and lighter weight machines.

3.6.14 <u>Choice of Technology</u>

a) <u>Technology in Developed Countries</u>

In attempting to strive towards greater competitiveness, companies in developed countries have gone for capital intensive-labour saving technology. For example , the application of machinery centres, which can be controlled by a single computer, in the production process will enable each worker to produce thousands of identical products each day.

The economic basis for adopting labour-saving technology is also clear cut. In 1961, a man could do a job at the cost of US$3.80 per hour. Now, that cost is US$19.00. A robot could do the work uninterrupted for US$6.00 per hour.

Needless to say, there has been a higher degree of antomation in machinery production. Wider robot usage is expected in welding and assembly works.

b) Technology Choice Ir Malaysia

At present most of the production technology in use are operated manually. Table 3.6.36 shows a sample of companies at their level of automation.

Contrary to popular belief, the price of the production technology and the cost of labour are not the two main factors determining the choice of technology. Table 3.6.37 reveals that firms generally consider the required product quality and the volume of annual production as the two most important factors when selecting technology. The other equally important factors are raw material cost and the firm's familiarity with the technology.

TABLE 3.6.36

LEVEL OF AUTOMATION IN THE MANUFACTURING PROCESS

| COMPANY | FULLY AUTOMATED MANUFACTURING PROCESSES | AUTOMATED MATERIAL HANDLING | COMPUTER CONTROLLED MACHINES | MANUALLY OPERATED MACHINES |
|---|---|---|---|---|
| <u>Engines and Turbines</u> | | | | |
| Syarikat Lee Industries Sendirian Berhad | x | x | x | x |
| Yanmar (M) Sendirian Berhad | | | | x |
| <u>Agricultural Machinery</u> | | | | |
| Howard Alat Pertanian Sendirian Berhad | | | | |
| <u>Metal and Woodworking Machiner</u> | | | | |
| Mah Cheok Pui Foundary | | | | x |
| Malaysian Gauge & Tool Bhd | | | | x |
| <u>Material Handling Machinery</u> | | | | |
| UMW Engineering Berhad | | | | x |

# TABLE 3.6.37

## FACTORS DETERMINING THE CHOICE OF TECHNOLOGY

| FACTORS | PERCENTAGE OF FIRMS WHICH CONSIDER FACTORS AS : QUITE IMPORTANT | | VERY IMPORTANT | |
|---|---|---|---|---|
| | UNWEIGHED | WEIGHED | UNWEIGHED | WEIGHED |
| 1. QUALITY OF THE PRODUCT | 16.8 | 11.8 | 65.9 | 73.1 |
| 2. VOLUME OF ANNUAL PRODUCTION | 25.3 | 16.6 | 56.7 | 58.2 |
| 3. RAW MATERIAL COSTS | 20.7 | 28.3 | 43.9 | 36.2 |
| 4. PRICE OF THE MACHINES | 29.9 | 23.8 | 39.9 | 36.5 |
| 5. FAMILIARITY WITH A TECHNOLOGY FROM EXPERIENCE IN OTHER COUNTRIES | 20.4 | 23.2 | 27.4 | 35.6 |
| 6. LABOUR COSTS | 26.8 | 25.5 | 31.1 | 24.9 |
| 7. AVERAGE BATCH SIZE OF PRODUCTION RUN | 27.4 | 21.3 | 27.7 | 22.5 |
| 8. INTEREST ON CAPITAL | 23.8 | 21.6 | 23.6 | 14.6 |
| 9. USAGE OF TECHNOLOGY BY COMPETITOR | 20.1 | 14.9 | 14.0 | 19.2 |
| 10. TRADE MARK OF EQUIPMENT | 19.5 | 27.4 | 7.3 | 6.3 |
| 11. ELIMINATION OF LABOUR FOR OTHER REASONS THAN LABOUR COSTS | 30.1 | 17.7 | 9.1 | 11.5 |
| 12. OTHER FACTORS | 0.6 | 0.2 | 4.6 | 15.6 |

SOURCE : HOFFMAN, L & TAN, S.E. (1980), INDUSTRIAL GROWTH, EMPLOYMENT & FOREIGN INVESTMENT IN PENINSULAR MALAYSIA

FIGURE 3.6.9

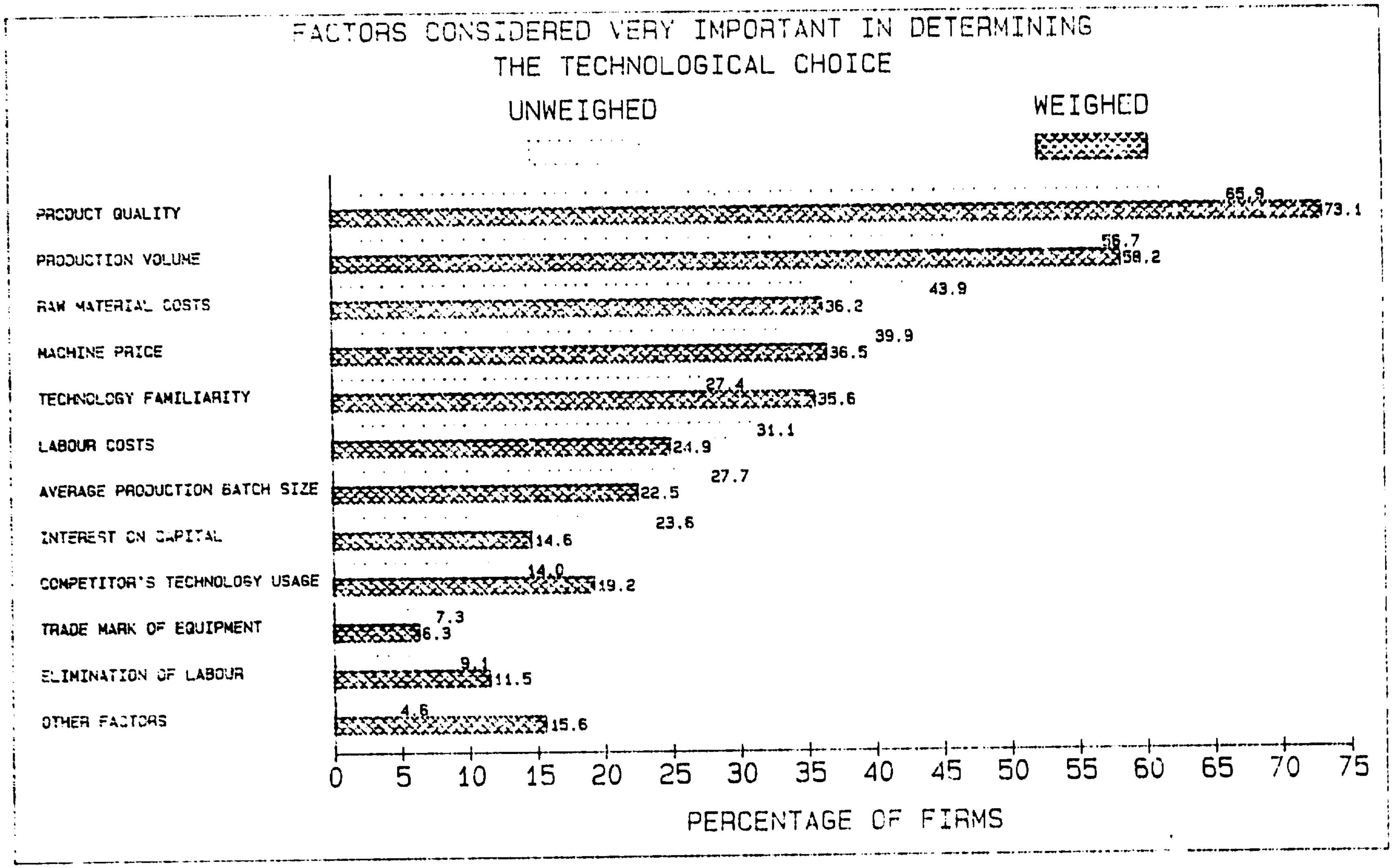
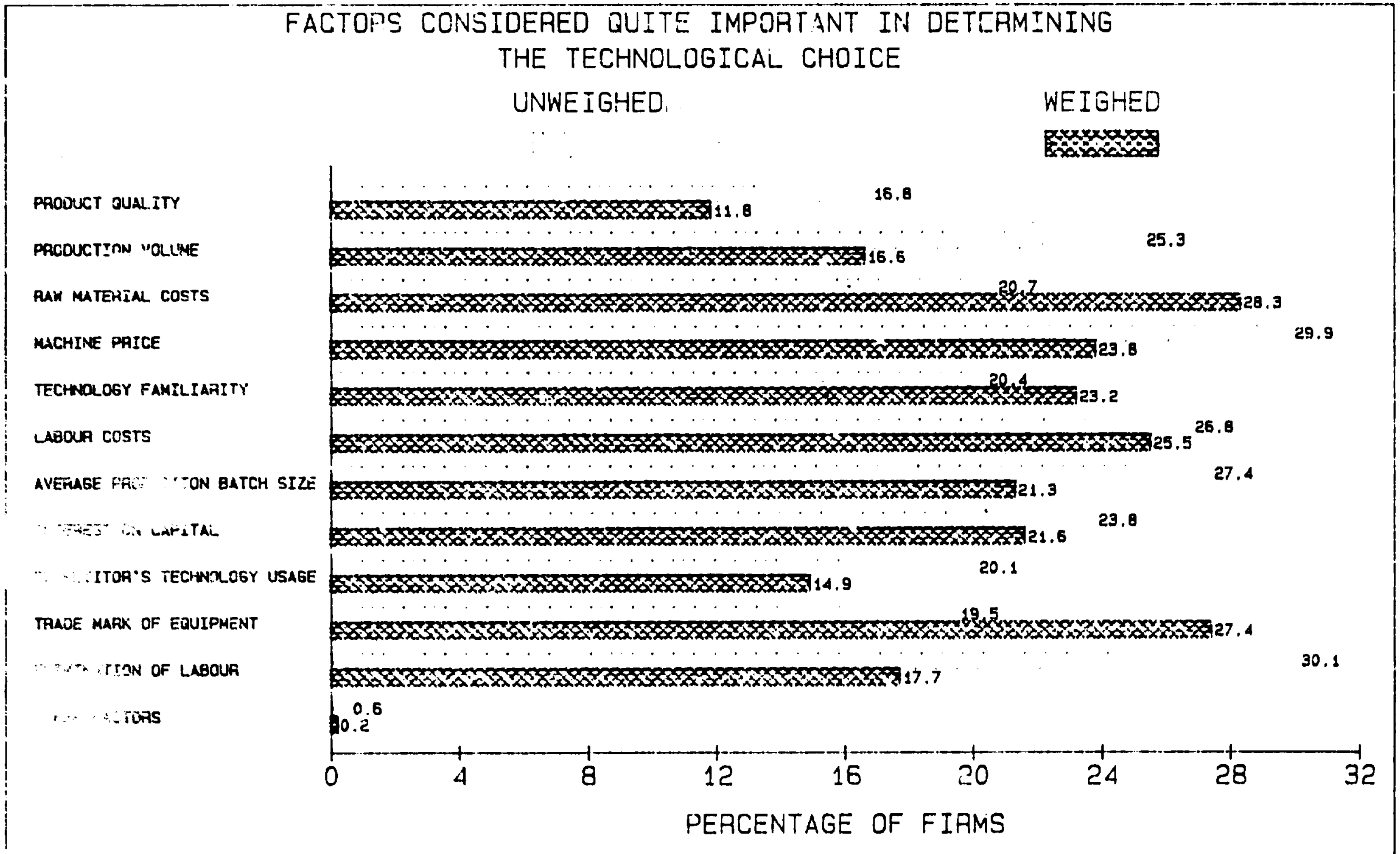

FACTORS CONSIDERED VERY IMPORTANT IN DETERMINING
THE TECHNOLOGICAL CHOICE
UNWEIGHED
WEIGHED
PRODUCT QUALITY
65.9
73.1
PRODUCTION VOLUME
56.7
58.2
RAW MATERIAL COSTS
43.9
36.2
MACHINE PRICE
39.9
36.5
TECHNOLOGY FAMILIARITY
27.4
35.6
LABOUR COSTS
31.1
24.9
AVERAGE PRODUCTION BATCH SIZE
27.7
22.5
INTEREST ON CAPITAL
23.6
14.6
COMPETITOR'S TECHNOLOGY USAGE
14.0
19.2
TRADE MARK OF EQUIPMENT
7.3
6.3
ELIMINATION OF LABOUR
9.1
11.5
OTHER FACTORS
4.6
15.6
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
PERCENTAGE OF FIRMS

FIGURE 3.6.10




111.211

3.6.15 Transfer of Technology

In many ways, the choice of technology is also dependent on the available range of technology on offer. To that extent where there is an association with foreign companies, the range of technology made available to the local companies is necessarily limited to what the foreign firms are prepared to offer.

a) Means of Technology Transfer

At present, there is a heavy reliance on foreign production and product design technology. The technology is acquired by the local firms in various ways. They include,

i) Direct purchase

ii) Making study of imported finished products and experimentation

iii) Business joint venture

iv) Employment of expatriates, foreign experts and consultants.

b) Local and Foreign Companies

Table 3.6.38 and Table 3.6.39 show the nature of technology transfer. In the machinery sector, the most common means of technology acquisition is via licences. However, this is commonly related to product

## TABLE 3.6.38

### THE TRANSFER OF TECHNOLOGY BY SELECTED INDUSTRIES

| | PERCENTAGE OF FIRMS IMPORTING TECHNOLOGY THROUGH | | | |
|---|---|---|---|---|
| | LICENCES | FOREIGN PERSONNEL | TECHNICAL CO-OPERATION AGREEMENTS | [illegible]GN RESEARCH |
| ALL FIRMS | 17.7 | 38.7 | 26.8 | 29.3 |
| | | | | |
| FOOD PRODUCTS | 25.0 | 60.7 | 32.1 | 42.9 |
| BEVERAGES | 40.0 | 60.0 | 50.0 | 40.0 |
| TEXTILES | 5.9 | 64.7 | 5.9 | 23.5 |
| PAPER PRODUCTS | - | 40.0 | 40.0 | 20.0 |
| CHEMICALS | 20.0 | 40.0 | 40.0 | 40.0 |
| CHEMICAL PRODUCTS | 25.0 | 62.5 | 43.8 | 62.5 |
| PETROLEUM PRODUCTS | 50.0 | 50.0 | 50.0 | 50.0 |
| PLASTIC PRODUCTS | 27.3 | 54.5 | 18.2 | 45.5 |
| EARTHENWARE | - | 50.0 | 25.0 | 50.0 |
| GLASS PRODUCTS | - | 66.7 | 33.3 | 33.3 |
| NM MINERAL PRODUCTS | 9.5 | 38.1 | 42.9 | 38.1 |
| STEEL | 7.1 | 50.0 | 42.9 | 35.7 |
| NF BASIC PRODUCTS | 50.0 | 75.0 | 25.0 | 100.0 |
| METAL PRODUCTS | 25.0 | 50.0 | 43.8 | 25.0 |
| MACHINERY | 62.5 | 50.0 | 50.0 | 37.5 |
| ELECTRICAL MACHINERY | 41.7 | 66.7 | 75.0 | 41.7 |
| TRANSPORT EQUIPMENT | 46.2 | 46.2 | 61.5 | 38.5 |

SOURCE : HOFFMAN, L & TAN, S.E. (1980), INDUSTRIAL GROWTH, EMPLOYMENT AND FOREIGN INVESTMENT IN PENINSULAR MALAYSIA

FIGURE 3.6.11

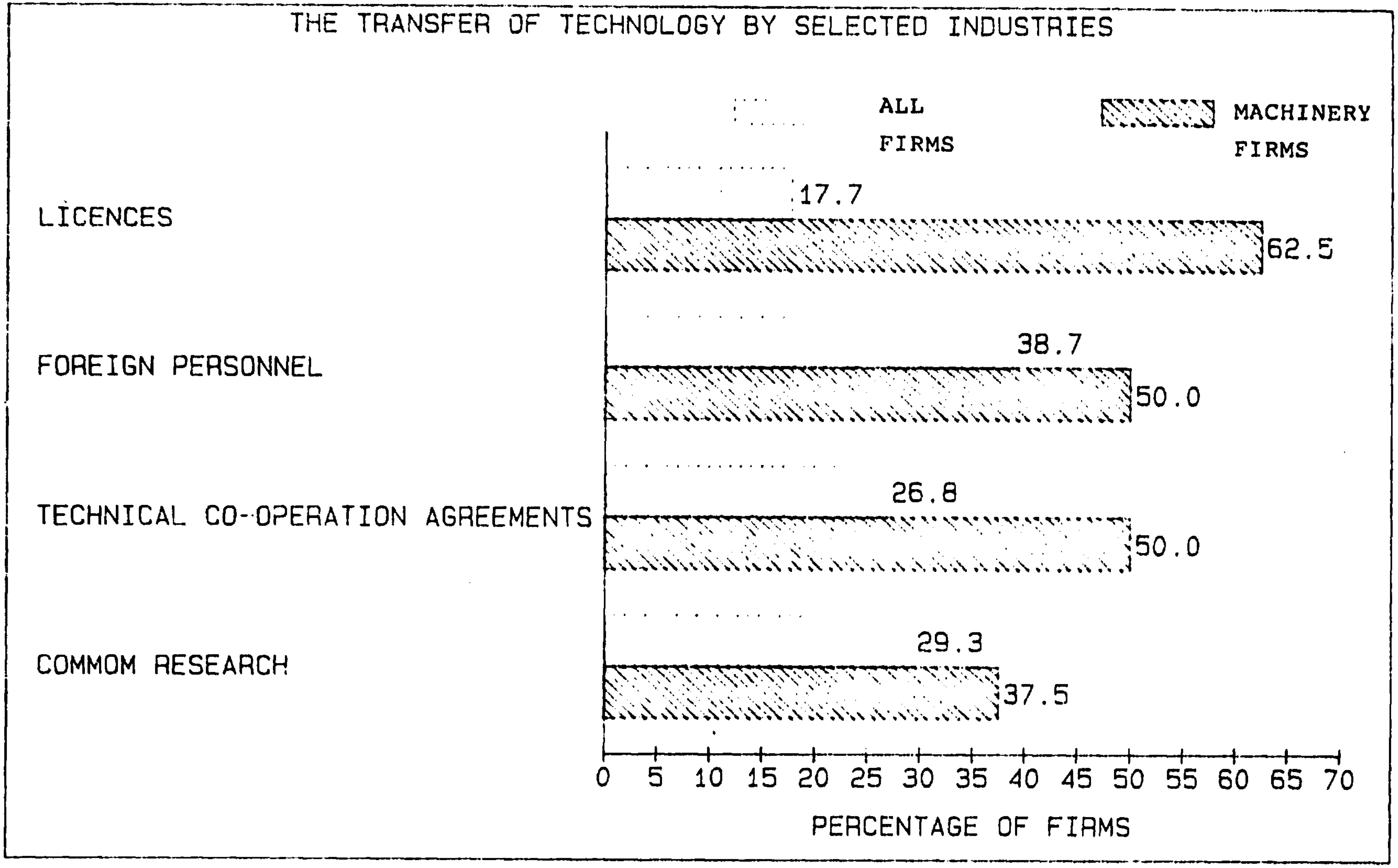

THE TRANSFER OF TECHNOLOGY BY SELECTED INDUSTRIES
ALL FIRMS
MACHINERY FIRMS
LICENCES
17.7
62.5
FOREIGN PERSONNEL
38.7
50.0
TECHNICAL CO-OPERATION AGREEMENTS
26.8
50.0
COMMOM RESEARCH
29.3
37.5
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70
PERCENTAGE OF FIRMS

TABLE 3.6.39

TECHNOLOGY TRANSFER AT MICRO LEVEL

| COMPANY | TECHNOLOGY TRANSFER |
|---|---|
| Syarikat Lee Industries Sdn. Berhad. | •Taiwanese and Japanese providing technical assistance (product design)<br>•Production Technology are imported from Japan & Taiwan<br>•Moulds are self-made |
| Yanmar (M) Sdn Berhad | •Products licencing agreements from Japan<br>•Technical collaboration in the localisation and assembly of diesel engines<br>•Royalty payment of 2% on sales to the Japanese<br>•Production technology imported from Japan<br>•Employment of 1 foreign engineer |
| Howard Alat Pertanian Sdn. Berhad | •Technical design know-how assistance from the Australians<br>•Technical production know-how assistance (evaluation of suitability of existing production Process for batch production from United Kingdom) |
| Mah Cheok Pui Foundry | •Relies on "copy-technology"<br>•Based its machinery design on imported ones and product brochures of wood-working machinery suppliers from England and Japan |
| Malaysian Gauge and Tool Berhad | •1 mechanical and 1 electrial engineers are based in Malaysia to provide technical assistance on production<br>•Technical design of the technology is imported from India<br>•Employment of 2 foreign engineers |
| UMW Engineering | •Product licensing agreements (Germany-Bonag; Japan - Komatzu; U.S.A -Peerless)<br>•Technical assistance in the form of manufacturing and design technology<br>•Royalty payment in the form of a lump sum |

licensing agreements rather than process licensing agreement. Joint research activity plays the least important role in technological diffusion. Often, the transfer of technology is facilitated by the association of the local company with the foreign investing company. In return, foreign companies receive financial payment in the form of a lump sum payment or a percentage royalty payment.

In addition, restrictive conditions are another important feature of technological transfer contracts. Within the machinery industry in Malaysia, a high percentage of local companies have conditional agreements related to purchases of know-how and prescribed pricing (Table 3.6.40) First, local firms are prohibited from purchasing know-how from sources other than the contract foreign companies. Secondly, there are 2 types of prescribed pricing. The local firms are required to sell their products at a prescribed selling prices. Alternatively, the local companies are required to buy input from the foreign companies. Certainly, the pricing policies will not work in the interest of the local company. The consequences can only be negative and reduce the competitiveness of the local firms. Hence, although a higher proportion of the machinery firms were able to acquire technology from abroad as compared to the manufacturing sector as a whole, this benefits had been nullified by the highly restrictive conditions. In fact, the

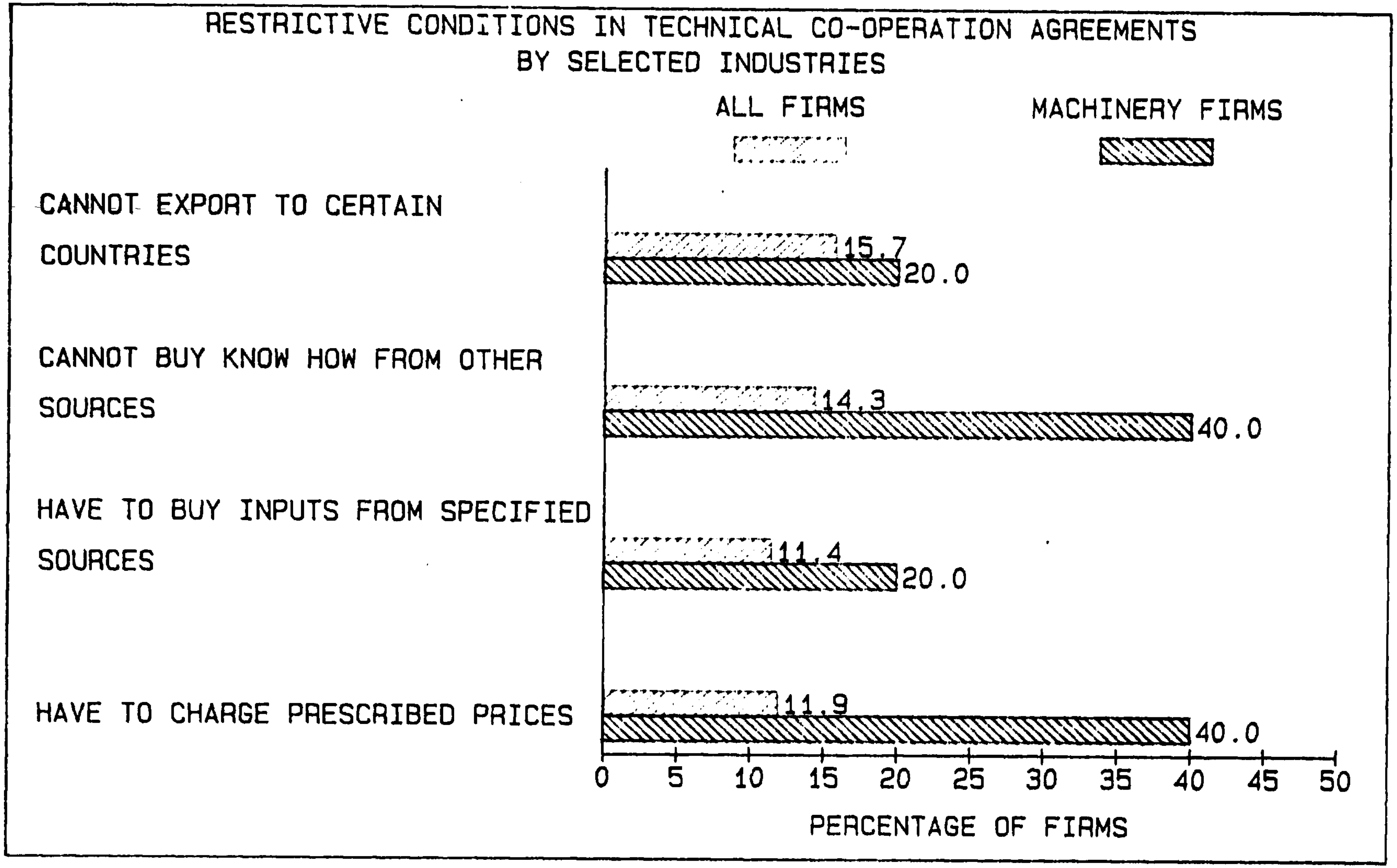
TABLE 3.6.40

RESTRICTIVE CONDITIONS IN TECNNICAL CO-OPERATION AGREEMENTS BY SELECTED INDUSTRIES

| | PERCENTAGE OF FIRMS WITH TECHNICAL COOPERATION AGREEMENTS WHICH : | | | |
|---|---|---|---|---|
| | CANNOT EXPORT TO CERTAIN COUNTRIES | CANNOT BUY KNOW HOW FROM OTHER SOURCES | HAVE TO BUY INPUTS FROM SPECIFIED SOURCES | HAVE TO CHARGE PRESCRIBED PRICES |
| ALL FIRMS | 15.7 | 14.3 | 11.4 | 11.9 |
| | | | | |
| BEVERAGES | 25.0 | 37.5 | 37.5 | 37.5 |
| TOBACCO PRODUCTS | 100.0 | - | - | - |
| LEATHER PRODUCTS | - | 100.0 | - | 100.0 |
| WOOD PRODUCTS | 11.1 | 22.2 | - | 11.1 |
| PRINTING & PUBLISHING | - | 18.2 | - | - |
| CHEMICAL PRODUCTS | 42.9 | 21.4 | 28.6 | 7.1 |
| PETROLEUM PRODUCTS | 50.0 | - | - | 50.0 |
| PLASTIC PRODUCTS | 33.3 | 50.0 | 16.7 | 16.7 |
| NM MINERAL PRODUCTS | 16.7 | 8.3 | 8.3 | 16.7 |
| STEEL | 12.5 | 12.5 | 25.0 | 12.5 |
| NF BASIC PRODUCTS | - | 25.0 | - | - |
| METAL PRODUCTS | 27.3 | 18.2 | 18.2 | - |
| MACHINERY | 20.0 | 40.0 | 20.0 | 40.0 |
| ELECTRICAL MACHINERY | 9.1 | 27.3 | 18.2 | 9.1 |
| TRANSPORT EQUIPMENT | 36.4 | 27.3 | 54.5 | 27.3 |

SOURCE : HOFFMAN, L & TAN, S.E. (1980), INDUSTRIAL GROWTH, EMPLOYMENT & FOREIGN INVESTMENT IN PENINSULAR MALAYSIA

FIGURE 3.6.12


RESTRICTIVE CONDITIONS IN TECHNICAL CO-OPERATION AGREEMENTS
BY SELECTED INDUSTRIES
ALL FIRMS
MACHINERY FIRMS
CANNOT EXPORT TO CERTAIN COUNTRIES
15.7
20.0
CANNOT BUY KNOW HOW FROM OTHER SOURCES
14.3
40.0
HAVE TO BUY INPUTS FROM SPECIFIED SOURCES
11.4
20.0
HAVE TO CHARGE PRESCRIBED PRICES
11.9
40.0
0
5
10
15
20
25
30
35
40
45
50
PERCENTAGE OF FIRMS

incidence of restrictive practices on the machinery firms is much higher than the manufacturing sector.

c) Independent Local Companies

Further down the line are companies which do not have any formal technical assistance from overseas. They rely on "copy-technology", imitating similar imported machinery and whenever necessary, modifying the design to suit local needs. The machinery design is based on imported product as well as product brochures. Naturally, the products will be less sophisticated.

### 3.6.16 Effectiveness of Technology Transfer

a) Theoretical Aspect

At the theoretical level, the design and production technology can be spread to indigenous technicians and managers who are employed by the foreign related enterprises or to local subcontractors. But, whether there has been effective cransfer of technological know-how is open to question.

Two possible models of technological diffusion may be advocated - Model A and Model B (Lynsu Kim, 1980).

MODEL A

Stage I : Foreign-related enterprises, the major assemblers, import foreign technology.

Stage II : Technology is transferred to local small-scale firms which subcontract the production of parts or the provision of special manufacturing services.

Stage III : Local sub-contractors grow up to become independent modern enterprises.

Stage IV : The later specialised either in the production of parts and components or in the provision of special fabricating and/or processing services, or both

MODEL B

Stage I : Foreign-related enterprises, the assemblers of imported parts and components, brought in "packaged" foreign technology.

Stage II : Indigenous technicians and managers are being trained in the foreign-related enterprises.

Stage III : Design and production technologies are spread to local newcomers via the movement of the above skilled labour force from the foreign-related enterprises.

Stage IV : Domestic production of parts and components also expands.

Stage V : Indigenous enterprises attempt at localising, research, development and engineering activities (specific kinds of "unpacked" technology are still imported).

Stage VI : Improvement on the performance of foreign technology.

## Technology Transfer in Practice

It is difficult to assess the effectiveness of the technology transfer in the machinery sector. This is primarily due to 2 main factors:

- uncooperative attitude of the machinery companies;

- lack of documentation.

However, a 1976 research project entitled "A study of Ancillary Firm Development in Asian Countries" commissioned by the Council for Asian Manpower Studies may shed some light to this matter. The report, which investigates into the metal-working or machine-building industry in East and Southeast Asia (including the experience of Malaysia), makes the following conclusions.

a) Theoretical models of technology transfer have not been quite support- by empirical evidence.

b) Little domestic transfer of technology has taken place

Perhaps, it is time for policy makers to realise that technology transfer is not merely a transfer of the physical aspect of the technology. In the final analysis, it is the transfer of technological know-how which is the crux of the matter.

## 3.7 Inter-Industry Linkage

### 3.7.1 Introduction

The inter-industry linkage structure between the Machinery sector and other sectors in the national economy as well as the rest of the world can be estimated by using the 1975 international Input-Output Table for ASEAN countries.

The characteristic of the machinery sector can also be described in terms of the proportions of its input bought from local and foreign industries as well as in terms of output sold to local and foreign industries and consumers as intermediate product and final product.

However, a word of caution need to be mentioned at this juncture. The analysis of the Input-Output Table is based on 24 sectors only, which provides a broad definition of machinery. The definition covers both electrical and non-electrical goods. The 56 sectors study is not referred to for analysis because of various reasons. First, the definition of machinery is still quite general and there is no detail breakdown of the various categories of machinery for a proper study. Secondly, the 56 sectors study is too inconsistent and incomplete to carry out a detail study of linkages. It does not provide information on the multiplier effect and the backward and forward linkages. Because of these factors, the subsequent analysis of the linkages should be read with caution.

### 3.7.2 Input of the Machinery Sector

The manufacturing of machinery requires not only physical input such as intermediate equipment, materials and component parts, but also non-physical input like labour, facilities and services. Table 3.7.1 shows that the total cost of input from the domestic economy and abroad constituted about 65% of the total output value in 1975. Of the input cost, about 53% of the input was derived domestically in the form of inter-industry purchases from other sectors. Another 42% of the cost was made up of payments for imported equipment, materials and parts, while 4.2% was paid out in the form of import duties and taxes, about 1.2% went to freight and insurance payments.

Hence, 2 main points can be made from these observations. First, the input structure of the local machinery industry was dependent on imports. Japan and the United States of America formed the bulk of the suppliers. Second, local input come mainly from the machinery, metal products, construction, and trade and transport sectors. And third, about half the total input cost is used to purchase intermediate input for the machinery sector.

The other component of the product value is made up of value added. It accounted for about 35 per cent of the output value. Of these, wages and salaries took up about 30% while operating surplus and depreciation another 64%. The remainder went to net indirect taxes.

TABLE 3.7.1

INPUT STRUCTURE OF MALAYSIA SECTOR, MALAYSIA 1975

| Code No | Sectors | Input Table (US$) | Coefficients |
|---|---|---|---|
| | A. Input From Local Sectors | | |
| AM 004 | Forestry | 90 | 0 |
| AM 007 | Other mining | 4 | 0 |
| AM 009 | Textile, leather & its products | 1,961 | 0.004 |
| AM 010 | Lumber & wodden products | 6,491 | 0.013 |
| AM 011 | Pulp, paper & printing | 2,654 | 0.005 |
| AM 012 | Chemical Products | 4,216 | 0.008 |
| AM 013 | Petroleum & its products | 6,483 | 0.01? |
| AM 014 | Rubber products | 6,486 | 0.013 |
| AM 015 | Non-metallic mineral products | 2,965 | 0.006 |
| AM 016 | Metal products | 38,739 | 0.075 |
| AM 017 | Machinery | 44,829 | 0.086 |
| AM 018 | Transport equipment | 1,1478 | 0.002 |
| AM 019 | Other Manufacturing products | 3,505a | 0.007 |
| AM 020 | Electricity, gas & motor supply | 6,959 | 0.013 |
| AM 021 | Construction | 3,216 | 0.006 |
| AM 022 | Trade & Transport | 33,635 | 0.065 |
| AM 023 | Services | 14,537 | 0.028 |
| AM 290 | Sub-Total | 177,917 | 0.343 |
| | B. Imports | | |
| AI 290 | Sub-total Indonesia | 400 | 0.001 |
| AP 290 | Sub-total Philippines | 160 | 0 |
| AS 290 | Sub-total Singapore | 15,825 | 0.031 |
| AT 290 | Sub-total Thailand | 848 | 0.00? |
| AJ 290 | Sub-total Japan | 43,511 | 0.084 |
| AU 290 | Sub-total USA | 25,943 | 0.050 |
| CW 290 | Import elsewhere | 53,323 | 0.103 |
| | Sub-Total Imports | 140,450 | 0.27? |
| BF 001 | C. Freight & insurance | 4,094 | 0.008 |
| DT 001 | D. Import duties & tax | 13,926 | 0.027 |
| ET 290 | Grand Total Input Cost | 336,387 | 0.648 |
| | F. Value Added | | |
| VV 301 | Wage & salary | 54,170 | 0.104 |
| VV 302 | Operating surplus | 98,844 | 0.190 |
| VV 303 | Depreciation | 17,611 | 0.034 |
| VV 304 | Indirect taxes less subsidies | 12,318 | 0.024 |
| VV 309 | Value Added Total | 182,943 | 0.35? |
| XX 600 | Total Output Value | 519,330 | 1.000 |

Source : Institute of Developing Economies, Input-Output Table for ASEAN Countries, Japan 1982.

### 3.7.3 Cross-country Comparison of Input Structure

Table 3.7.2 shows the input profile of various countries. It can be seen that all the selected reference countries, except for Indonesia, had higher domestic input coefficients than Malaysia. Its input form the local metal products and from within the machinery industry itself was lower than Japan, United States of America, Korea, Philippines and Singapore. It only surpassed those of Thailand and Indonesia. The low coefficient suggests a relatively unintegrated industry and undeveloped ancillary activities.

It can also be seen that import input coefficient for the machinery industry in Malaysia was relatively high. In the case of developed countries like Japan and United States of America, their import input coefficients were below 0.05. In the case of Malaysia, the coefficient was about 0.27. This implied a heavy drain to the foreign exchange resources of the country.

Another distinctive feature of the machinery sector of developed countries, like Japan and United States of America, is that their services industry play a significant role in their input structures as compared to the other countries. This may be attributed to the capital intensiveness of their production activities. Such circumstances entail greater degree of servicing activities like maintenance and repair works. Also, it can be observed that Malaysia had relatively lower input from the metal product and machinery sectors as opposed to the developed

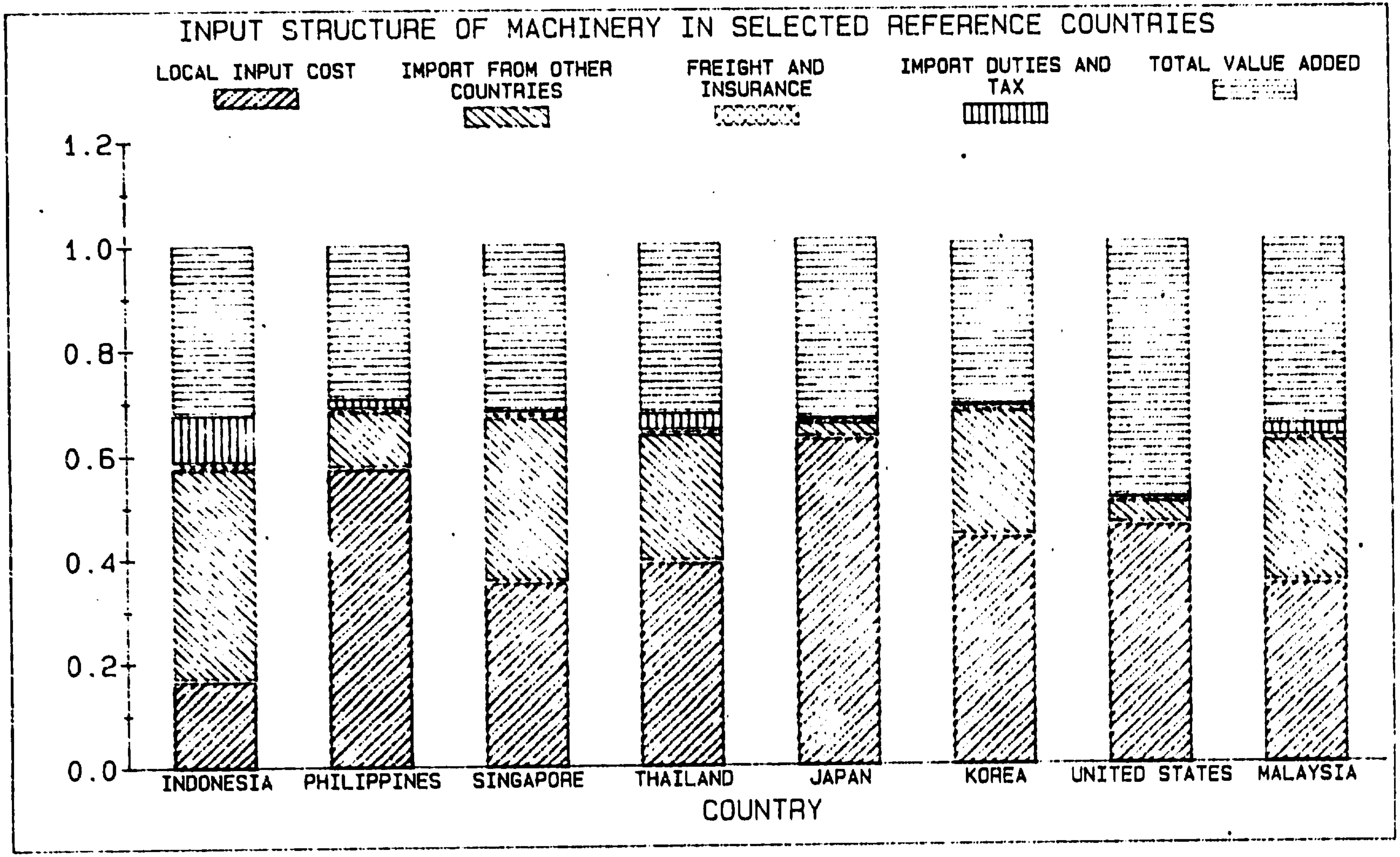
TABLE 3.7.2

INPUT STRUCTURE OF MACHINERY IN SELECTED REFERENCE COUNTRIES

| CODE NUMBER | SECTORS | INDONESIA | PHILIPPINES | SINGAPORE | THAILAND | JAPAN | KOREA | U.S.A. | MALAYSIA |
|---|---|---|---|---|---|---|---|---|---|
| 007 | OTHER MINING | 0.001 | 0.064 | - | - | - | 0.002 | 0.001 | 0 |
| 010 | LUMBER AND WOODEN PRODUCTS | 0.002 | 0.005 | 0.008 | 0.005 | 0.007 | 0.006 | 0.003 | 0.013 |
| 013 | PETROLEUM AND PRODUCTS | 0.003 | 0.021 | 0 | 0.012 | 0.003 | 0.013 | 0.007 | 0.013 |
| 014 | RUBBER PRODUCTS | 0.001 | 0.004 | 0.005 | 0.005 | 0.004 | 0.005 | 0.004 | 0.013 |
| 015 | NON METALLIC MINERAL PRODUCTS | 0.001 | 0.004 | 0,008 | 0.011 | 0.007 | 0.006 | [illegible] | 0.006 |
| 016 | METAL PRODUCT | 0.015 | 0.123 | 0.026 | 0.051 | 0.137 | 0.118 | 0.125 | 0.075 |
| 017 | MACHINERY | 0.015 | 0.106 | 0.170 | 0.088 | 0.257 | 0.126 | 0.172 | 0.086 |
| 020 | ELECTRICITY, GAS AND WATER SUPPLY | 0.007 | 0.007 | 0 | 0.012 | 0.008 | 0.011 | 0.007 | 0.013 |
| 022 | TRADE AND TRANSPORT | 0.083 | 0.143 | 0.126 | 0.135 | 0.060 | 0.078 | 0.038 | 0.065 |
| 023 | SERVICES | 0.018 | 0.049 | 0.004 | 0.025 | 0.104 | 0.036 | 0.059 | 0.028 |
| 290 | SUB-TOTAL (LOCAL INPUT COST) | 0.163 | 0.572 | 0.352 | 0.388 | 0.625 | 0.435 | 0.456 | 0.343 |
| 290S | IMPORT FROM OTHER COUNTRIES | 0.407 | 0.107 | 0.314 | 0.245 | 0.029 | 0.240 | 0.044 | 0.271 |
| BF001 | FREIGHT AND INSURANCE | 0.013 | 0.005 | 0.011 | 0.008 | 0.001 | 0.006 | 0.001 | 0.008 |
| DT001 | IMPORT DUTIES AND TAX | 0.093 | 0.022 | 0.002 | 0.035 | 0.001 | 0.010 | 0.003 | 0.027 |
| VV301 | WAGES AND SALARY | 0.073 | 0.080 | 0.321 | 0.087 | 0.226 | 0.103 | 0.383 | 0.104 |
| VV302 | OPERATING SURPLUS | 0.188 | 0.141 | - | 0.181 | 0.069 | 0.104 | 0.113 | 0.190 |
| VV303 | DEPRECIATION | 0.036 | 0.058 | - | 0.036 | 0.040 | 0.034 | - | 0.034 |
| VV304 | INDIRECT TAXES LESS SUBSIDIES | 0.027 | 0.015 | - | 0.021 | 0.017 | 0.067 | - | 0.024 |
| VV309 | TOTAL VALUE ADDED | 0.324 | 0.294 | 0.321 | 0.324 | 0.352 | 0.308 | 0.496 | 0.352 |

SOURCE : INSTITUTE OF DEVELOPING ECONOMIES INPUT-OUTPUT TABLE FOR ASEAN COUNTRIES, JAPAN, 1982

Figure 3.7.1




Source : Derived from Table 3.7.2

countries. This implies low backward linkages for the machinery sector. This observation is upheld in the subsequent linkage analysis.

In addition, the machinery sector in Malaysia, like other reference countries, had a higher contribution to the value added made by operation surplus than wages and salaries when compared to Japan and the United States of America. This suggests that the local machinery sector had relatively profitable manufacturing activities and that the labour force employed was predominantly less-skilled than the Japanese and American counterparts.

### 3.7.4 Output of the Machinery Sector

Output of the machinery sector is illustrated in Table 3.7.3. The data suggests that the sector was dependent on exports for its revenue generation and that there was limited domestic demand for its output. Only 44% of the industry output was absorbed by local demand, 11% of the output was used as intermediate goods by other sectors of the economy and 33% as end products for final demand.

Exports accounted for slightly more than half the total output of the machinery sector. The bulk of the foreign demand comprised of final products consumption.

Overall, the output of the machinery sector in terms of intermediate goods and end products were at least 23% and 65% of total output respectively.

TABLE 3.7.3

OUTPUT STRUCTURE OF MACHINERY SECTOR, MALAYSIA 1975

| Code No. | Sectors | Input Table (US$) | Input Table (Co-efficient) |
|---|---|---|---|
| | **A. Output For Local Sectors** | | |
| AM 001 | Paddy | 106 | 0 |
| AM 002 | Other agriculture | 259 | 0.001 |
| AM 003 | Livestock | 34 | 0 |
| AM 004 | Forestry | 302 | 0.001 |
| AM 005 | Fishery | 74 | 0 |
| AM 007 | Other Mining | 416 | 0.001 |
| AM 008 | Food, beverage and tobacco | 669 | 0.001 |
| AM 009 | Textile, leather & it products | 165 | 0 |
| AM 010 | Lumber & wooden products | 217 | 0 |
| AM 011 | Pulp, paper & printing | 181 | 0 |
| AM 012 | Chemical products | 54 | 0 |
| AM 013 | Petroleum & its products | 285 | 0.001 |
| AM 014 | Rubber products | 302 | 0.001 |
| AM 015 | Non-metallic mineral products | 497 | 0.001 |
| AM 016 | Metal products | 802 | 0.002 |
| AM 017 | Machinery | 44,829 | 0.086 |
| AM 018 | Transport equipment | 1,586 | 0.004 |
| AM 019 | Other manufacturing products | 652 | 0.001 |
| AM 020 | Electricity, gas & water supply | 1,347 | 0.003 |
| AM 021 | Construction | 1,474 | 0.003 |
| AM 022 | Trade & Transport | 670 | 0.001 |
| AM 023 | Services | 2,754 | 0.005 |
| AM 290 | Sub-Total Of Intermediate Goods | 58,275 | 0.112 |
| | **B. Export Of Intermediate Goods** | | |
| AI 290 | Sub-total Indonesia | 540 | 0.001 |
| AP 290 | Sub-total Philippines | 39 | 0 |
| AS 290 | Sub-total Singapore | 10,755 | 0.021 |
| AT 290 | Sub-total Thailand | 1,166 | 0.002 |
| AJ 290 | Sub-total Japan | 4,992 | 0.010 |
| AK 290 | Sub-total Korea | 14 | |
| AU 290 | Sub-total USA | 45,213 | 0.087 |
| | Sub-Total Export of Intermediate Goods | 62,719 | 0.121 |
| ET 290 | Grand Total of Intermediate Output | 120,994 | 0.233 |
| | **C. Exports Of Final Goods** | | |
| FI 309 | Sub-total, final demand, Indonesia | 1,531 | 0.003 |
| FM 309 | Sub-Total, Final demand, Malaysia | 172,580 | 0.332 |
| FM 309 | Sub-total, final demand, Philippines | 905 | 0.002 |
| FS 309 | Sub-total, final demand, Singapore | 13,565 | 0.026 |
| FT 309 | Sub-total, final demand, Thailand | 6,562 | 0.013 |
| FJ 309 | Sub-total, final demand, Japan | 12,330 | 0.024 |
| FK 309 | Sub-total, final demand, Korea | 36 | 0 |
| FU 309 | Sub-total, final demand, U.S.A. | 128,946 | 0.248 |
| GW 320 | Export to rest of world | 69,499 | 0.134 |
| | Grant Total Of Final Output | 405,954 | 0.782 |
| HX 400 | Change in In-transit stock | -7,618 | -0.015 |
| XX 600 | Total output | 519,330 | 1.000 |

Source : Institute of Developing Economics, Input-Output Table for ASEAN Countries, Japan, 1982

These observations suggest that the machinery sector in Malaysia is,

a) as dependent on exports as on domestic market for its revenue generation.

b) characterised by limited intermediate goods production. The industry is engaged predominantly in assembling activity.

However, the observation in (a) is not really reflective of the machinery sector that is being studied in this report. The analysis of the sources of growth of the local machinery sector (engines and turbines industry, agricultural machinery industry, metal and woodworking machinery industry and machinery and equipment n.e.c. industry) suggests that the domestic market provided the main impetus for growth. This difference in observations can be attributed to the broad defination of machinery employed in the input-output study. The observation was distorted by the inclusion of electrical machinery in the defination. It is well known that Malaysia is not only the second largest exporter of semi-conductors to the United States, but also the largest exporter of air-conditioners in the world.

### 3.7.5 Cross-country Comparison of Output Structure

The status of the output structure of the Machinery sector in Malaysia is compared with some selected reference countries in Table 3.7.4.

TABLE 3.7.4

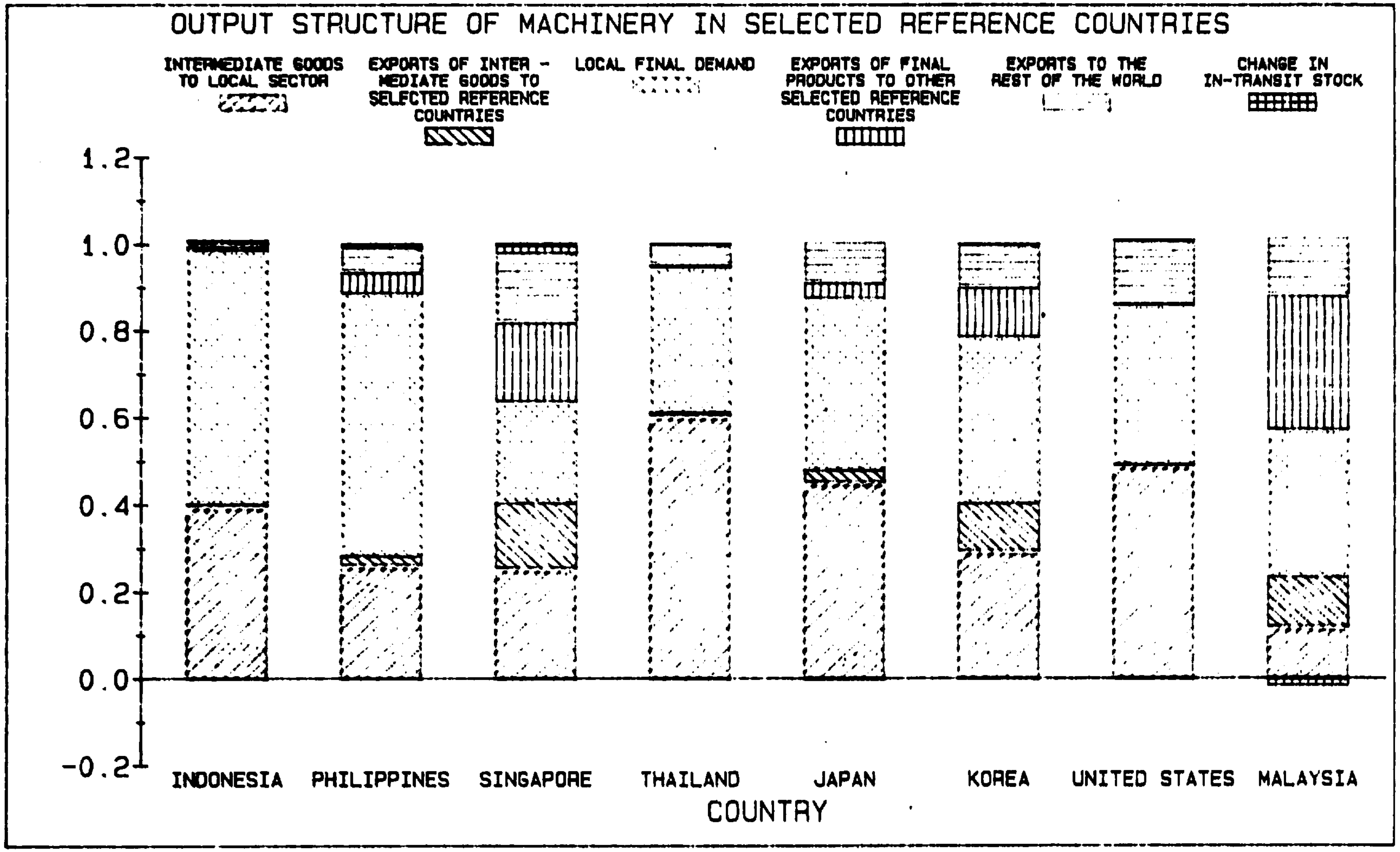
OUTPUT STRUCTURE OF MACHINERY IN SELECTED REFERENCE COUNTRIES

| CODE NUMBER | SECTORS | INDONESIA | PHILIPPINES | SINGAPORE | THAILAND | JAPAN | KOREA | U.S.A. | MALAYSIA |
|---|---|---|---|---|---|---|---|---|---|
| 016 | METAL PRODUCTS | 0.010 | 0.002 | 0 | 0.019 | 0.009 | 0.007 | 0.040 | 0.002 |
| 017 | MACHINERY | 0.015 | 0.106 | 0.170 | 0.005 | 0.257 | 0.126 | 0.172 | 0.086 |
| 018 | TRANSPORT EQUIPMENT | 0.025 | 0.006 | 0.002 | 0.078 | 0.063 | 0.024 | 0.070 | 0.004 |
| 019 | OTHER MANUFACTURING INDUSTRIES | 0.001 | 0.004 | 0 | 0.005 | 0.004 | 0.003 | 0.009 | 0.001 |
| 020 | ELECTRICITY, GAS AND WATER SUPPLY | 0.041 | 0.004 | 0 | 0.045 | 0.004 | 0.026 | 0.003 | 0.003 |
| 021 | CONSTRUCTION | 0.070 | 0.024 | 0.069 | 0.132 | 0.056 | 0.644 | 0.078 | 0.003 |
| 023 | SERVICES | 0.022 | 0.026 | 0.003 | 0.077 | 0.023 | 0.018 | 0.057 | 0.005 |
| 290 | SUB-TOTAL INTERMEDIATE GOODS TO LOCAL SECTOR | 0.390 | 0.255 | 0.248 | 0.597 | 0.445 | 0.287 | 0.483 | 0.112 |
| 290S | EXPORTS OF INTERMEDIATE GOODS TO OTHER SELECTED REFERENCE COUNTRIES * | 0.010 | 0.025 | 0.154 | 0.013 | 0.032 | 0.114 | 0.005 | 0.121 |
| F309 | LOCAL FINAL DEMAND | 0.579 | 0.599 | 0.229 | 0.329 | 0.391 | 0.377 | 0.363 | 0.332 |
| F309S | EXPORTS OF FINAL PRODUCTS TO OTHER SELECTED REFERENCE COUNTRIES * | 0.014 | 0.053 | 0.186 | 0.011 | 0.041 | 0.12 | 0.010 | 0.313 |
| GW320 | EXPORTS TO THE REST OF THE WORLD | 0.006 | 0.052 | 0.156 | 0.042 | 0.093 | 0.093 | 0.140 | 0.134 |
| HX400 | CHANGE IN IN-TRANSIT STOCK | 0 | 0.016 | 0.028 | 0.008 | -0.001 | 0.009 | 0 | -0.015 |

* REFERS TO INDONESIA, MALAYSIA, PHILIPPINES, SINGAPORE, THAILAND, JAPAN, KOREA, U.S.A.

SOURCE : INSTITUTE OF DEVELOPING ECONOMIES, INPUT -OUTPUT TABLE FOR ASEAN COUNTRIES, JAPAN, 1982

Figure 3.7.2




Source : Derived from Table 3.7.4

Generally, the local machinery sector had the lowest ratio of domestic demand to export of its output. This implies that the relatively higher dependence on export makes the machinery sector in Malaysia more vulnerable to fluctuations in the global economy. As mentioned earlier, the higher level of export was not attributed to the export of the machinery being studied but rather to the export of electrical machinery.

It also has the lowest ratio of intermediate goods to end products in its output composition as compared to other countries. Indeed, it has a very weak supporting industries.

### 3.7.6 Forward and Backward Linkages

#### a) Inter-sectoral Linkages Comparison

A comparative study of the forward and backward linkages of the various sectors within the local economy is illustrated in Table 3.7.5.

The nature of these linkages in the domestic machinery sector had changed substantially between 1970 and 1975. According to Hoffman and Tan, the coefficients for the backward and forward linkages were 0.897 and 1.083 respectively in 1970. However, the latest figures show a reversed trend. The backward linkage coefficient is 1.084 while the forward linkage coefficient 0.653. This implies that despite the rather weak

TABLE 3.7.5

BACKWARD AND FORWARD LINKAGES EFFECTS

FOR 1975

| Code No: | Sectors | Backward (X) | Forward (B) |
|---|---|---|---|
| AM 001 | Paddy | 0.763 | 0.667 |
| AM 002 | Other agriculture | 0.665 | 1.247 |
| AM 003 | Livestock | 0.900 | 0.664 |
| AM 004 | Forestry | 0.640 | 0.853 |
| AM 005 | Fishery | 0.650 | 0.586 |
| AM 006 | Crude petroleum & natural gas | 0.553 | 0.553 |
| AM 007 | Other mining | 0.651 | 0.884 |
| AM 008 | Food, beverage & tabacco | 1.070 | 1.236 |
| AM 009 | Textile, leather & its products | 1.124 | 0.818 |
| AM 010 | Lumber & Wooden products | 0.913 | 0.845 |
| AM 011 | Pulp, paper & printing | 0.983 | 0.712 |
| AM 012 | Chemical products | 1.141 | 0.789 |
| AM 013 | Petrolium & its products | 0.599 | 1.095 |
| AM 014 | Rubber products | 1.020 | 0.832 |
| AM 015 | Non-metallic mineral products | 0.916 | 0.733 |
| AM 016 | Metal products | 1.031 | 0.914 |
| AM 017 | Machinery | 1.084 | 0.653 |
| AM 018 | Transport equipment | 1.163 | 0.674 |
| AM 019 | Other manufacturing products | 0.858 | 0.658 |
| AM 020 | Electricity, gas & water supply | 0.888 | 0.717 |
| AM 021 | Construction | 1.197 | 0.661 |
| AM 022 | Trade & Transport | 0.793 | 1.376 |
| AM 023 | Services | 0.721 | 1.097 |
| AM 024 | Public Administration | 0.553 | 0.553 |
| AM 290 | Sub-total | 0.874 | 0.826 |

Source : Institute Of Developing Economies, Input-Output Table For ASEAN Countries, Japan 1982 ancillary network, the local machinery sector is moving towards purchasing relatively more intermediate input from local suppliers.

Nonetheless, the overall linkages of the machinery sector were low when compared to the construction, transport equipment, chemical products and textile, leather and its products sectors. While its backward linkages was high, its forward linkages is one of the lowest.

b) Cross-country Linkages Comparison

When compared to other countries, it will be observed that all the other selected reference countries except Indonesia, have higher overall linkage coefficients than Malaysia.

Table 3.7.6 shows the backward-forward linkages of the machinery sector of various selected reference countries. As expected, the machinery sectors of Japan and the United States of America had the highest linkage coefficients of (3.269 and 2.779 respectively). Newly industrialised countries like Korea and Singapore had the next highest linkage coefficients (2.138 and 2.043 respectively). The linkages of the machinery sector in Malaysia was comparatively underdeveloped. It had a relatively low linkage coefficient of 1.737.

TABLE 3.7.6

LINKAGE COEFFICIENT FOR MALAYSIA'S MACHINERY SECTOR AND OTHER SELECTED REFERENCE COUNTRIES, 1975

| | Machinery sector linkage coefficient | | | ALL | |
|---|---|---|---|---|---|
| Country | Total | Backward (X) | Forward (B) | X | B |
| Malaysia | 1.737 | 1.084 | 0.653 | 0.874 | 0.826 |
| Indonesia | 1.676 | 1.015 | 0.661 | 0.886 | 0.840 |
| Philippines | 1.887 | 1.216 | 0.671 | 0.952 | 0.867 |
| Singapore | 2.043 | 1.169 | 0.874 | 1.040 | 0.850 |
| Thailand | 1.923 | 1.105 | 0.818 | 0.910 | 0.850 |
| Japan | 3.269 | 1.360 | 0.909 | 1.159 | 1.559 |
| Korea | 2.138 | 1.328 | 0.810 | 1.075 | 0.925 |
| USA | 2.779 | 1,058 | 1.721 | 1.104 | 1.284 |

Source :Institute Of Developing Economies, Input-Output Table For ASEAN Countries, Japan 1982

### 3.7.7 Multiplier Effect

Table 3.7.7 shows the Inverse Table Coefficient for the machinery sector in Malaysia for 1975. This income multiplier is the overall direct and indirect effect on the economy of a dollar increase in final demand of machinery product. An overall multiplier coefficient of 1.96 for the sector was estimated. This meant that for every increase of $1 million of machinery sector output value, it had generated $1.96 million of total output value in the economy.

Of this, about $1.52 million was generated within the domestic economy; about $1.10 million within the local machinery sector itself, $0.10 million in the metal product sector, $0.09 million in the trade and transport sector, $0.05 million in the services sector and $0.03 million in the mining sector.

About $0.44 million was "leaked" out of the country in the form of import demand. It stimulated the income growth of $0.26 million and $0.12 million in the economies of Japan and United States of America respectively. Another $0.06 million went to Singapore. These three countries were the main beneficiaries from the machinery sector of Malaysia. This is to be expected as they were the main traders with the sector.

TABLE 3.7.7

INVERSE TABLE MULTPLIER FOR MACHINERY SECTOR, MALAYSIA 1975

| Code No. | Sectors | Coefficients |
|---|---|---|
| AM 001 | Paddy | 0 |
| AM 002 | Other agriculture | 0.009 |
| AM 003 | Livestock | 0.001 |
| AM 004 | Forestry | 0.006 |
| AM 005 | Fishery | 0 |
| AM 006 | Crude petroleum & natural gas | 0 |
| AM 007 | Other mining | 0.032 |
| AM 008 | Food, beverage & tabacco | 0.005 |
| AM 009 | Textile, leather & its products | 0.007 |
| AM 010 | Lumber & Wooden products | 0.017 |
| AM 011 | Pulp, paper & printing | 0.008 |
| AM 012 | Chemical products | 0.011 |
| AM 013 | Petrolium & its products | 0.028 |
| AM 014 | Rubber products | 0.016 |
| AM 015 | Non-metallic mineral products | 0.009 |
| AM 016 | Metal products | 0.097 |
| AM 017 | Machinery | 1.095 |
| AM 018 | Transport equipment | 0.004 |
| AM 019 | Other manufacturing products | 0.009 |
| AM 020 | Electricity, gas & water supply | 0.019 |
| AM 021 | Construction | 0.008 |
| AM 022 | Trade & Transport | 0.087 |
| AM 023 | Services | 0.049 |
| AM 290 | Sub-total | 1.518 |
| AI 290 | Sub-total Indonesia | 0.005 |
| AP 290 | Sub-total Philippines | 0.001 |
| AS 290 | Sub-total Singapore | 0.057 |
| AT 290 | Sub-total Thailand | 0.004 |
| AJ 290 | Sub-total Japan | 0.256 |
| AK 290 | Sub-total Korea | 0.001 |
| AU 290 | Sub-total U.S.A. | 0.118 |
| ET 290 | Grand total | 1.959 |

Source : Institute Of Developing Economics, Input-Output Table For ASEAN Countries, Japan 1982.

a) Inter-Sectoral Multipliers Comparison

Table 3.7.8 shows the multiplier effect of the various domestic sectors engaging in manufacturing activity. Despite having one of the highest overall multiplier effect in Malaysia, the machinery sector had the lowest multiplier effect on the domestic economy.

In 1975, the multiplier for the machinery sector in Malaysia registered a value of 1.96. This was high when compared to the multiplier of 1.79 estimated for the local manufacturing sector as a whole. However, in terms of the proportional multiplier effect on the country, the impact resulting from the expansion of the machinery sector was very low. Only 77% of the overall multiplier effect was absorbed locally. This was not only below the average of 87% for the manufacturing sector as a whole, it was also the lowest when compared to the various individual manufacturing sectors within the national economy.

b) Cross-Country Multipliers Comparison

When compared to other countries, the overall multiplier effect for the machinery sector in Malaysia was lower than overall average multiplier effect of 2.11 which was estimated for all the selected reference country. (Tables 3.7.8 and 3.7.9) As can also be

Table 3.7.8

INVERSE TABLE MULTIPLIER FOR MANUFACTURING SECTOR, 1975

| CODE | SECTORS | KOREA | | | JAPAN | | | U.S. | | | MALAYSIA | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (A) | (B) | A/B(100) | (A) | (B) | A/B(100) | (A) | (B) | A/B(100) | (A) | (B) | A/B(100) |
| 008 | Food, Beverage and Tobacco | 1,960 | 2,210 | 88.69 | 2,243 | 2,385 | 94.05 | 2,948 | 2,967 | 99.36 | 1,846 | 1,933 | 95.50 |
| 009 | Textile, Leather and Products their of | 2,209 | 2,703 | 81.72 | 2,416 | 2,504 | 96.49 | 2,074 | 2,107 | 98.43 | 1,628 | 2,031 | 80.16 |
| 010 | Lumber and Wooden Products | 1,541 | 2,275 | 67.74 | 2,123 | 2,314 | 91.75 | 1,887 | 1,905 | 99.06 | 1,579 | 1,649 | 95.76 |
| 011 | Pulp, Paper and Printing | 1,875 | 2,235 | 83.89 | 2,380 | 2,450 | 97.14 | 1,886 | 1,895 | 99.53 | 1,439 | 1,776 | 81.02 |
| 012 | Chemical Products | 1,837 | 2,355 | 78.00 | 2,404 | 2,488 | 96.62 | 1,971 | 1,987 | 99.19 | 1,776 | 2,062 | 86.13 |
| 013 | Petroleum and Its product | 1,231 | 1,312 | 93.83 | 1,294 | 1,450 | 89.24 | 2,476 | 2,490 | 99.44 | 1,060 | 1,082 | 97.97 |
| 014 | Rubber Products | 1,917 | 2,519 | 76.10 | 2,229 | 2,305 | 96.70 | 1,975 | 1,997 | 98.90 | 1,755 | 1,843 | 95.23 |
| 015 | Non-metallic Mineral Products | 1,886 | 2,021 | 93.32 | 2,124 | 2,187 | 97.12 | 1,868 | 1,879 | 99.41 | 1,492 | 1,655 | 90.15 |
| 016 | Metal Products | 2,091 | 2,846 | 73.47 | 2,561 | 2,626 | 97.52 | 2,099 | 2,144 | 97.90 | 1,712 | 1,863 | 91.89 |
| 017 | Machinery | 1,771 | 2,399 | 73.82 | 2,408 | 2,458 | 97.96 | 1,871 | 1,911 | 97.91 | 1,518 | 1,959 | 77.49 |
| 018 | Transport Equipment | 1,801 | 2,409 | 74.76 | 2,546 | 2,592 | 98.26 | 2,149 | 2,200 | 97.68 | 1,637 | 2,100 | 77.95 |
| 019 | Other Manufacturing Products | 1,919 | 2,413 | 79.53 | 2,341 | 2,394 | 97.79 | 1,825 | 1,848 | 98.76 | 1,304 | 1,549 | 84.18 |
| | Average Manufacturing | 1,837 | 2,308 | 80.41 | 2,256 | 2,346 | 95.88 | 2,086 | 2,111 | 98.80 | 1,562 | 1,792 | 87.79 |

Notes: (A) Within the National Economy
(B) Total multiplier effects inclusive of those 'leaked' out of the economy

Source: Institute of Developing Economies, Input-Output Table for ASEAN Countries, Japan, 1982.

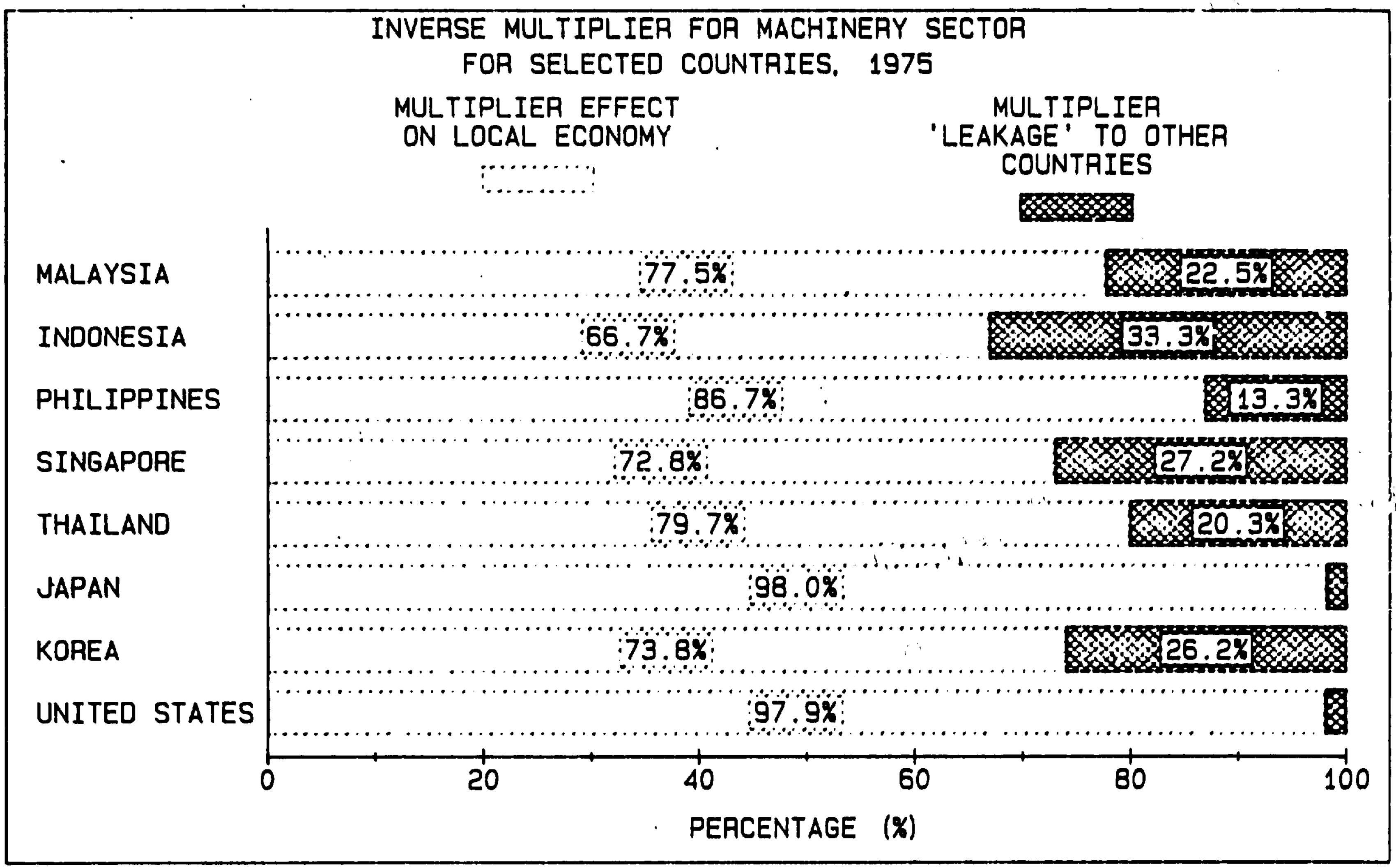
Table 3.7.9

INVERSE MULTIPLIER FOR MACHINERY SECTOR FOR SELECTED COUNTRIES, 1975

| CODE | SECTOR | COEFFICIENT | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MALAYSIA | INDONESIA | PHILIPPINES | SINGAPORE | THAILAND | JAPAN | KOREA | U.S. |
| 012 | CHEMICAL PRODUCTS | 0.011 | 0.005 | 0.035 | 0.005 | 0.022 | 0.040 | 0.035 | 0.029 |
| 013 | PETROLEUM AND ITS PRODUCTS | 0.028 | 0.006 | 0.055 | 0.006 | 0.034 | 0.049 | 0.046 | 0.020 |
| 016 | METAL PRODUCTS | 0.097 | 0.017 | 0.168 | 0.036 | 0.073 | 0.358 | 0.222 | 0.221 |
| 017 | MACHINERY | 1.095 | 1.016 | 1.120 | 1.205 | 1.102 | 1.356 | 1.149 | 1.226 |
| 019 | OTHER MANUFACTURING PRODUCTS | 0.009 | 0.005 | 0.017 | 0.002 | 0.014 | 0.042 | 0.012 | 0.022 |
| 022 | TRADE AND TRANSPORT | 0.086 | 0.095 | 0.230 | 0.176 | 0.176 | 0.145 | 0.134 | 0.081 |
| 023 | SERVICES | 0.049 | 0.028 | 0.104 | 0.045 | 0.050 | 0.258 | 0.072 | 0.145 |
| | OTHERS | 0.143 | 0.051 | 0.177 | 0.062 | 0.120 | 0.160 | 0.101 | 0.127 |
| 290 | LOCAL INDUSTRIES | 1.518 | 1.223 | 1.906 | 1.537 | 1.591 | 2.408 | 1.771 | 1.871 |
| 290 | LEAKAGE IN THE FORM OF IMPORTS | 0.441 | 0.611 | 0.292 | 0.575 | 0.405 | 0.050 | 0.629 | 0.040 |
| ET290 | TOTAL | 1.959 | 1.834 | 2.198 | 2.112 | 1.996 | 2.458 | 2.400 | 1.911 |

SOURCE : INSTITUTE OF DEVELOPING ECONOMIES, INPUT-OUTPUT TABLE FOR ASEAN COUNTRIES, JAPAN, 1982

Figure 3.7.3




Source: Derived from Table 3.7.9

observed, the local machinery had a slightly higher magnitude of multiplier effect than its counterpart in the United States.

Nonetheless, the proportional impact of the multiplier effect of the machinery sector in the local economy was comparable to that experienced by the other developing countries and NICs (Table 3.7.9). But when compared to the Japanese or American experiences, the domestic multiplier effects of the machinery sector in Malaysia was relatively insignificant. This is because while the Japanese and American had a multiplier leakage of 2% of their overall multiplier effect, the Malaysian counterpart experienced a loss of 23%.

## 3.8 Current Promotional Policies and Issues

### 3.8.1 Introduction

The objective of this section is to assess the effectiveness of the present system of policies and regulations which are designed to regulate and promote the development of the local machinery industry. The existing set of government policies and regulations have directly or indirectly affected the growth and development of the industry. The findings in this section will serve as a basis, where necessary, for the development of a new set of policies and programmes for the future.

Briefly, the present set of government regulations can be classified into.

a) Incentive Schemes
b) Special Ammenities and Facilities
c) Financial Facilities
d) Regulations
e) Taxation
f) Tariff Protection and Import Quota Restriction

Table 3.8.1 shows the range of policy instruments used for regulating the investment climate within the machinery industry in Malaysia. The list is only meant to be illustrative. Nonetheless, it provides a fairly comprehensive picture of the various schemes.

## TABLE 3.8.1

### GOVERMENT POLICY FOR PROMOTING AND REGULATING GOVERNMENT INDUSTRIAL DEVELOPMENT

| | |
|---|---|
| **A) Incentive Schemes** | |
| **Pioneering Incentive** | |
| Pioneer Status | (PS) |
| **Labour Oriented Incentives:** | |
| Labour Utilization Relief Incentive | (LUR) |
| Incentive for Training Manpower | (ITM) |
| **Investment Oriented Incentives:** | |
| Investment Tax Credit | (ITC) |
| Reinvestment Allowance | (RIA) |
| Accelerated Depreciation Allowance | (ADA) |
| Increased Capital Allowance | (ICA) |
| **R & D Oriented Incentives** | |
| Incentive for R & D | (IRD) |
| **Export Oriented Incentives:** | |
| Export Allowance | (EA) |
| Export Financing | (EF) |
| Accelerated Depreciation Allowance | (ADA) |
| Pre- and Post-shipment Preferential Duty Drawback on imported raw materials | |
| Export Financing | (PPEF) |
| Deduction for Promotion Overseas | (DPO) |
| Export Refinancing Facility | (ERF) |
| **Location Oriented Incentives** | |
| Locational Incentive | (LI) |
| **B) Special Ammenities and Facilities** | |
| Industrial Estates | |
| Free Trade Zone | |
| Licensed Manufacturing Warehouse | |
| SIRIM (R & D Suppport) | |
| **C) Financial Facilities** | |
| MIDF Loans | |
| CGC Loans | |
| SBL Loans | |
| **D) Regulations** | |
| Industrial Coordination Act | ICA |
| Manufacturing licensing approval | |
| Foreign Investment Control | FIC |
| Standards Specification | SIRIM |
| **E) Taxations** | |
| Sales Tax | |
| Surtax | |
| IMPORT/Export Duties | |
| **F) Tariff Protection and Import Quota Restriction** | |
| Tariff protection | |
| Import Licensing | |
| Exemption from import duties and surtax on raw materials, component parts or machinery drawback and/or refund of import duties/surtax paid | |

Our analysis of the effectiveness of various policies will center on the extent to which the various objectives have been achieved rather than the evaluation of each policy instrument. This is due to the nature of data presented. To begin with, the impact of the major policy instruments on the machinery industry will be reviewed first.

The analysis of the effectiveness of these policy instruments in the machinery industry will be discussed in relation to the following objectives:

- helping entrepreneurs to commence production
- creating demand
- promoting export
- helping create competitiveness
- increasing local content
- creating skilled labour
- developing technology
- increasing Bumiputera interest
- balancing regional dispersal
- promoting small scale firms

### 3.8.2 Investment Incentives Impact

Table 3.8.2 shows the total proposed capital investment according to the various incentives awarded to the machinery industry in Malaysia. Between 1970-1982, a total of $446.85 million capital investment has been proposed. This is about 3.5% of total proposed capital investment in the manufacturing sector.

TABLE 3.8.2

MALAYSIA : TOTAL PROPOSED CAPITAL INVESTMENT TO INCENTIVES MACHINERY SECTOR, 1970 - 1982 ( M $MILLION)

| MIC | INDUSTRY DESCRIPTION | PIONEER STATUS | INVESTMENT TAX CREDIT | LABOUR UTILIZATION RELIEF | LOCATIONAL INCENTIVE | ADA, ICA, IBA | TOTAL PROPOSED CAPITAL INVESTMENT GRANTED TAX INCENTIVES | PROPOSED CAPITAL INVESTMENT WITHOUT TAX INCENTIVES | TOTAL PROPOSED CAPITAL INVESTMENT |
|---|---|---|---|---|---|---|---|---|---|
| 38210 | MANUFACTURE OF ENGINES AND TURBINES | - | 1.73 | 8.76 | - | - | 10.49 | 0.80 | 11.29 |
| 38220 | MANUFACTURE OF AGRICULTURAL MACHINERY AND EQUIPMENT | 19.95 | 169.10 | - | - | - | 189.05 | 117.46 | 306.51 |
| 38230 | MANUFACTURE OF METAL AND WOOD WORKING MACHINERY | 2.60 | 6.54 | - | - | - | 9.14 | 5.50 | 14.64 |
| 38299 | MANUFACTURE OF MACHINERY AND EQUIPMENT, N.E.C. | 41.94 | 37.08 | 2.96 | - | - | 81.98 | 32.43 | 114.41 |
| TOTAL MACHINERY SECTOR | | 64.49 | 214.45 | 11.72 | - | - | 290.66 | 156.19 | 446.85 |
| TOTAL MANUFACTURING SECTOR | | 4,801.98 | 3,101.62 | 87.27 | 904.78 | 208.80 | 9,104.45 | 3,521.86 | 12,626.31 |
| % SHARE OF MACHINERY SECTOR IN THE TOTAL MANUFACTURING SECTOR | | 1.34 | 6.91 | 13.43 | 0.00 | 0.00 | 3.19 | 4.43 | 3.54 |

SOURCE : MIDA

However, the machinery industry has only 65.0% of its total investment granted tax incentives. This is lower than the manufacturing sector as a whole, which has about 72.1% of total manufacturing investment given tax incentives. At most, only 3.2 % of the total proposed capital investment granted incentives to the manufacturing sector was alloted to the machinery industry.

It can also be observed that about 73.8% of the total proposed capital investment of the machinery industry that was granted tax incentives took the forms of Investment Tax Credit. Projects listed under this incentive scheme are likely to be more capital intensive as the amount of incentive to be granted is dependent on the amount of capital invested (see Appendices 3.8.1 and 3.8.2). As can be observed, only about 4.0% of the investment granted tax incentives within the machinery industry was awarded labour utilisation relief.

About 14.4% of the total capital investment within the machinery was granted pioneer status. This pioneer industry programme discriminates against small firms and mainly benefits the large companies. As most of the firms in the machinery industry are small, they are precluded from a four-year tax exemption period which is meant for capital investment of more than $500,000.

There is no locational incentives, accelerated depreciation allowance, increased capital allowance and the like granted to the machinery industry.

In short, the machinery industry enjoys low level of investment incentives as compared to the manufacturing sector as a whole. Where these incentives have been granted, they mainly benefited the larger companies.

3.8.3 Taxation

Table 3.8.3 illustrates the various duties and taxes levied on the products of the machinery industry. In 1984, a uniform tax of 10% sales tax was imposed on all the products of the machinery industry. Generally, there has not been any export duty or surtax levied on these products. However, some of the machinery are subjected to import duty. They include engines and some agricultural machinery. The duties imposed vary from 5% to 25%. Given that the machinery industry has much potential for import-substitution, the impact of these taxes on the industry deserves more detail discussions.

3.8.4 Protection of the Machinery Sector

Among the various types of incentives, tariff protection can be considered as the most important for industries producing primarily for the local market. The relative impact of tariff protection and tax incentives on the inducement of foreign investors both in Malaysia and other developing countries has been studied before (for example, see Edwards [1975, page 45-46]). While tax incentives can increase a firm's profits at a certain fixed price and cost, protection can alter

TABLE 3.8.3

NON ELECTRICAL MACHINERY PRODUCTS : IMPORT DUTIES, EXPORT DUTIES, SURTAX, SALES TAX, 1984

| SELECTED PRODUCTS | UNIT OF QUANTITY | IMPORT DUTY | EXPORT DUTY | SURTAX | SALES TAX |
|---|---|---|---|---|---|
| TURBINES | NO. | NIL | NIL | NIL | 10% |
| ENGINES | NO. | 5% | NIL | NIL | 10% |
| OUTBOARD MARINE ENGINES | NO. | 5% | NIL | NIL | 10% |
| MARINE ENGINES NOT EXCEEDING 7.5 KW BUT NOT 40 KW | NO. | NIL | NIL | NIL | 10% |
| MECHANICAL SHOVELS AND EXCAVATORS | NO. | 25% | NIL | NIL | 10% |
| PLOUGHS | NO. | NIL | NIL | NIL | 10% |
| SCARIFIERS, CULTIVATING, WEEDERS | NO. | NIL | NIL | NIL | 10% |
| COMBINED HARVESTER THRESHERS | NO. | 15% | NIL | NIL | 10% |
| LATHES | NO. | NIL | NIL | NIL | 10% |
| WOOD WORKING MACHINE TOOLS | NO. | NIL | NIL | NIL | 10% |

SOURCE : TRADE CLASSIFICATION AND CUSTOM TARIFF 1978, INCORPORATING ALL AMENDMENTS UP TO JULY 1984 the boundaries of the profit margin by allowing for an increase in price or a reduction in cost or both. Thus, tariff protection can have much greater effect on profit-after-tax than tax incentives. In fact, tariff protection is more beneficial than tax holidays for the average import-substituting industry.

Tariff protection can be of two types. Nominal tariff protection reflects the extent of protections given to a final product while the effective tariff protection measures the level of protection given to the production process in terms of inputs, component parts and end products.

Table 3.8.4 summarises the nominal protection rates and the effective protection rates.

### 3.8.5 Nominal Tariff Protection Rates

The nominal tariff protection rate is a measure of the domestic price effect brought about by policy instrument or instruments. A nominal tariff is the difference between the price of an imported good and the price an equivalent local good brought about by the policy instruments.

As observed from the table, the nominal protection rates for the machinery industry fluctuates substantially. Over the years, only wood and metal-working machinery and equipment n.e.c. received increased protection. Nonetheless, the overall protection rates for the Machinery Sector, except for the machinery and equipment n.e.c., have been minimal. In 1982, the rates ranged from 0.8 to 2.7%. The latest information on the

TABLE 3.8.4

NOMINAL AND EFFECTIVE TARIFF PROTECTION RATES IN THE NON ELECTRICAL MACHINERY SECTOR, MALAYSIA, 1970 - 1982

| MIC | INDUSTRY DESCRIPTION | NOMINAL PROTECTION RATE (%) | | | | EFFECTIVE RATE OF PROTECTION (%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1970 | 1974 | 1979 | 1982 | 1970 | | 1974 | | 1979 | | 1982 | |
| | | | | | | C | B | C | B | C | B | C | B |
| 38210 | MANUFACTURE OF ENGINES AND TURBINES | [illegible] | 2 | 1.1 | 1.1 | 8 | 8 | -1.6 | -2 | 58 | 62 | -6 | -7 |
| 38220 | MANUFACTURE OF AGRICULTURAL MACHINERY AND EQUIPMENT | 0 | 2 | 0.8 | 0.8 | -9 | -9 | -1.8 | -2 | -8 | -8 | -4 | -4 |
| 38230 | MANUFACTURE OF METAL AND WOODWORKING MACHINERY | 2 | 2 | 2.7 | 2.7 | 8 | 8 | -1.6 | -2 | -6 | -6 | -9 | -10 |
| 38299 | MANUFACTURE OF MACHINERY & EQUIPMENT N.E.C. | 2 | 23.8 | N.A. | N.A. | 8 | 8 | 25.4 | 26.6 | N.A. | N.A. | N.A. | N.A. |

NOTE : C = CORDEN'S METHOD; B = BALASSA'S METHOD

SOURCE : K.A.M. ARIFF, "PROTECTION FOR MANUFACTURES IN PENINSULA MALAYSIA" IN HITOTSUBASHI JOURNAL OF ECNOMICS, FEB 1975, ECONOMIC PLANNING UNIT, MALAYSIA,
AUTHOR'S CALCULATIONS BASED ON BASIC DATA FROM DEPARTMENT OF STATISTICS, MALAYSIA

machinery and equipment n.e.c. sector suggests a relatively high nominal protection rate of about 24%.

Despite this, the nominal protection received by the machinery industry is relatively low when compared with the manufacturing sector as a whole. In 1970, the manufacturing sector received a 25% nominal rate of protection. In 1974-1979, this has increased substantially to about 34%.

### 3.8.6 Effective Rates of Protection

The Effective Protection Rate is an estimate of the assistance to the value added of a particular product or industry. It reflects the combined effects of nominal tariffs on the products as well as on its inputs. Positive values imply that the local producer is able to "price" his value added at a certain percentage higher than the "international" c.i.f. supply price. Values between 0 and -100, imply that the industry is a disadvantaged industry. Values lower than -100 suggest an activity which would not make commercial sense in an unprotected environment, and probably, an extremely high level of assistance.

The effective rates of protection has been calculated based on two methods - Balassa's method and Corden's method. The Balassa approach attempts to study effective protection by relating value added per unit of output in the protection situation to value added in the free trade situation. However, in Corden's approach the non-traded inputs have also been included into the valued added. Table 3.8.4 shows the Effective Protection Rates of the Machinery industry.

The machinery industry is generally a disadvantaged industry. In the early 1970s, all the sectors (except the agricultural machinery and equipment sector) had net positive ERPs. But, the level of protection granted to the industry is generally low. In the 1980s, the trend has changed somewhat. All the sectors have negative ERP values. This implies that the machinery sector has been discriminated against. It implies that the tariff on the input of the machinery industry clearly outweights the benefit, in terms of protection on final output enjoyed by the manufacturers. Nonetheless, there are variations within the industry.

The engines and turbines sector experienced a brief spell of very high protection (in 1979) before being made disadvantaged by the higher tax on input relative to output. The agricultural machinery and equipment sector had been improving its performance (-9% to -4% between 1970 and 1982). In the case of the metal and wood-working machinery, the sector's positive performance had been slowly eroded and increasingly disadvantaged. The machinery and equipment n.e.c. sector is an exception within the machinery industry. The latest data (1970-1974) suggests an increased level of protection. In 1974, it was able to "price" its value added at about 26% above the "international" c.i.f. supply price.

Compared to the tariff protection granted by various governments to the machinery industry, it can be observed that the tariff protection given to the machinery industry in Malaysia is below the average tariff rate of the ASEAN countries (Table 3.8.5). It is lower than that of Philippines, Thailand and Indonesia. In the case of Philippines, the protection rates have actually increased (except for the machinery and equipment n.e.c.) over the years (Table 3.8.6).

In short, the machinery industry requires minimal protection and assistance within a stipulated period for further development. Nonetheless, the sectors are not dependent on extremely high protection level to survive at the moment. However, this does not mean that radical measures (like banning of imports) can not be consider as an option when formulating development policies. The present disadvantaged position of the machinery industry as compared to the manufacturing sector as a whole (ERP for 1982 is 14.7%) certainly deserve its due attention from politicians and policy makers.

### 3.8.7 Protection Rates and Comparative Advantage

The effective protection rates of the machinery industry can also be compared with the comparative advantage indices. The difference between EPR and DRC index is that the former measures the relative level of protection and incentives given to the sectors while the latter measures the degree of efficient utilisation of local resources. The net low protection granted to the machinery sector did

TABLE 3.8.5

COMPARISONS OF SIMPLE AVERAGES OF TARIFF RATES IN ASEAN COUNTRIES, 1978

| CATEGORY/SECTOR | INDONESIA | MALAYSIA | PHILIPPINES | SINGAPORE | THAILAND | ASEAN |
|---|---|---|---|---|---|---|
| 1. BUILDING MATERIALS | 37.9 | 14.9 | 52.0 | 0.4 | 32.0 | 27.4 |
| 2. NON ELECTRICAL MACHINERIES | 18.0 | 10.7 | 23.0 | 1.4 | 18.0 | 14.2 |
| 3. TRANSPORT EQUIPMENT | 18.0 | 10.0 | 23.0 | 1.5 | 18.0 | 14.0 |

SOURCE : PHILIPPINES TARIFF COMMISSION (1979)

TABLE 3.8.6

NOMINAL AND EFFECTIVE PROTECTION RATES OF THE NON-ELECTRICAL MACHINERY SECTOR , PHILIPPINES, 1969-1985

| Industry | Nominal Rate of Protection | | | Effective Rate of Protection | | |
|---|---|---|---|---|---|---|
| | 1969 | 1974 | 1980 | 1969 | 1974 | 1980 |
| Manufacture of Engines & Turbines | 26 | 18 | 30 | 7 | 7 | 18 |
| Agricultural Machinery & Equipment | 23 | 22 | | 18 | 14 | 27 |
| Metal & Wood Working Machinery | 21 | 13 | | 3 | 4 | 16 |
| Machinery & Equipment nec. | 25 | 29 | | 36 | 27 | 13 |

Source: Bautista, "Industrial Promotion Policies in the Phillipines" Chapter 1, and Special Papers, Chapter 5 not help the sector particularly when it did not enjoy comparative advantage. The potential harm is that the local manufactured product will price itself out of the market. This is attributed to the inability of the sector to reap economies of scale.

All the three industries which were disadvantaged had comparative disadvantage (refer Table 3.9.14). However, all these had shown some improvement on their inefficient positions over the years. Policy formulation should therefore be geared towards the further improvement on their efficient. Only the machinery and equipment n.e.c. industry, which had indicated relatively efficient utilisation of resources, enjoyed comparative advantage.

### 3.8.8 Investment Credit

The machinery industry as a whole has received low level of loan financing from both the private commercial banks and the government sector. Table 3.8.7 shows the trend of the machinery industry share of total loans allocated in the economy from 1973 to 1982.

a) Machinery Industry Share of Loans

The allocation of loan to the machinery industry is low. The share of loan finance of the machinery industry has been fluctuating between 0.5% and 3.9% . The trend appears to be cyclical, peaking after every three-years interval. The relative high percentage shares were found in 1973, 1977

TABLE 3.8.7

DISTRIBUTIONS OF LOANS BY INDUSTRY (PER CENT), 1973 - 1982

| INDUSTRIES | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 |
|---|---|---|---|---|---|---|---|---|---|---|
| Food Manufacturing | 14.61 | 9.86 | 20.09 | 17.17 | 26.85 | 26.76 | 2.81 | 12.43 | 6.89 | 2.69 |
| Tabaccos | - | - | 0.09 | - | 1.28 | 0.90 | 1.22 | 0.16 | 1.38 | 2.69 |
| Textile & textile products | 54.46 | 22.79 | 7.77 | 3.45 | 3.21 | 4.11 | 2.29 | 2.35 | 1.77 | 0.39 |
| Leather & Leather Products | 0.59 | 0.22 | 0.11 | 0.18 | 1.07 | 0.26 | 0.09 | 0.05 | 0.06 | 0.09 |
| Wood & wood products | 2.79 | 1.87 | 5.70 | 9.08 | 8.46 | 5.38 | 1.95 | 5.12 | 5.24 | 4.45 |
| Furniture & Fixture | 0.02 | 0.35 | 0.37 | 0.21 | 0.84 | 2.06 | 0.02 | 0.57 | 0.22 | 0.25 |
| Paper Printing and Publishing | 0.40 | 2.29 | 39.90 | 16.66 | 1.35 | 0.78 | 0.23 | 1.56 | 4.87 | 0.06 |
| Chemical & chemical products | 4.00 | 14.57 | 3.91 | 15.35 | 22.74 | 6.22 | 0.89 | 10.70 | 8.27 | 36.72 |
| Petroluem & Coal | 0.00 | 0.00 | - | - | 0.38 | 0.23 | 60.96 | 3.62 | 1.03 | 5.01 |
| Rubber Products | 1.02 | 1.75 | 0.80 | 2.82 | 5.81 | 5.96 | 1.30 | 6.14 | 3.21 | 0.92 |
| Plastic Products | 1.63 | 0.64 | 0.88 | 0.96 | 1.24 | 1.62 | 0.48 | 1.67 | 1.13 | 0.54 |
| Non-Metallic mineral Products | 3.57 | 8.87 | 7.16 | 3.10 | 6.69 | 6.78 | 10.83 | 17.68 | 35.71 | 6.80 |
| Basic Metal Products | 1.90 | 2.44 | 3.02 | 3.54 | 0.82 | 4.62 | 5.64 | 16.92 | 12.39 | 21.28 |
| Fabricated metal Products | 0.92 | 3.33 | 1.16 | 4.62 | 1.96 | 15.81 | 3.52 | 2.86 | 1.83 | 1.74 |
| Machinery Manufacturing | 2.15 | 0.84 | 0.81 | 1.56 | 3.89 | 1.94 | 0.46 | 1.19 | 2.55 | 1.38 |
| Electrical and Electronics Products | 7.30 | 8.82 | 3.75 | 3.11 | 5.39 | 12.76 | 4.71 | 13.36 | 4.14 | 2.93 |
| Transport Equipments | 0.50 | 11.17 | 3.27 | 3.96 | 4.40 | 1.02 | 0.51 | 0.43 | 4.01 | 2.88 |
| Scientific and Measuring equipment | 1.84 | 0.23 | 0.06 | 0.26 | 0.25 | 0.12 | 0.14 | 0.86 | 0.14 | 0.1 |
| Miscellaneous | 1.03 | 2.46 | 0.53 | 0.38 | 0.99 | 0.62 | 0.20 | 1.93 | 0.09 | 0.46 |
| Hotel and Tourist Complex | 1.27 | 7.50 | 0.62 | 18.59 | 2.38 | 2.05 | 1.75 | 0.37 | 5.09 | 10.04 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Source: MIDA Annual Reports, various issues and 1981. In 1982, the machinery industry share of total loan has dropped to 1.4% from 2.6% in 1981. In monetary terms, this loan has been reduced from $128.2 million to $120.2 million.

b) Loan-value added ratio.

When the loan allocation is compared to the value added of the various industries, it can be observed that there has been misallocation of resources. Tables 3.8.8 and 3.8.9 shows the loan allocated per ringgit value added to the machinery industry.

Table 3.8.8 shows the composition of loan-value added ratio of each sector within the machinery industry. In 1970, only the machinery and equipment n.e.c. sector received credit facilities. From 1975 onwards, the sectors which were awarded credit incentives extended to the manufacturing of agricultural machinery, and metal and wood-working machinery. There was no allocation of loans for the engines and turbines manufacturers through out the 1970s and early 1980s. In 1982, the metal and wood-working machinery manufacturers were also not granted any credit facilities.

On average, Table 3.8.9 shows that loan allocated to the machinery industry was about 16% of its value added. This is low when compared to the manufacturing sector as a whole. The latter was allocated loan at about 25% of its value added.

TABLE 3.8.8

CREDIT INCENTIVES: NON-ELECTRICAL MACHINERY SECTOR, MALAYSIA
LOAN PER RINGGIT VALUE ADDED

| MIC | DESCRIPTION | 1970 | 1973 | 1975 | 1979 | 1982 |
|---|---|---|---|---|---|---|
| 38210 | Manufacture of engines and turbines | - | - | - | - | - |
| 38220 | Manufacture of agricultural machinery and equipment | - | - | 0.033 | 0.299 | 0.107 |
| 38230 | Manufacture of metal & wood working machinery | - | 0.070 | 0.042 | 0.117 | - |
| 38240 | Manufacture of special industrial machinery & equipment except metal wood working machinery | - | 1.374 | - | 0.115 | 0.630 |
| 38291 | Manufacture of refrigerating exhaust ventilating and air-conditioning machinery | - | - | 0.102 | 0.021 | 0.004 |
| 38299 | Machinery and equipment nec | 0.033 | 0.004 | 0.041 | 0.008 | 0.136 |

Source : Calculated from data provided by MIDA

TABLE 3.8.9

LOAN PER RINGGIT VALUE ADDED IN THE NON-ELECTRICAL MACHINERY SECTOR, MALAYSIA

| | 1973 | 1976 | 1978 | 1981 | Average |
|---|---|---|---|---|---|
| Total Loan Facilities (in $ million) | 14.4 | 11.9 | 12.5 | 79.1 | |
| Value Added (in $ million) | 87.242 | 76.082 | 153.873 | 323.129 | |
| Loan per ringgit value added in Non-electrical Machinery sector | 0.165 | 0.146 | 0.080 | 0.245 | 0.16 |
| Loan per ringgit value added in the manufacturing Sector | 0.325 | 0.207 | 0.121 | 0.348 | 0.25 |

Source : MIDA Annual Report, various years; Survey of Industries, various years, Statistics Department.

Cross-country comparison with South Korea also suggests a very low investment credit allocation to the Malaysian machinery industry. The machinery industry of South Korea was awarded loans to a magnitude of about 190% of the value added. This is about 12 times as much as what their Malaysian counterpart received.

### 3.8.9 Effectiveness of Various Incentives and Regulatory Policy Instruments

### 3.8.10 Differentiation of Incentive Impacts by Product Group

Appendices 3.8.4 and 3.8.5 show the list of industries and products which are to be promoted. Within the machinery sector, the industries and products encouraged for establishment in Malaysia encompass all types of manufacturing. More specifically, they include the manufacturing of ball bearings, machine tools, tooling (including dies and moulds), wood-working tools and power driven handtools. Investment opportunities are provided for joint ventures producing for exports.

However, when it comes to priority products, the range of machinery to be emphasised in these categories have been narrowed in recent years. According to the 1970 official gazette, all the different types of industrial machinery, inclusive of ball bearing and machine tools, had been identified as priority products for development. But in 1975, only machine tools and power driven hand tools received further emphasis. Indeed, the list of targetted products have been reduced. In addition, they are also oriented towards the export market.

As can be observed in previous sections, the incidence of machinery firms receiving incentives had been generally low. Indeed, the effect of this national incentive structure on the machinery sector needs to be critically evaluated at this juncture and a fresh perspective towards the machinery sector needs to be adopted.

### 3.8.11 Helping Entrepreneurs to Commence Production

The commencement of production is a function of numerous variables. This include factors such as licensing approval, adequate financing, industrial land and infrastructure facilities. Of these various factors, manufacturing licensing approval is the least important obstacle to the commencement of an enterprise. As most of the machinery manufacturing firms are small, they do not have to apply for manufacturing licences from MIDA. Under the present industrial regulation, enterprises with capital investment of more than $250,000 have to apply to MIDA to seek approval for manufacturing activities.

However, although MIDA is responsible for the promotion and co-ordination of industrial development in Malaysia, its power is limited. This is particularly so with respect to ensuring adequate financing, industrial land and infrastructure facilities for industrial development. Some of these factors are beyond the control of MIDA. One such example has been the values of industrial land. On average, the price of industrial land had increased by at least 11 percent from $90.50 per square metre in 1982 to about $100.60 per square metre in 1983 (see Appendix 3.8.6). On the other hand, there are also bottlenecks which are the consequences of the coordination problem faced by MIDA vis-a-vis various federal governmental authorities; departments and agencies, as well as local state authorities. These have resulted in the occasional occurrences of plants delaying their production activities as a result of for example, the lack of essential facilities. Other problems faced by investors include the different regulations of the various state authorities. Occasionally, over zealous bureaucrats had imposed additional requirements to those specified under the ICA.

In addition, lack of information can be a hindrance to potential investors. This is particularly true with the machinery industry. Information on Government policies and procedures, investment opportunities, production statistics and market statistics are essential for stimulating industrial development.

### 3.8.12 Creating Domestic Demand

Though the machinery industry is supposedly well protected, particularly the component part manufacturing industry, it does not appear to be so in practice. Two observations can be made with respect to the present domestic market for machinery and equipment. First, there is still a large market for imported machinery and equipment. And second, the imported goods are still relatively cheaper than local produce.

This has resulted in the excess production capacity experienced by firms manufacturing the product locally. Firstly, the tariff on imports are not sufficiently high enough to stimulate local demand for the locally manufactured machinery and equipment. Secondly, the local firms are not operating efficiently. And finally, the quality of the locally produced machinery and equipment is not compatible with foreign imports. Indeed, a three pronged approach to this vicious cycle problem of competitiveness (in terms of price and quality) and demand needs to be adopted. The implication for policy formulation will be spelt out later. At present, there is no specific policy for promoting locally manufactured machinery and equipment within the domestic market.

### 3.8.13 Exports Promotion

There are numerous incentives for the promotion of exports. They can be generally classified into 2 categories - direct subsidies and tax incentives.

Some of the subsidy scheme implemented are export allowance, pre-and-post shipment preferential payment, duty drawback on imported raw materials, deduction for overseas promotion as well as export financing facilities. However, these incentives are not very attractive because the benefits granted are too small. Moreover, the procedure of application for these incentives can be cumbersome. Undeniably, these incentives do help Malaysia exporters to lower export price.

Other than giving subsidies for exports, there are also incentives granted to export oriented projects. These include Pioneer Status, Investment Tax Credit and Location Incentives.

Table 3.8.10 shows that the number of projects intended for exports which were given tax incentives, amounted to 35 approvals. This is equivalent to 58% of all export-oriented projects approved during the period of 1975 - 1983 in the machinery sector. It should also be noted that projects with higher degrees of export-orientation were given more favourable consideration for tax incentives. It is evident that 65% of total projects which had the intention of exporting more than 80% of their products had been awarded various tax incentives, while only 50% of projects which had the intention of exporting between 50% to 80% of the products had been granted similar incentives. However, for the consideration of export oriented projects, entrepreneurs often pay more attention to size and condition of the export market. To that effect, more direct subsidies for export, rather than tax incentives, should be granted by the government as direct subsidies are more effective.

In addition, factors such as promotional activities are also important. Sadly, this activity is lacking in the machinery sector. This is basically due to absence of organised marketing

TABLE 3.8.10

NUMBER OF APPROVED PROJECTS WITH EXPORT ORIENTATION ACCORDING TO TAX INCENTIVES IN THE NEM SECTOR, MALAYSIA, 1975 - 1982

| DEGREE OF EXPORTS | WITHOUT TAX INCENTIVE | INVESTMENT TAX CREDIT | PIONEER STATUS | LOCATIONAL INCENTIVE | LABOUR UTILISATION RELIEF | TOTAL |
|---|---|---|---|---|---|---|
| MORE THAN 80 % OF PRODUCTION | 12 | 9 | 11 | 2 | - | 34 |
| MORE THAN 80 % OF PRODUCTION | 13 | 8 | 3 | 2 | - | 26 |
| TOTAL | 25 | 17 | 14 | 4 | - | 60 |

SOURCE : MIDA

boards and uneffective export promotion organisations. In this respect, organisations such as small-scale industries promotion boards, federation of industries, industry and trade associations will have important roles to play with regards to the promotional activities of the machinery industry.

### 3..8.14 Export Competitiveness

The impact of investment incentives on creating competitiveness in the NEM sector can be assessed from the willingness of the firms to diversify or to expand their present capacity.

Table 3.8.11 shows that though that there were 45 projects approved for expansion or diversification in the NEM sector during the period 1975 - 1982, only about 27% of the projects were granted tax incentives. The majority of the projects was not granted any tax incentives. Hence, tax incentives have not been widely used to assist firms to achieve competitiveness in the NEM sector. Expansion or diversification of activities does not by themselves warrant special consideration for tax incentive awards.

Other factors like bumiputra equity and local content are also important.

Table 3.8.12 shows that the average gross rate of return on investment in this sector in 1982. The machinery sector had a gross rate of return of 0.59 to fixed assets.

TABLE 3.8.11

NUMBER OF PROJECTS APPROVED FOR EXPANSION OR DIVERSIFICATION ACCORDING TO TAX TAX INCENTIVES IN THE NEM SECTOR, MALAYSIA FOR PERIOD 1975 - 1982

| YEAR | WITHOUT TAX INCENTIVES | INVESTMENT TAX CREDIT | PIONEER STATUS | LABOUR UTILISATION RELIEF | TOTAL |
|---|---|---|---|---|---|
| EXPANSION | 9 | 1 | 2 | - | 12 |
| DIVERSIFICATION | 24 | - | 6 | 3 | 33 |
| TOTAL | 33 | 1 | 8 | 3 | 45 |

SOURCE : MIDA

TABLE 3.8.12

MALAYSIA : GROSS RATE OF RETURN OF THE MACHINERY SECTOR, 1982

| MIC | INDUSTRY | VALUE ADDED (1) | WAGES (2) | FIXED ASSETS (3) | GROSS RATE OF RETURNS (a) = $\frac{(1)-(2)}{(3)}$ |
|---|---|---|---|---|---|
| 38210 | Manufacture of engines and turbines | 1,328,800 | 609,000 | 531,000 | 1.356 |
| 38220 | Manufacture of agricultural machinery and equipment | 37,421,573 | 13,340,000 | 19,585,000 | 1.230 |
| 38230 | Manufacture of metal and wood working machinery | 5,246,809 | 3,186,000 | 12,176,000 | 0.169 |
| 38299 | Machinery and equipment nec. | 99,926,333 | 52,159,000 | 94,120,000 | 0.508 |

Source of Basic Data : Department of Statistics; MIDA

However, if the NEM sector is appraised in terms of its international competitiveness or comparative advantage, it is noted that all machinery industries except the machinery and equipment n.e.c. industry have DRC/SER coefficients of more than one for the period 1974 - 1982. This means that the industries do not enjoy comparative advantage in the export market (Refer Table 3.8.13).

In spite of this unfavourable factor, and coupled with the fact that the machinery sector is disadvantaged in terms of protection, it has managed to survive to reap positive returns to investment.

### 3.8.15 Increasing Local Content

The present incentive schemes have provisions for additional benefit to be granted to industrial projects which have been awarded Pioneer Status, Investment Tax Credit, Labour Utilisation Relief or Locational Incentive if more than 50% of local contents is incorporated in their finished products. The Table 3.8.14 shows the nature of benefits.

However, the pre-condition that the companies must be under the existing incentive schemes before being eligible for additional benefits does not work in favour to the machinery industry. As shown in Table 3.8.2, the proportion of firms engaging in machinery manufacturing which received incentives is lower than the proportion of firms which were eligible within the manufacturing

TABLE 3.8.13

COMPARATIVE ADVANTAGE OF THE NON-ELECTRICAL MACHINERY SECTOR, MALAYSIA, 1970 - 1982

| MIC | INDUSTRY | DRC/SER | | |
|---|---|---|---|---|
| | | 1974 | 1979 | 1982 |
| 38210 | Manufacture of Engines and Turbines | 3.2 | 3.0 | 2.9 |
| 38220 | Manufacture of Agri-cultural Machinery and Equipment | 2.8 | 2.9 | 2.7 |
| 38230 | Manufacture of Metal and Woodworking Machinery | 2.3 | 2.1 | 2.1 |
| 38299 | Machinery and Equipment N.E.C. | 0.55 | 0.58 | 0.62 |

Source of Basic Data : Calculated from data provided in Input-Output Table for Peninsular Malaysia, 1975 updated;
Survey of Manufacturing Industries, West Malaysia, various years;
Trade Classification and Custom Tariff 1978 incorporating amendments up to December 1982;
International Financial Statistics, IMF, various issues;
External Trade Statistics for Peninsular Malaysia, various years.

TABLE 3.8.14

INCENTIVES FOR INCREASED LOCAL CONTENT

| INCENTIVE SCHEMES GRANTED | ADDITIONAL BENEFITS FOR MORE THAN 50 PERCENT LOCAL CONTENT IN FINISHED PRODUCT |
|---|---|
| a) INVESTMENT TAX CREDIT | ADDITIONAL 5 PERCENT WILL BE ADDED TO THE TAX CREDIT GRANTED |
| b) PIONEER STATUS<br>c) LABOUR UTILISATION RELIEF<br>d) LACATIONAL INCENTIVE | APPROVED TAX EXEMPTION PERIOD WILL BE EXTENDED BY ONE YEAR |

SOURCE: MIDA

sector as a whole. The machinery firms made up only a small 3.2% of all manufacturing firms which were granted incentives.

Apart from this, there is another factor which is contrary to the policy of increasing local content in the machinery parts, equipment and finished machinery. At present, exemption from import duty and surtax on imported raw materials is granted to firms which export their finished goods.

### 3.8.16 Creating Skill Labour

One important feature that distinguishes the machinery industry from other industries is that the former is a capital and skilled labour intensive industry. As observed earlier, only 2.5% of the total proposed capital investment in the machinery industry qualified for Labour Utilisation Relief.

However, the above incentive bears no direct relation to skill labour training. In fact, prior to 1984, there were no incentives provided to firms to upgrade the skill of their labour force. But recently, an incentive for manpower training is introduced which provides for a Building Allowance (an initial allowance of 10% and annual allowance of 2%) for the approved premises used for training.

### 3.8.17 Incentives for Developing Technology

There is no tax incentive specifically for the promotion of technology development in the machinery industry. However, there is a research and development scheme which provides for 1% deduction of revenue expenditure incurred for research and development. Besides this, the buildings used for research and development can be considered as industrial buildings and will be eligible for IBA (Industrial Building Allowance). It will be in the form of an initial allowance of 10% and annual allowance of 2%. However, the effectiveness in this incentive to induce significant research and development in the machinery industry is uncertain. It is too early for proper evaluation.

As for SIRIM, its role is more confined to specification of standards rather than researching and developing the technology of the machinery industry. Indeed, there is no major research project carried out at firm level simply because most of these companies rely heavily on imported technology. There is little effort made to develop indigeneous technology.

As regards the transfer of technology, there is no specific provision for incentives. In terms of expatriate employment, companies are allowed to bring in the required personnel in areas where there is a shortage of Malaysian to do the job. There is no consideration of incentives for firms employing expatriates to train local personnel. The Industries Division of the Ministry of Trade and Industry is also responsible for ensuring that local firms get a fair deal from foreign companies in their technology transfer transactions.

A centre for research in the technology of the machinery sector is also lacking. The engineering faculties of the local universities are not performing that role adequately. Indeed, there is a weak linkage between research activities of the local universities and the technological needs of the machinery industry.

### 3.8.18 Increasing Bumiputra Participation

The major policy instrument for the promotion of greater bumiputra participation in the manufacturing sector is the Industrial Co-ordination Act 1975. Companies with paid-up capital exceeding $250,000 or employing more than 25 workers are required to restructure their equity to allow at least 30% bumiputra participation. In addition, an exemption of 5% corporate tax is offered as an incentive to firms which comply to such equity requirement.

While there is no specific investment tax incentive designed for greater bumiputra participation, favourable consideration is granted for tax incentive, particularly ITC of 25% and above if a project is 51% bumiputra-owned.

However, the impact of the mandatory administrative measure is obvious in terms of progress made in equity and employment (Please refer to Current Status Section).

The impact of various investment incentives on promoting more bumiputra participation is shown in Table 3.8.15. It is observed that a total of 32 projects or 59% of total number of approved bumiputra projects in the NEM sector are given tax incentives, mostly in the form of ITC and PS. It is also noted that during the period 1975 to 1982 there were a total of 407 bumiputra projects approved out of which only 32 projects went to the NEM sector. The increased bumiputra equity participation in the NEM sector appears to have been concentrated among larger firms with higher capital investment rather than in smaller firms. In summing up, the bumiputra participation in the NEM sector over the years has shown marked progress.

3.8.19 Balancing Regional Dispersal

The locational incentives were introduced to encourage the dispersal of industries away from the existing industrial concentration in the urban and well-developed regions. Companies which locate their activities in areas specified by the government as locational incentive areas may be considered for a maximum of up to 10 years tax relief.

At present, areas which have been declared as "Locational Incentives Areas" are as follows:

TABLE 3.8.15

NUMBER OF APPROVE BUMIPUTERA PROJECTS (51% EQUITY HOLDING) ACCORDING TO TAX INCENTIVES IN THE NEM SECTOR, MALAYSIA, 1970 - 1982

| YEAR | WITHOUT TAX INCENTIVE | INVESTMENT TAX CREDIT | PIONEER STATUS | LOCATIONAL INCENTIVE | LABOUR UTILIZATION RELIEF | TOTAL |
|---|---|---|---|---|---|---|
| 1970 | - | - | - | - | - | - |
| 1971 | - | - | - | - | - | - |
| 1972 | - | - | - | - | - | - |
| 1973 | - | - | - | - | - | - |
| 1974 | 1 | - | - | - | - | - |
| 1975 | 1 | 2 | 3 | - | - | 6 |
| 1976 | 6 | 2 | 2 | - | - | 10 |
| 1977 | 1 | 1 | - | - | - | 2 |
| 1978 | 2 | 4 | 1 | - | - | 7 |
| 1979 | - | 2 | - | - | - | 2 |
| 1980 | 4 | 1 | 2 | - | - | 7 |
| 1981 | 4 | 3 | 1 | - | - | 8 |
| 1982 | 3 | 6 | 1 | 1 | - | 11 |
| TOTAL | 22 | 21 | 10 | 1 | - | 54 |

SOURCE : MIDA

a) Kedah excluding Kuala Muda District, Kulim District and Bandar Baru District
b) Pahang excluding Kuantan District
c) Kelantan
d) Trengganu
e) Perlis
f) Sabah
g) Sarawak
h) Johore Tenggara Area

As shown in Table 3.8.2, the machinery industry (MIC 38210, 38220, 38230 and 38299) did not have any locational incentives granted. The locational incentive had proved not to be effective in relocating industrial activities of the machinery sectors in less developed areas. It appears that well-developed infrastructure in already developed areas may have played an important factor influencing the locational pattern of the machinery manufacturing firms.

The above observation is further substantiated by Table 3.8.16 (using the broader definition of machinery). Between 1970 to 1982, about 81% of approved projects of the machinery industry are located in the more developed states, despite the fact that 66% of the firms located here are not granted any incentives. There is still a tendency towards the concentration of activities in already developed regions.

This situation is reinforced by the fact that firms located in priority areas are not guaranteed incentives. Only 42% of the firms located in the less developed areas received some form of incentives.

TABLE 3.8.16

NUMBER OF APPROVE PROJECTS ACCORDING TO STATES AND TAX INCENTIVES IN THE NEM SECTOR, MALAYSIA, 1970 - 1982

| LESS DEVELOPED STATES | WITHOUT TAX INCENTIVE | INVESTMENT TAX CREDIT | PIONEER STATUS | LOCATIONAL INCENTIVE | LABOUR UTILIZATION RELIEF | ICA | TOTAL |
|---|---|---|---|---|---|---|---|
| PERLIS | - | - | - | - | - | - | - |
| KEDAH | 11 | 4 | 3 | 4 | - | - | 22 |
| KELANTAN | - | 1 | 3 | - | - | - | 4 |
| TERENGGANU | 2 | - | - | - | - | - | 2 |
| PAHANG | 7 | 4 | - | - | 1 | - | 12 |
| SABAH | 5 | 1 | 7 | - | - | - | 13 |
| SARAWAK | 17 | 2 | 1 | - | - | - | 20 |
| NEGRI SEMBILAN | 9 | 2 | 5 | - | - | - | 16 |
| MELAKA | 8 | 1 | 4 | - | - | - | 13 |
| SUB-TOTAL | 59 | 15 | 23 | 4 | 1 | - | 102 |
| | | | | | | | |
| MORE DEVELOPED STATES | WITHOUT TAX INCENTIVE | INVESTMENT TAX CREDIT | PIONEER STATUS | LOCATIONAL INCENTIVE | LABOUR UTILIZATION RELIEF | ICA | TOTAL |
| JOHORE | 51 | 12 | 3 | - | - | - | 67 |
| PENANG/S. PERAI | 22 | 8 | 14 | - | 1 | - | 49 |
| PERAK | 9 | 6 | 5 | - | 1 | - | 21 |
| FEDERAL TERRITORY | 39 | 5 | 2 | - | - | - | 46 |
| SELANGOR | 124 | 24 | 34 | - | 3 | 1 | 186 |
| SUB-TOTAL | 245 | 55 | 58 | 4 | 5 | 1 | 373 |
| TOTAL | 304 | 70 | 81 | - | 6 | 1 | 471 |

SOURCE : MIDA

### 3.8.20 Promoting Small-Scale Firms

As most incentives are granted according to the level of capital investment, the small firms which dominate the machinery industry are placed in an unfavourable position. In fact, there is no special incentive scheme to promote small-scale industries.

The provision of low interest loans (at 7.5% per annum) up to $50,000 under the CGC and SLS without collateral requirement and exemptions from excise and license fees do help small-scale industries. But this is insignificant when compared to the benefits made available to large-scale investors. Couple with the fact that the machinery manufacturing firms receive low level of loan, the effect of utilisation of loans as an instrument to promote the development of small-scale firms has been small (see Table 3.8.7).

The other investment incentive schemes like investment tax credit, pioneer status, accelerated depreciation allowance, increased capital allowance and the like tend to be capital-bias. Thus, they encouraged the growth of large-scale firms at the expense of the smaller firms. In practice, other incentives such as research and development incentives and Free Trade Zone facilities are seldom within the reach of small-scale industries because of their smallness.

Apart from all these factors, the small-scale industries operated by non-bumiputra entrepreneurs, also find it difficult seeking suitable Bumiputra partners. While some firms are reluctant to restructure, there are others which have difficulties attracting prospective bumiputra partners because of the smallness of the firm. The net result of all these factors has little positive effect on the development of small-scale firms.

## 3.9 Factor Endowment Analysis

### 3.9.1 Introduction

The objective of this section is to identify and assess the availability of factor endowments, with particular emphasis on manpower and natural resource. This section will also determine the extent to which these factors can be advantageously utilized to maximise the comparative advantage of the industry in the export market.

Data for this section is highly aggregated and available for broad industry groups. Since the NEM industry is the nearest proxy for the 4 sub industries studied in this report, data from this industry group will be used.

The factor endowments will be analysed based on the following :-

i. raw materials supply
ii. professional/technical manpower availability
    skilled and unskilled labour supply
iii. utilities and infrastructure

### 3.9.2 Supply of Raw Materials

Iron and steel represents more than 85% of raw material components in the NEM industry. Rubber and wooden fixtures represent a very small portion.

Table 3.9.1 shows the distribution pattern of iron ore reserves in Peninsular Malaysia. Altogether there is a total of 30 million tonnes of medium grade iron ore and 2 million tonnes of high grade ore reserves are currently being mined in Perak, Kedah, Johore and Pahang. There were 8 mines in operation as at December, 1984.

The production trend for iron ore is found in Table 3.9.2. As may be seen, production has been steadily declining. This is probably due to poor local demand as a result of recession. Local consumption is being used mainly by Malayawata Sdn Bhd. Exports too have been steadily declining since 1981 as shown in Table 3.9.3. Most of the ore is sold to Singapore and Indonesia.

Other mineral constituents of cast iron and steel are carbon, silicon, phosphorus and sulphur. The composition of these minerals in cast iron and steel products range from less than 0.1% to 4.5%. Except for phosphorus with 80,000 tonnes reserves in Kelantan, the other minerals are not readily available in Malaysia.

Crude steel production for Malaysia is shown in Table 3.9.4. together with production of selected countries. South Korea and Taiwan both recorded normal growth rates of about 34% from 1975 to 1980. However Malaysia merely grew at about 1.8% annually over the same period. In fact, Malaysia has the lowest annual growth rate.

Absolute output of 200,000 metric tonnes was also the lowest average among the group of selected countries.

TABLE 3.9.1

DISTRIBUTION OF IRON ORE RESERVES AS AT Y/E 1980

(million tonnes)

| MEDIUM GRADE * | | HIGH GRADE * | |
|---|---|---|---|
| PAHANG | 13 | PERAK | 2 |
| JOHORE | 11 | KEDAH | |
| TERENGGANU | 3 | JOHORE | |
| KEDAH | 2 | PAHANG | |
| PERAK | 3 | | |
| TOTAL | 30 | | 2 |

*NOTE : ORE CONTAINING (55.6 %) OF IRON IS MEDIUM GRADE
WHILE ORE WITH 60% AND ABOVE IS HIGH GRADE

SOURCE : DEPARTMENT OF MINES

TABLE 3.9.2.

PRODUCTION AND CONSUMPTION OF IRON ORE, PENINSULAR MALAYSIA
('000 TONNES)

| YEAR | PRODUCTION | LOCAL CONSUMPTION |
|---|---|---|
| 1984 ('SEPT) | 134.67 | 118.47 |
| 1983 | 113.99 | 82.93 |
| 1982 | 341.29 | 315.87 |
| 1981 | 532.46 | N.A. |
| 1980 | 371.19 | N.A. |
| 1979 | 350.50 | N.A. |
| 1978 | 320.03 | N.A. |

| STATE | NO. OF MINES AT Y/E 1984 |
|---|---|
| PERAK | 3 |
| KEDAH | 2 |
| JOHORE | 2 |
| PAHANG | 1 |
| TOTAL | 8 |

SOURCE : DEPARTMENT OF MINES, v.y.

TABLE 3.9.3

EXPORT PATTERN OF IRON ORE, PENINSULAR MALAYSIA ('000 TONNES)

| YEAR | EXPORTS |
|---|---|
| 1984 ('SEPT) | 16.20 |
| 1983 | 31.06 |
| 1982 | 25.42 |
| 1981 | 31.03 |
| 1980 | 10.03 |
| 1979 | 16.49 |
| 1978 | 17.21 |

| YEAR | SINGAPORE | THAILAND | INDONESIA | TOTAL |
|---|---|---|---|---|
| 1984 ('SEPT) | 6.381 | 0.090 | 9.728 | 16.299 |
| 1983 | 18.246 | 0.171 | 12.638 | 31.055 |
| 1982 | 25.252 | 0.193 | NIL | 25.445 |

SOURCE : DEPARTMENT OF MINES, v.y.

TABLE 3.9.4.

CRUDE STEEL PRODUCTION OF SELECTED COUNTRIES, 1971 - 1980 ('000 METRIC TONNES)

| COUNTRY | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | ANNUAL GROWTH RATE (%) 1975 - 1980 |
|---|---|---|---|---|---|---|---|
| JAPAN | 102,313 | 107,313 | 102,399 | 102,405 | 111,748 | 111,406 | 1.7 |
| SOUTH KOREA | 1,994 | 3,515 | 4,347 | 4,969 | 7,610 | 8,606 | 34.0 |
| TAIWAN | 1,010 | 1,628 | 1,770 | 3,432 | 4,250 | 4,225 | 33.1 |
| INDIA | 7,991 | 9,364 | 10,009 | 100,099 | 10,126 | 9,431 | 34.0 |
| MALAYSIA | 183 | 189 | 194 | 203 | 207 | 200 | 1.8 |
| PHILIPPINES | 309 | 350 | 357 | 276 | 400 | 400 | 5.3 |
| THAILAND | 251 | 281 | 309 | 346 | 440 | 450 | 12.4 |
| INDONESIA | 100 | 139 | 250 | 225 | 305 | 360 | 29.2 |

SOURCE : SEAISI , "STEEL STATISTICS FOR MEMBER COUNTRIES"

Estimated domestic demand for 1985 is projected to be 2,550 thousand metric tonnes whereby supply is expected to meet 44% of this demand or 1120 thousand tonnes.(Table 3.9.5) Traditionally, imports of iron and steel products have always been greater than its exports. Certain flat and specialised steel products are not currently produced and these products are imported. With the start-up of HICOM's billet plant in Trengganu, these products will be produced locally.

### 3.9.3 Manpower

#### Lack of Manpower

Generally, the machinery sector lacks highly skill labour force. This applies both to the design as well as the production stage. According to the 1980 population census, it was found that only 1.3 per cent of the total workforce were engineers and related technicians while only 0.2 per cent were physical scientists and related technicians.

The skilled workers mainly work as moulders, machine setter operations, lathe operators, fitter assemblers and welders. The occupational profile in the machinery sector is given in Table 3.9.6. At present, the output of skilled personnel comes from local institutions (See Table 3.9.7). However for professional engineers, they are trained in both local and foreign institutions.

TABLE 3.9.5.

ESTIMATES OF DOMESTIC DEMAND AND SUPPLY FOR IRON AND STEEL PRODUCTS
FOR ASIAN COUNTRIES IN 1985 ('000 TONNES)

| COUNTRY | ESTIMATES FOR 1985 | | | ACTUAL PERFORMANCE FOR 1979 | | |
|---|---|---|---|---|---|---|
| | SUPPLY (1) | DEMAND (2) | BALANCES (1) - (2) | SUPPLY (4) | DEMAND (5) | BALANCES (4) - (5) |
| MALAYSIA | 1,120 | 2,550 | -1430 | 110 | 1,300 | -1190 |
| PHILIPPINES | 810 | 2,710 | -1900 | 400 | 1,700 | -1300 |
| THAILAND | 590 | 2,880 | -2290 | 440 | 2,000 | -1560 |
| SINGAPORE | 400 | 2,370 | -1970 | 290 | 1,590 | -1300 |
| TAIWAN | 8,570 | 8,320 | 250 | 4,250 | 5,500 | -1250 |
| SOUTH KOREA | 13,440 | 12,600 | 840 | 7,610 | 7,030 | 580 |
| INDONESIA | 2,250 | 3,920 | -1670 | 310 | 2,100 | -1790 |

SOURCE : INSITUTE OF DEVELOPING ECONOMIES, TOKYO, JAPAN,
COMPARATIVE ADVANTAGE OF MANUFACTURING INDUSTRIES IN ASEAN COUNTRIES, 1982

TABLE 3.9.6

OCCUPATIONAL PROFILE IN THE INDUSTRIAL MACHINERY INDUSTRY

| | 1974 (%) | 1977 (%) | 1980 (%) |
|---|---|---|---|
| PROFESSIONAL AND TECHNICAL | 0.2 | 0.6 | 2.4 |
| ADMINISTRATIVE AND MANAGERIAL | 1.5 | 2.7 | 4.4 |
| CLERICAL | 7.4 | 11.9 | 13.8 |
| SERVICE | - | - | - |
| PRODUCTION WORKERS :- SKILLED AND SEMI-SKILLED | 70.4 | 63.6 | 56.5 |
| UNSKILLED | 20.5 | 21.4 | 23.0 |

SOURCE : LABOUR AND MANPOWER REPORT 1981/82

TABLE 3.9.7.

TOTAL OUTPUT OF ALL INDUSTRIAL TRAINING INSTITUTIONS AND VOCATIONAL INSTITUTION

| | 1978 | 1979 | 1980 | 1981 | 1982 |
|---|---|---|---|---|---|
| ALL PUBLIC INDUSTRIAL TRAINING INSTITUTES | | | | | |
| MECHANICAL ENGINEERING | 1,412 | 1,305 | 1,345 | 1,383 | 1,335 |
| MECHANIC | 193 | 258 | 261 | 187 | 427 |
| MACHINIST | 531 | 610 | 677 | 645 | 648 |
| TOOL AND DIE | 6 | 7 | - | 1 | 3 |
| WELDING | 558 | 673 | 648 | 712 | 703 |
| METAL WORKS | 244 | 294 | 352 | 375 | 469 |
| 1) VARIOUS UNIVERSITIES | | | | | |
| ENGINEERING | 209 | 175 | 156 | 138 | 135 |
| MECHANICAL ENGINEERING | 72 | 86 | 90 | 109 | 102 |
| AGRICULTURAL ENGINEERING | - | 23 | 10 | 18 | 29 |
| 2) INSTITUTE KEMAHIRAN MARA | | | | | |
| METALWORKS | | | | | |
| SHEET METAL | 14 | 12 | - | 3 | 19 |
| GAS AND ARC WELDING | 83 | 88 | 140 | 111 | 136 |
| GENERAL MECHANICS | 82 | 109 | 106 | 97 | 104 |
| TURNING MACHINING | 51 | 59 | 90 | 113 | 149 |
| FOUNDRY | 14 | 12 | 16 | 19 | 20 |
| ELECTRO-PLATING | - | - | - | 11 | 13 |
| WOODWORKING MACHINIST | - | - | 4 | 20 | 8 |
| SAWMILL MECHANIC | - | - | - | 13 | - |
| MECHANICAL DRAUGHTING | 126 | 54 | 115 | 130 | 115 |
| 3) MARA INSTITUTE OF TECHNOLOGY | | | | | |
| ENGINEERING | 213 | 271 | 286 | 320 | 363 |
| 4) POLYTECHNICS | | | | | |
| MECHANICAL ENGINEERING (GENERAL) | 67 | 90 | 104 | 113 | 127 |
| MECHANICAL ENGINEERING (PRODUCTION) | 22 | 25 | 24 | 45 | 43 |
| MECHANICAL ENGINEERING (AUTOMOTIVE & DIESEL) | 25 | 25 | 24 | 19 | 28 |
| 5) VOCATIONAL SCHOOLS | | | | | |
| FITTING AND MACHINING | 424 | 561 | 612 | 600 | 540 |
| SHEETMETAL WORKS & WELDING | 445 | 572 | 555 | 649 | 602 |
| MECHANICAL ENGINEERING PRACTICE | - | - | - | 32 | 40 |
| HEAVY MACHINERY REPAIRING | - | - | - | 30 | 48 |

SOURCE: MINISTRY OF LABOUR, LABOUR AND MANPOWER REPORT, 1981/1982

The local universities produce less than 400 engineers annually and most of them are absorbed by government institutions like LLN, DID, JKR and other statutory bodies like MIDA, Petronas and Hicom and even the banking sector. Those who actually work in a technical setting do not stay in that capacity for long. After a couple of years, many of them will move into managerial and administrative positions.

The present shortage of trained professionals have also been caused by the "brain drain" to other countries, particularly to Singapore.

At present, the skill labour in mould, die and tool making is also lacking.

These are related to :-

> the ability to comprehend drawings and produce the moulds and dies, highly specialised tool making skill such as precision machining and testing. As the industry is built upon a skilled work force, formal training is a pre-requisite.

### 3.9.4 Training and Skill Acquiring

Table 3.9.8 shows the labour force composition of a few companies. While there are much training activities for the staff, they are mainly centered around in-house on-the-job training. There has been a reluctance on the part of the local companies to train up highly skilled labour for fear of losing employees to other companies.

TABLE 3.9.8

FIXED ASSETS AND LABOUR FORCE COMPOSITION OF SELECTED REFERENCE COMPANIES

| COMPANY | PAID-UP CAPITAL (As at 31st) ( Dec 1983 ) | EQUITY STRUCTURE Local | Foreign | FIXED ASSETS VALUE (Book Value at 31.12.83) Plant and Machinery | Land | Buildings |
|---|---|---|---|---|---|---|
| Sykt. Lee Indst Sdn Bhd | $4,125.005 | 88% | 12% | $461,299 | $1,484,199 | $3,380,060 |
| Yanmar (M) Sdn. Bhd. | $2,640.627 | 61% | 39% | $550,104 | $105,413 | $570,922 |
| Howard Alat Pertanian Sdn Berhad | N.A | N.A | N.A | N.A | N.A | N.A |
| Mah Cheok Pui Foundry | $1,700,000 | 100% | N.A | $500,000 | $1,200,000 (incl. building) | |
| Malaysian Guage and Tool Bhd. | $1,250.000 | 79% | 21% | $513,265 | $78,432 | $370,887 |
| UMW Engineering Sdn. Bhd. | $11,000,000 | 54% | 46% | $3,020,000 | $3,160,000 | $9,760,000 |

TABLE 3.9. 8 (Cont.)

| COMPANY | STAFF | | | | STAFF TRAINING | | TECHNOLOGY TRANSFER |
|---|---|---|---|---|---|---|---|
| | Engineers | Workers | | Total Staff | In-house | Overseas | |
| | | Skilled | Unskilled | | | | |
| Syarikat Lee Industries Sdn. Berhad. | 4 | 17 | 44 | 81 | Yes | No | 'Taiwanese and Japanese providing technical assistance (product design)<br>'Production Technology is imported from Japan Taiwan<br>'Moulds are self-made |
| Yanmar (M) Sdn Berhad | 1 | 15 | - | 28 | Yes | Yes (to get familiar with new products) | 'Products licencing agreements from Japan<br>'Technical collaboration in the localisation and assembly of diesel engines<br>'Royalty payment of 2% on sales to the Japanese<br>'Production technology imported from Japan<br>'Employment of 1 foreign engineer |
| Howard Alat Pertanian Sdn. Berhad | N.A | N.A | N.A | N.A | N.A | N.A | 'Technical design know-how assistance from the Australians<br>'Technical production know-how assistance (evaluation of suitability of existing production Process for batch production from United Kingdom) |
| Mah Cheok Pui Foundry | 2 | 7 | 31 | 44 | N.A | N.A | 'Relies on "copy-technology"<br>'Based its machinery design on imported ones and product brochures of wood-working machinery suppliers from England and Japan |
| Malaysian Gauge and Tool Berhad | 2 | 11 | 19 | 51 | Yes | Yes (skilled precision workers to India) | '1 mechanical and 1 electrial engineers are based in Malaysia to provide technical assistance in production<br>'Technical design of the technology is imported from India<br>'Employment of 2 foreign engineers |
| UMW Engineering | 18 technical and super visory personnel | 119 | 22 | 201 | Yes | No | 'Product licensing agreements (Germany-[illegible]; Japan - Komatsu; U.S.A -Peerless)<br>'Technical assistance in the form of manufacturing and design technology<br>'Royalty payment in the form of a lump sum |

SOURCE: Information from respective companies

At the macro level, training schemes are not oriented toward skills upgrading. This is particularly true in areas like machining, tool and die making skill. Table 3.9.9 shows the number of people going through various types of training. Unless the present trend is reversed, the lack of highly skilled labour force will be an obstacle to the development of the machinery sector.

Wage Rate and Labour Productivity

Table 3.9.10 shows the annual wages and labour productivity of the NEM sector of various countries. The annual wage rate for Malaysia for 1981 was US$2,069.8. Comparatively, this wage rate was relatively higher than that in Indonesia and Philippines (the developing countries of ASEAN) but lower than the NICs like South Korea and Singapore.

The labour productivity of the machinery sector in Malaysia was also relatively higher than Indonesia and Philippines. In 1981, the value added per employee was US$5,303.6. However, the NICs and developed countries like Japan have even much higher wage rates which corresponded with higher value added per employee, suggesting that the higher wages attracted better skilled workers.

Table 3.9.11 shows the average monthly earnings of the major catagories of workers in the NEM sector. In 1980, the average monthly earning was estimated at $523. This is much higher than the

TABLE 3.9.9.

TOTAL OUTPUT OF ALL INDUSTRIAL TRAINING INSTITUTIONS AND VOCATIONAL INSTITUTION

| | 1978 | 1979 | 1980 | 1981 | 1982 |
|---|---|---|---|---|---|
| **NATIONAL APPRENTICESHIP SCHEME** | | | | | |
| GENERAL MECHANIC | 36 | 46 | 58 | 41 | 24 |
| GENERAL MACHINIST | 15 | 11 | 9 | 5 | 9 |
| WELDING | 20 | 14 | 9 | 5 | 1 |
| TOOL AND DIE MAKING | 5 | - | - | 1 | 3 |
| **PREPARATORY TRADE COURSES** | | | | | |
| GENERAL MECHANIC | 65 | 111 | 97 | 81 | 183 |
| GENERAL MACHINIST | 14 | 23 | 44 | 40 | 97 |
| WELDING | 38 | 66 | 58 | 17 | 57 |
| SHEET METAL WORKS | - | - | - | 5 | 13 |
| **SKILL UPGRADING COURSES** | | | | | |
| GENERAL MECHANIC | 28 | 2 | 14 | - | 8 |
| GENERAL MACHINIST | - | 11 | 12 | - | 2 |
| **INSTRUCTORS TRAINING COURSES** | | | | | |
| GENERAL MECHANIC | - | 18 | - | - | 17 |
| GENERAL MACHINIST | - | 4 | - | - | - |
| WELDING | - | - | - | - | 6 |
| **PRIVATE SECTOR TRAINING INSTITUTIONS** | | | | | |
| MECHANICAL ENGINEERING | 208 | 221 | 282 | 141 | 165 |
| DRAUGHTSMENSHIP | 59 | 49 | 84 | 192 | 156 |
| WELDING ARC AND GAS | 34 | 18 | 38 | 18 | 32 |

SOURCE: MINISTRY OF LABOUR, LABOUR & MANPOWER REPORT (1981/1982)

TABLE 3.9.10.

ANNUAL WAGES & LABOUR PRODUCTIVITY IN THE NEM SECTOR IN REFERENCE COUNTRIES

| COUNTRY | YEAR | ANNUAL WAGE PER EMPLOYEE (US $) | VALUE ADDED PER EMPLOYEE (US $) |
|---|---|---|---|
| MALAYSIA | 1981 | 2,069.8 | 5,303.6 |
| INDONESIA | 1979 | 768.7 | 2,657.2 |
| PHILIPPINES | 1977 | 860.1 | 1,829.2 |
| SINGAPORE | 1980 | ,838.8 | 15,134.5 |
| SOUTH KOREA | 1979 | 3,418.3 | 10,677.6 |
| JAPAN | 1980 | 13,223.5 | 37,824.3 |

SOURCE : MIDA

TABLE 3.9.11

AVERAGE MONTHLY EARNINGS OF EMPLOYEES IN THE NEM SECTOR, MALAYSIA, 1974 - 1980

| OCCUPATION | AVERAGE MONTHLY EARNING ($) | | | ANNUAL GROWTH RATE (1974 - 1980) |
|---|---|---|---|---|
| | 1974 | 1977 | 1980 | |
| PRODUCTION SUPERVISOR & FOREMAN, GENERAL | 512 | 549 | 737 | 6.3 |
| MOULDER, METAL FOUNDRY, FLOOR | 297 | 303 | 500 | 9.1 |
| MOULDER, METAL FOUNDRY, FIT | 253 | 281 | - | - |
| METAL-WORKING MACHINE-SETTER-OPERATORS | 270 | 299 | 419 | 7.6 |
| LATHE SETTER-OPERATOR | 270 | 299 | 469 | 9.6 |
| METAL PRODUCTS FITTER ASSEMBLERS | 284 | 313 | 463 | 8.5 |
| WELDER | 269 | 374 | 551 | 12.7 |
| BOILER-MAKER | 282 | 321 | - | - |
| AVERAGE MONTHLY WAGE RATE OF THE NEM SECTOR | 305 | 342 | 523 | 9.4 |
| AVERAGE MONTHLY WAGE RATE OF WHOLE MANUFACTURING SECTOR | 116 | 138 | 176 | 7.2 |

SOURCE : ADAPTED FROM MALAYSIA, MINISTRY OF LABOUR & MANPOWER, OCCUPATIONAL WAGE SURVEYS, PENINSULAR MALAYSIA, 1982 TABLE 3.A

MALAYSIAN IRON AND STEEL INDUSTRIES FEDERATION, MISIF SUBMISSION ON THE INDUSTRIAL MASTER PLAN, 1984 average wage of the manufacturing sector as a whole. Between 1974 and 1980, the monthly wage of the machinery sector grew at about 9.4 per cent per annum. The highest annual monthly growth rate was for the welders.

## Mechanical Engineers

Higher up the hierarchy of skilled staff are the mechanical engineers. Within the machinery sector, the rate of employment of engineers is low. This has a historical reason. A substantial number of these companies was founded by former skilled workers who had previously served their apprenticeship in other companies. To them, professional staff like mechanical engineers were not perceived as an essential part of the production staff. Nonetheless, there have been some recent changes in attitude within the industry. A sizeable number of engineers who graduated from Taiwan has been absorbed by these local firms. The high rate of unemployment among the Taiwan graduates have rendered them low market value. And local companies have taken them into productive employment. On the other hand some have branched out on their own as a result of the employment discrimination.

Indeed, the mechanical engineer is essential for imparting technical design know-how. As there is a relatively high rate of mechanical engineer graduating and entering the labour market, the potential source of technical know-how exist. However, know-how fails to materialise because of 2 related grounds.

Firstly, the final employment of the mechanical engineer is in areas not directly related to mechanical engineering works. Most of them ended up in administration and management positions. The structure of employment opportunities for the trained technical professional is such that there are more gains in managerial positions than in technical positions. This has definitely not contributed to the formation of a pool of "entrepreneur" engineers. And secondly, the technological know-how is neither developed nor enriched. This is because there has been no historical experience of machinery building within the industry. Hence, indigenous know-how is neither acquired nor accumulated.

Despite these, the importance of the mechanical engineers, the engineering assistants and skilled technical workers in the future development of the machinery sector is beyond doubt. Table 3.9.12 shows that the estimated supply of these manpower will fall short of the expected requirements in the economy. This will definitely affect the supply of skilled manpower to the machinery sector.

### 3.9.5 Utilities and Infrastructure

The machinery sector does not have a high energy consumption index. This is evident from the estimates based on 1975 I-O Table for Malaysia, which indicates that electricity, gas and water supply constituted only 1.3% of the total input for the machinery sector, as compared to 16% for

TABLE 3.9.12.

ESTIMATED REQUIREMENT AND SUPPLY OF MANPOWER IN THE JOB CATEGORIES 0/1 AND 2, 1981 - 1990

| KOD DOC | JOB CATEGORY | ESTIMATED MANPOWER 1980 (a) | ESTIMATED MANPOWER 1990 (b) | ESTIMATED REQUIREMENT 1981 - 1990 | ESTIMATED SUPPLY | DEFICIT (-) OR EXCESS (+) |
|---|---|---|---|---|---|---|
| 0/1 | PROFESSIONAL, TECHNICAL AND RELATED WORKERS | 670 | 1,085 | 415 | 1,239 | + 824 |
| 0-21 | ARCHITECTS AND TOWN PLANNERS | 1,002 | 1,603 | 601 | 648 | + 47 |
| 0-63 | DENTISTS | 4,750 | 8,065 | 3,275 | 4,268 | + 993 |
| 0-61 | MEDICAL DOCTORS | 1,500 | 2,361 | 861 | 1,238 | + 377 |
| 1-21, 1-22, 1-29 | LAWYERS AND JURISTS | 1,588 | 2,687 | 1,099 | 2,007 | + 908 |
| 0-22 | CIVIL ENGINEERS | 1,140 | 2,139 | 999 | 1,655 | + 656 |
| 0-23 | ELECTRICAL AND ELECTRONIC ENGINEERS | 1,670 | 4,339 | 2,669 | 1,230 | - 1,439 |
| 0-24 | MECHANICAL ENGINEERS | 450 | 1,199 | 749 | 348 | - 401 |
| 0-25 | CHEMICAL ENGINEERS | 720 | 1,227 | 507 | 736 | + 229 |
| 0-27, 0-28, 0-29 | MINING ENGINEERS/AGRICULTURAL ENGINEERS, ENGINEERS NEC. | 6,789 | 11,057 | 4,268 | 2,514 | - 1,754 |
| 0-31, 0-39 | SURVEYORS AND ASSISTANT SURVEYORS | 361 | 697 | 336 | 680 | + 344 |
| 0-67 | PHARMACISTS | 3,340 | 6,770 | 3,430 | 12,474 | + 9,044 |
| 1-31 | UNIVERSITY AND HIGHER EDUCATION TEACHERS | 77,757 | 101,249 | 23,306 | 5,040 | - 18,452 |
| 1-32 (d) | PRIMARY SCHOOL TEACHERS | 170 | 315 | 145 | 1,166 | + 1,021 |
| 0-83 | SYSTEM ANALYSI | 4,449 | 7,980 | 3,531 | 2,886 | - 645 |
| 1-10, 1-11 | ACCOUNTANTS AND AUDITORS | 470 | 759 | 289 | 7,058 | + 6,769 |
| 0-90 | ECONOMISTS | 450 | 813 | 363 | 457 | + 94 |
| 0-81, 0-82 | STATISTICIANS AND MATHEMATICIANS | 390 | 516 | 126 | 254 | + 128 |
| 0-65 | VETERINARIAN | 1,470 | 2,181 | 711 | 1,565 | + 854 |
| 0-53 | AGRONOMISTS AND RELATED SCIENTISTS | 390 | 608 | 218 | 158 | - 60 |
| 1-91 | LIBRARIAN AND ARCHIVISTS AND CURATORS | 1,090 | 2,277 | 1,187 | 2,298 | + 1,111 |
| 0-11 | CHEMISTS AND PHYSICAL SCIENTISTS | 19,958 | 33,833 | 13,875 | 10,263 | - 3,612 |
| 0-71 | NURSES | 5,759 | 9,706 | 3,947 | 1,602 | - 2,345 |
| 0-73 | MIDWIVES | 5,569 | 9,331 | 3,762 | 4,622 | - 860 |
| 0-32 | DRAUGHTMAN | 7,789 | 14,187 | 6,398 | 6,610 | - 212 |
| 0-33 | CIVIL ENGINEERING ASSISTANTS | 4,060 | 6,862 | 2,802 | 8,207 | + 5,405 |
| 0-34 | ELECTRICAL ENGINEERING ASSISTANTS | 3,340 | 7,369 | 4,029 | 5,157 | + 1,128 |
| 0-35 | MECHANICAL ENGINEERING ASSISTANTS | 250 | 656 | 406 | 174 | - 232 |
| 0-36 | CHEMICAL ENGINEERING ASSISTANTS | 6,099 | 9,051 | 2,952 | 814 | - 2,138 |
| 0-39 | ENGINEERING ASSISTANTS NEC. | 470 | 705 | 235 | - | - 235 |
| 0-38 | MINING ASSISTANTS | 7,239 | 13,092 | 5,853 | 2,376 | - 5,500 |
| 0-14 | PHYSICAL SCIENCE TECHNICIANS | 4,869 | 6,892 | 2,023 | | |
| 0-54 | LIFE SCIENCE TECHNICIANS | | | | | |
| 0-62 | MEDICAL ASSISTANTS ) | | | | | |
| 0-64 | DENTAL ASSISTANTS ) | 8,519 | 12,524 | 4,005 | 4,033 | + 28 |
| 0-68 | PHARMACEUTICAL ASSISTANTS ) | | | | | |
| 0-66 | VETERINARY ASSISTANTS | 670 | 1,018 | 348 | 282 | - 66 |
| 0-84 | STATISTICAL & MATHEMATICAL TECHNICIANS (COMPUTER PROGRAMMER) | 330 | 554 | 224 | 4,455 | + 4,231 |
| 1-9 | PROFESSIONAL, TECHNICAL & RELATED WORKERS NEC. | 46,584 | 71,159 | 24,575 | 1,147 | - 23,428 |
| 2 | ADMINISTRATIVE AND MANAGERIAL WORKERS | | | | | |
| 2-02 | GOVERNMENT ADMINISTRATORS | 9,579 | 16,870 | 7,291 | 32,492 | + 25,201 |
| 2-1 | MANAGERS | 52,621 | 72,971 | 20,350 | 4,654 | - 15,696 |

NOTE : a) FIGURES FROM FOURTH MALAYSIA PLAN, ECONOMIC PLANNING UNIT
b) FIGURES FROM MANPOWER STUDY REPORT, 1973, ECONOMIC PLANNING UNIT

SOURCE : MAMPU, LAPORAN KAJIAN KEPERLUAN TENAGA MANUSIA (MELIPUTI KUMPULAN PEKERJAAN UTAMA 0/1 DAN 2) DALAM "DICTIONARY OF OCCUPATIONAL CLASSIFICATION", JABATAN PERDANA MENTERI, 1982 the NMM sector. Nevertheless, the cost of electricity for industrial use in Malaysia is high if compared to the selected reference countries. (Table 3.9.13) However, the total consumption of electricity for the Machinery sector is low. This is due to the low level of electricity consumed, resulting in a comparative advantage over the countries.

### 3.9.6 Overall Comparative Advantage

The overall comparative advantage of the machinery sector can be measured by the Domestic Resource Cost Coeffecient. This social profitability index is measured by the Domestic Resource Cost (DRC) over the Shadow Exchange Rate (SER). The formula is given by

$$\frac{DRC}{SER}$$

When $\frac{DRC}{SER} < 1$, it indicates that the sector utilises less than one ringgit exchange. This implies a comparative advantage; expansion of activities via import substitution will bring net benefits to the country as a result of efficient utilisation of local resources. When $\frac{DRC}{SER} > 1$, it has the opposite implications.

Table 3.9.14 suggests that the machinery sector, except for machinery and equipment n.e.c. industry, was comparatively disadvantaged. It required

TABLE 3.9.13

COMPARATIVE ELECTRICITY COST FOR INDUSTRIAL USE

| COUNTRY | COST (M$/kwh) |
|---|---|
| MALAYSIA | 0.23 |
| KOREA | 0.16 |
| CANADA | 0.07 |
| U.S.A. | 0.14 |
| JAPAN | 0.24 |
| WEST GERMANY | 0.19 |

SOURCE : UN, WORLD INDUSTRIAL STATISTICS

TABLE 3.9.14

OVERALL COMPARATIVE ADVANTAGE OF THE NON-ELECTRICAL MACHINERY SECTOR, MALAYSIA, 1974 - 1982

| MIC | INDUSTRY DESCRIPTION | DRC/SER | | |
|---|---|---|---|---|
| | | 1974 | 1979 | 1982 |
| 38210 | MANUFACTURE OF ENGINES AND TURBINES | 3.20 | 3.00 | 2.90 |
| 38220 | MANUFACTURE OF AGRICULTURAL MACHINERY & EQUIPMENT | 2.80 | 2.90 | 2.70 |
| 38230 | MANUFACTURE OF METAL AND WOODWORKING MACHINERY | 2.30 | 2.10 | 2.10 |
| 38299 | MANUFACTURE OF MACHINERY AND EQUIPMENT NEC. | 0.55 | 0.58 | 0.62 |

URCE : CALCULATED FROM DATA PROVIDED IN INPUT-OUTPUT TABLE PENINSULAR MALAYSIA 1975;
SURVEY OF MANUFACTURING INDUSTRIES, WEST MALAYSIA, VARIOUS YEARS
TRADE CLASSIFICATION AND CUSTOM TARIFF 1978, INCORPORATING ALL AMENDMENTS UP TO DEC 1982
INTERNATIONAL FINANCIAL STATISTICS, IMF, VARIOUS ISSUES
EXTERNAL TRADE STATISTICS FOR PENINSULAR MALAYSIA, VARIOUS YEARS

more than two ringgits to earn or save an additional unit of foreign exchange. Nonetheless, there was an improvement on the efficiency of the sector over the years. As mentioned above, only the machinery and equipment n.e.c. industry had comparative advantage.

Besides the inability of the machinery sector to reap economies of scale, the inefficient technology, lack of skilled personnel and lack of skilled management had also contributed towards the inefficiency of the machinery sector. However, relative significance of these factors is not clear.

### 3.10 Summary of Major Problems and Issues Identified

This section will identify the major problems prevalent in this industry and is based on an indepth analysis of the past and current performance, the factor endowment potentials/ limitations as well as on past/current technology trends. Problems arising from current promotional policies will also be dealt with.

#### 3.10.1 Low Machine Building Capability

Central to this problem is the country's viability to manufacture the means of production of machinery. In short, our ability for capital reproduction is limited. Of most relevance at this point of discussion is the metal working machinery industry within the machinery and equipment sector. The metal working machinery industry in Malaysia is basically underdeveloped. The latest data (1981) shows that local production of metal and wood working machinery industry (no disaggregated data on metal working machinery and wood working machinery industry is available) only managed to satisfy 9.6% of total domestic demand. The bulk of domestic demand was met by imports. There was negligible exports of metal and wood working machinery.

### 3.10.2 Low Contribution to Overall Manufacturing Growth

Contributions by the industry to total manufacturing output, value added, fixed assets and employment ranged from 1.5% to 3.0%. This low contribution to overall manufacturing growth is not comparable with selected reference countries especially with industrialised and NIC countries.

Though the structural characteristics of this industry is not the main cause of this problem, it is nevertheless one of the reasons affecting the expansion of the industry.

### 3.10.3 Low Productivity as a Result of Small-Firm Size Operations

The industry is dominated by small size firms which are run as family concerns. Managerial capacity is limited and the very size of the firms prohibits efficient economies of scale. Without doubt, some of the firms have capable management but nevertheless there is an insufficient pool of high calibre managers to run an organised business. This problem arises because the entrepreneurs are basically apprentices turned entrepreneurs and are thus more well versed with production rather than with management activities.

### 3.10.4 Weak Export Performance and Negative Export Expansion Contribution to Growth

Throughout the 1970s, the machinery sector had a negative export expansion contribution to the growth of the sector despite a steady increase in exports. While this was prevalent for all industries, it was most pronounced in the Engines and Turbines industry. However, the overall growth in machinery exports had slowed down in the late 1970s. Exports had only marginally increased from $16.3 million and $17.5 million between 1978 and 1981. In fact, these figures underestimated the actual downward trend of the export performance of the machinery sector. This is because the 1981 figure was based on census while the 1978 figure was a survey.

Compared with the industrialised and NIC countries the machinery sector contributes relatively lower export earnings due to its inability to market its products. Several reasons are attributable. The main reasons are relatively inferior quality and price uncompetitiveness.

### 3.10.5 Problem of Excess Capacity

Most machinery firms suffered from excess capacity. The production capacity is constantly under utilised. This low level of utilisation is due to poor market share. The situation is further aggravated during recessions and economic downturns. Most firms absorb some of the excess capacity by sub-contracting for jobs.

With limited prospect in the export market, there is a reliance on the domestic market for expansion. This dependence is not necessarily negative. In fact, the potential domestic market for the local machinery sector is vast. At present, its penetration in the local market is restricted by the overwhelming influx of foreign imports. Indeed, if the local machinery sector's share of the domestic market is expanded, the excess productive capacity can be absorbed.

### 3.10.6 Low Degree of Specialisation

Due to the lack of indigenous research and development, most firms in the industry are engaged in the same product and service functions.

Since the start of operations the sector has been without any product development over the years. This has failed to develop a nucleus of firms specialising in products and skills causing the machinery sector to rely on imports from abroad.

The intra-industry trade index suggests a low level of specialisation within the machinery sector in Malaysia. This is reflected by the sizeable import-export gap faced by the machinery sector. Despite the fact that it has a relatively higher intra trade coefficient, and hence a greater degree of industrialisation, as compared to other developing ASEAN countries, it trailed behind the level of industrial specialisation of NICs. This gap needs to be narrowed.

3.10.7 Weak Inter-Industry Linkages

The linkages of the local machinery sector is low relative to other sectors and other countries. The linkages are lower than that of the construction, transport equipment, chemical products and the textile and leather product sectors. The machinery sector has comparatively lower forward linkages than backward linkages. The low internal backward linkage is due to the sector's need to import raw materials from developed countries while the low internal forward linkage is due to imports for machinery from overseas.

When the linkages are compared to the other developing ASEAN (except Indonesia) countries, Malaysia has a lower linkage index in spite of a relatively higher degree of industrialisation. The machinery sector linkages are also well below that of NICs and developed countries.

Much of this weak linkages is the direct effect of the machinery manufacturers prefering foreign inputs rather than local inputs. The latter is perceived to be inferior than foreign goods.

3.10.8 Low Utilisation of Local Content

The input structure shows that the machinery sector utilises a relatively low level of imported input to local input ratio in the production process. It had a ratio of 1:1.3 in 1975, implying that for every monetary unit of input imported by the machinery sector, 1.3 unit of local input will be used in combination with imports. This local content utilisation rate was higher than Indonesia (1:0.4) and Singapore (1:1.1) but lower than Thailand (1:1.6), South Korea (1:1.8), Philippines (1:5.3), U.S.A. (1:10.4) and Japan (1:21.6).

### 3.10.9 Sizeable Multiplier Leakage

For every increase of $1 million of machinery output value, about $0.44 million is "leaked" out of the country in the form of imports. This is relatively high when compared to the manufacturing sector as a whole (only $0.23 million being "leaked" out). Effectively, about 23% of the total multiplier effect created is leaked out as compared to 13% in the case for the manufacturing sector. While this leakage is comparable to the experiences of both the developing ASEAN countries and NICs, it contrasts drastically with those of the developed countries. The multiplier leakage for Japan and U.S.A. is about 2% of total multiplier effect.

### 3.10.10 Few Investment Incentives

When compared to the manufacturing sector as a whole, the machinery sector has not received a favourable amount of incentives. The proportion of total capital investment for the machinery sector which was granted investment incentives was lower than for the whole manufacturing sector. Despite having a relatively higher proportion of capital investment within the manufacturing sector, only 3.2% of the total manufacturing capital investment that was granted incentives was given to the machinery sector.

There is a resigned attitude towards the lack of government incentives and assistance on the part of the industry. This attitude is often translated into muted anger and skepticism which has a dampening effect on modernisation programmes. As a result, the collection of field data was also greatly hampered.

### 3.10.11 Sector Bias and Firm Bias of Pioneer Status Incentives

Only 1% of the total capital investment in the manufacturing sector is granted to the machinery sector. To add insult to injury, the granting of pioneer status mainly benefited the large companies. For example, to be entitled for a four-year tax exemption period, the capital investment of the company must be more than $500,000. As most of the machinery firms are small, they are precluded from this incentive.

### 3.10.12 Disadvantaged Sector in Terms of Protection

The machinery industries have negative effective protection rate. This implied that the protection structure discriminated against the machinery sector. Among the developing ASEAN countries (except for Singapore), the tariff rates on machinery in Malaysia are the lowest (10.7 per cent) as compared to the ASEAN average tariff rate of 14.2 per cent (inclusive of Singapore) or 17.4 per cent (excluding Singapore). Besides, the tariff on the input of the Machinery sector in Malaysia outweighs the benefit derived from the protection granted to the final products. Despite these, the machinery sector is commercially-viable even in an unprotected environment. In fact, the sector is experiencing positive rate of return to capital investment.

### 3.10.13 Overall Comparative Disadvantage

The domestic resource cost index of the Machinery sector, except machinery and equipment n.e.c. industry, is greater than 2. An import substituting activity will require more than two ringgit to earn or save an additional unit of foreign exchange. Hence, the machinery sector is faced with comparative disadvantage. Only the machinery and equipment n.e.c. industry has comparative advantage.

### 3.10.14 Limited Investment Credit Facility

Despite the productiveness of loans being utilised by the machinery sector, the sector received little credit facilities from both the private and public sector. In 1982 the bulk of loans went to Chemical and Chemical Products industry (37 per cent of total loans to all the industries), Basic Metal Products industry (21 per cent) and Hotel and Tourist Complex industry (10 per cent). The machinery sector took up about 1.4 per cent of the total loans allocated to the industries. In addition, the loan to value added allocation to the machinery sector is lower that granted to the manufacturing sector as a whole. This is about one-twelve the loan to value added granted to the machinery sector in South Korea.

### 3.10.15 Limitation of Case-by-Case Approach

At present, there is no coherent sectoral policy with regards to protection and investment incentives. Provision of these incentives is dependent on case by case evaluation. In practice, the criteria used to assess the eligibility of a firm to the various incentives is rather vague. Inadvertantly very few firms within the machinery sector were granted incentives. Moreover, many firms have complained about the lengthy assessment period prior to confirmation of incentives eligibility. Given the relatively more sophisticated level of industralisation that the country is undergoing, a uniform sectoral approach to incentive eligibility will be more appropriate.

### 3.10.16 Locational Concentration

Currently, the location of machinery firms are still concentrated in the developed states of Selangor, Johore, Penang, Federal Territory and Perak. The process towards locational concentration occurred in spite of the fact that the majority of the firms located in these areas will not receive any benefits. This concentration is reinforced by the fact that when firms do locate their activities in less developed areas, only a minority of them are granted incentives. In fact, there is no locational incentives granted to the machinery sector being studied.

3.10.17 Discrimination Against Small-Scale Firms

Firms in the machinery sector are discriminated against. Moreover, given the low level of loans granted to the machinery sector, it effectively means that the development of the small-scale machinery firms is hampered by this limited level of financial assistance.

3.10.18 Obstacles to Commencement of Production

Some of the obstacles to the commencement of production within the machinery sector that needs to be tackled include inadequate financing facility, accessibility to industrial land and inadequate infrastructural facilities.

,.10.19 Inadequate Export Promotions

One of the main reasons which led to a weak export performance in the machinery sector has been the lack of export promotional drive. There is a conspicuous absence of organised marketing boards and ineffective export promotion organizations. In addition, some firms complained that the existing export incentives granted were rather low and not very attractive. Also, the pessimistic view held by machinery firms of the future state of the market directly affected and has discouraged promotional activity aboard.

3.10.20 Low Incentives to Induce Competitiveness

Of all the projects approved for expansion and diversification, only a quarter of them are granted some form of incentive. It is clear that incentives have not been widerly used to assist firm to achieve competitiveness.

3.10.21 Shortage of Skilled Labour

There is a dearth of skilled professionals and techniques to disseminate technological expertise in the industry.

As the machinery sector is a capital and skilled labour intensive industry, an available pool of skilled labourers is vital. However, skilled labour is a rare commodity in Malaysia. Indeed, the skill of the workers has to be upgraded. But there is an obstacle tc achieving this goal within the private sector. Machinery firms have privately expressed their reluctance to train up their workers for fear of losing them to other potential employees. The problem of low level of skilled labour force is also due to insufficient institutions to train and disseminate the required skill to the population.

This appears to be the proverbial chicken and egg situation where superior technological skills needed to be passed on by skilled technicians can only be built up when the technology is transferred throughout this industry.

The skill required is not only at the production stage but also at the designing stage. This is particularly true of precision machining and die design.

### 3.10.22 Weak Technological Infrastructure

The local technological infrastructure of machine building capability is only marginally linked to the machining sector under study. As was shown earlier, between one quarter to one-half of the firms engaged in the process of machinery manufacturing gear their activities towards the machinery and engineering sector. The rest of the companies provided services, machinery and machinery parts to the resource based sector such as the rubber, oil palm, sawmill, tin mining, quarrying and construction sectors. In addition, most of the machinery employed in the production technology is relatively old and less efficient.

In terms of material supply, the supply of grey cast iron products and greater variety of steel products need to be expanded in the foreseeable future. They are most important for the machine parts. This is particularly true for special steels and standard parts like screws, nuts and bolts.

Poor quality work in ancillary and supporting activities is found in machining, heat treatment, die casting, tool and die making

The development of local tool working capability is hindered by the lack of properly equipped tool rooms.

In addition, there is inadequate machining and surface treatment activities. Forging, research and development activities have also been neglected within the machinery sector.

Finally, the quality control procedures are very weak. At best, simple testing equipment are utilised. Most of the quality control activities is visual. Sophisticated and more accurate testing equipment are seldom used.

3.10.23 Limited and Conditional (Restrictive) Transfer to Technology

The machinery sector exhibits two distinct characteristics with regards to the transfer of technology. First, there is little transfer of technological know how. The technology transfer that is realised is mainly the physical aspect of the technology (for example, plants and machinery). The joint research activity plays the least important role in technological diffusion. Secondly, the conditions for the transfer of technology as laid down by the parent or associate companies abroad are detrimental to the development of the local machinery firms.

Two common conditions are :

a. Purchase of know-how - Firms are prohibited from purchasing know-how from sources other than the contracted foreign companies.

b. Prescribed pricing - Local firms are either required to sell their products or buy the input from the foreign companies at prescribed selling prices.

All these conditions do not work to the interest of the local companies.

### 3.10.24 Lack of Research and Development Activity

Since the industry structure is characterised by small and medium size firms with low turnover it is incapable of supporting R&D programmes. What ever research and development activity there is in the machinery sector is hardly of any significance. Existing research and development activity is mostly performed on an ad hoc basis. Recurrent expenditure on such activity on a regular basis is not a feature on the budgets of machinery companies. What is required is a concerted disciplined programme to research into new products, improvements on existing products and improvements on the current technology.

Without this back-up, it would be difficult for the industry to be a significant contributor to the overall growth in the manufacturing sector.

3.10.25 <u>Lack of Uniform Product Standards and Quality Control Measures</u>

There is insufficient emphasis on quality control measures and standards. Among some firms, quality control is on a trial and error method. This method leaves much to be desired. SIRIM has not been monitoring the specification standards effectively and as such, firms in the industry use manual and visual methods resulting in relatively non-uniform quality products.

# PART IV DEMAND ANALYSIS AND MARKET PROJECTION

# PART IV DEMAND ANALYSIS AND MARKET PROJECTION

## 4.1 Introduction and Methodological Overview

The objective of this chapter of the report is to estimate the potential market demand, both domestic and external, for the products of the NEM sector over the next decade 1985 - 1995. While market demand is largely affected by national and exogenous international economic factors, it can also be influenced somewhat by government policies. In assessing future market demand for NEM products, therefore, certain assumptions about the government's policy framework for industrial development over the next 10 years will have to be made. The details of this framework requirement will not be discussed here but postponed to a later chapter (Section 5). In view of the uncertain nature of the various market factors in the future, we shall present our market demand projection estimates in the form of three alternative scenarios (medium growth, pessimistic growth and optimistic growth) to indicate the likely range in growth variation expected.

### 4.1.1 Data Limitations and Methodological Approach

The NEM demand for sector products are mainly derived demand, i.e. as capital goods to be used in other economic activities (principal manufacturing). Hence, demand for NEM goods is in principle reflected as part of the addition to fixed capital formation or growth in capital investment in the country as well as internationally. Owing to the paucity of data on capital formation trend, however, other proxy variables are often used out of necessity (see later discussion).

Another data limitation which is particularly severe in Malaysia is that of the lack of sufficiently disaggregated product group data over time. Data are often missing for earlier years, and coverage is often incomplete even in later years. This problem is compounded by the fact that the coverage classification and grouping of product categories has changed over time, making consistent time-series impossible to establish over time period of sufficient length for statistical regression analysis. Incompatibility between the SITC commodity classification and MIC industry groupings also create problem in terms of matching export/import data to production statistics. These data problems to a large extent reflect the great heterogenity of the NEM sector products (see discussion in earlier section).

In view of the above data limitation problem, a compromise methodological approach has to be adopted that utilizes international comparative estimate wherever local,national-specific data are missing or unreliable. Moreover, a two-level projection approach is adopted to suit the data availability constraints :

a) An aggregate projection, based largely on selected NEM product groups studied in Chapter 3 which is assumed to be reflective of the entire NEM sector. Projection will cover selected NEM product groups covered in Chapter 3 which is taken as representative of the whole NEM sector.

b) Projection of selected major product groups based on individual product market analysis, wherever data availability permits.

In as much as the future growth of the domestic market demand will be greatly influenced by the future macro-economic growth trend of the country in general and its manufacturing sector in particular assumptions about the likely scenarios for these variables will need to be made explicitly. To ensure consistency with the projection analysis of other sectoral studies for the Industrial Masterplan (IMP); the set of macro economic projections provided by EPU will be adopted.

In particular, the three alternative GDP growth scenarios (low = 6% p.a., medium = 7% p.a. and high = 8% p.a.) forecasted by EPU will be adopted as our projection basis.

The organisation of this Chapter will be as follows. Section 4.2 will focus on estimating the domestic market demand. Section 4.3 will next examine the potential external market demand growth trend. Finally, Section 4.4 combines the findings of the two to provide an overall projection of total demand for the industry.

## 4.2 Analysis and Projection of Domestic Market Demand

### 4.2.1 Past Aggregate Domestic Market Trend

The domestic market for selected NEM product groups in Malaysia in recent years can be approximated by :

(Apparent) Domestic market demand = domestic production + import - export.

Table 4.2.1 summarizes the trend in domestic market demand for selected NEM products estimated for the period 1968-1981 using the above method. As can be seen, the total domestic market demand was estimated to be about $1.2 billion (1984 prices) in 1981, up from $464 million (1984 prices) in 1973 or a growth rate of about 13.0% p.a. over the period 1973-1981. The overall average growth rate over 1968-1981 was about 14.9% p.a.

As Table 4.2.1 shows, domestic production accounted for less than half of the total domestic demand (DD) in 1981, while export was negligible as a share of domestic demand. The low share of domestic production in domestic demand suggests that the NEM industry in Malaysia is relatively under developed when compared with the industrial production structure of other more advanced industrial countries. That this is indeed the case is shown clearly in the next comparison table (Table 4.2.2).

TABLE 4.2.1

ESTIMATED DOMESTIC DEMAND FOR SELECTED NEM PRODUCTS IN PENINSULAR MALAYSIA, 1968 - 1981

| YEAR | DOMESTIC DEMAND (DD) ($ MIL. CURRENT PRICE) | DOMESTIC DEMAND (DD) (1984 $) | DOMESTIC PRODUCTION AS % OF DD | IMPORT AS % OF DD | EXPORT AS % OF DD |
|---|---|---|---|---|---|
| 1968 | 90.5 | 204.0 | 38.6 | 66.4 | 5.0 |
| 1973 | 240.5 | 464.0 | 54.7 | 47.9 | 2.6 |
| 1981 | 1,091.4 | 1,235.0 | 45.0 | 56.6 | 1.6 |

| % P.A. GROWTH | |
|---|---|
| 1968 - 1973 | 17.9 |
| 1973 - 1981 | 13.0 |
| 1968 - 1981 | 14.9 |

NOTE : 1968 FIGURES PERTAIN TO SELECTED NEM PRODUCTS

SOURCE : DERIVED FROM APPENDIX 5.2.1

TABLE 4.2.2

SHARE OF MACHINERY SECTOR IN TOTAL MANUFACTURING VALUE ADDED, PENINSULAR MALAYSIA AND SELECTED COUNTRY GROUPINGS

| | NON ELECTRICAL MACHINERY SECTOR (V.A.) (382) AS % OF TOTAL MANUF. V.A |
|---|---|
| a) DEVELOPED MARKET ECONOMIES (DMES) | |
| 1963 | 10.6 |
| 1970 | 11.5 |
| 1978 | 11.1 |
| b) DEVELOPING COUNTRIES (LDCS) | |
| 1963 | 2.6 |
| 1970 | 3.4 |
| 1978 | 5.1 |
| c) PENINSULAR MALAYSIA | |
| 1963 | 3.5 |
| 1968 | 2.9 |
| 1973 | 3.7 |
| 1981 | 3.5 |

SOURCE : (a) & (b) : UNIDO (1982) : TABLE 7

(c) CMI 1968, 1973, 1981

As Table 4.2.2 clearly shows, not only is share of the NEM sector in total manufacturing V.A. in Malaysia (3.5% in 1981) lower than the typical share of industrialised countries (about 11%), it is also lower than the weighted average share for LDCs as a whole (about 5% in 1978). Moreover, while the share of NEM in Manufacturing VA in LDCs as a whole has been steadily increasing, that in Malaysia has fluctuated around 3-4% over the last twenty years or so (1963-1981).

The sectoral share of NEM in Malaysia manufacturing would have been higher if Malaysia produces more for its own domestic market instead of importing. Indeed if all of Malaysia's domestic demand in 1981 for NEM goods were produced domestically, then the sectoral share of NEM in total Malaysian manufacturing would increase to about 7.4%. The formula is:

$$\alpha_2 = \frac{\alpha_1}{\omega + (1 - \omega)\eta\alpha_1}$$

where $\alpha 1$ = existing sectoral share

$\alpha 2$ = sectoral share achieved if domestic demand is fully supplied by domestic production

$\omega$ = existing domestic production/domestic demand ratio

$\eta$ = linkage multiplier effect of sector on all manufacturing

In the case of Malaysia's NEM sector, $\alpha \sim 0.035$, $\omega$ 0.463 while $n$ is not known, it can be estimated as $n \sim 1.3$ based on international comparative experience.

## 4.2.2 Projection of Future Aggregate Domestic Market Demand Trend

The likely growth of domestic market for NEM products is dependent on the future growth scenario for GDP growth in the country in general and capital formation growth in particular. Three alternative projection approaches will be used in what follows :

a) The elasticity of NEM domestic demand relative to GDP growth is estimated from past Malaysia data. Assuming the elasticity remains constant over the next 10 years, NEM domestic demand for selected products can be projected based on EPU's forecast of GDP growth.

b) The elasticity coefficient is taken instead from comparative international data and applied to the Malaysian case instead.

c) The elasticity of GDCF (Gross Domestic Capital Formation) relative to GDP is estimated from past Malaysian data and is used to project GDCF growth over 1985-1995. Domestic demand for selected NEM products is then estimated as a share of the projected GDCF.

Findings from the three different approaches will be compared and the most reasonable set of projections will be selected for adoption.

4.2.3 Method (a)

No time series data exists for NEM domestic demand in Malaysia over the recent past; instead, only three time-point estimates have been obtainable (1968,1973,1981) as shown in Table 4.2.1 earlier. As such, it is not possible to use regression analysis to estimate the elasticity of selected NEM domestic demand relative to GDP statistically. Instead, a simple arc estimate based on the 1973-1981 data points for selected NEM products is made as follow:

$$\left(\frac{X_{81}}{X_{73}}\right) = \left(\frac{Y_{81}}{Y_{73}}\right)^{\beta}$$

Where $\beta$ = elasticity coefficient
X = NEM domestic demand
Y = GDP
(both in constant price)

A value of $\beta$ = 1.7 is obtained
(A slightly lower value is obtained if the 1968 -1981 points are used instead)

The high elasticity of NEM domestic demand relative to GDP growth over 1973-1981, if continued into the future will result in high growth rates of NEM domestic demand over 1985-1995 (see Table 4.2.3). The formula relating NEM domestic demand growth to GDP growth is :

$$r_d = \left[ \left( 1 + \frac{r_g}{100} \right)^{\beta} - 1 \right] 100$$

Where $r_d$ = NEM domestic demand growth rate p.a.%

$r_g$ = GDP growth rate p.a.%

$\beta$ = elasticity coefficient

Under the medium scenario of EPU, NEM domestic demand in selected products is expected to grow at 12.2% p.a. which implies a growth of 3.2 times over a 10 year period. The low and high growth scenarios are 10.4% and 14.0% respectively.

4.2.4 Method (b)

The elasticity estimate obtained in (a) is based on limited data and may not be very reliable. An alternative approach is therefore to utilize the elasticity estimates derived from international cross-sectional data. The most recent comprehensive study by UNIDO (see UNIDO (1982) provided the following regression estimate of the income and size elasticity of manufacturing activities :

TABLE 4.2.3

PROJECTED GROWTH RATE OF NEW DOMESTIC DEMAND, 1985 - 1995 BASED ON METHOD (a)

| PROJECTION SCENARIO (EPU) | $r_g$ GDP GROWTH % P.A. | $r_d$ IMPLIED NEW DOMESTIC DEMAND GROWTH % P.A. |
|---|---|---|
| PESSIMISTIC | 6 | 10.4 |
| MEDIUM | 7 | 12.2 |
| OPTIMISTIC | 8 | 14.0 |

SOURCE : SEE FORMULA IN TEXT

$$\ln V_i = \alpha + \beta \ln (Y/P) + \gamma \ln P$$

Where : $V_i$ = value added of manufacturing sector i

$Y$ = GDP

$P$ = Population

Appendix 4.2.1 summarizes the regression results for all 28 industrial subgroups (ISIC) obtained by UNIDO (1982) using data over 1970-78. We have abstracted the relevant findings for the NEM sector in Table 4.2.4. As can be seen, the elasticity of NEM VA generation relative to per capita GDP varies with the type of national economies concerned with a range of 1.24 - 1.92. In the typology used by UNIDO, Malaysia will fall most closely within the category "small countries with industrial orientation", which implies that the relevant elasticity coefficients for Malaysia should be around $\beta \sim 1.77$, $\gamma \sim 0.11$ (see boxed values in Table 4.2.4).

Alternatively, case (ii) can also be used as a proxy standard ( $\beta \sim 1.82, \gamma \sim 0.49$).

Using the above estimates and the projected GDP per capita and population figures calculated from data provided by EPU (See Appendix 4.2.2); the implied growth rate of NEM domestic production over 1985-1995 can be projected as shown in Table 4.2.5. The resulting figures appear rather low. Note, however, these projections pertain to growth of domestic V.A. production, not domestic demand, and hence may not be a good proxy for forecasting the growth of domestic demand.

TABLE 4.2.4

ELASTICITY ESTIMATES OF NEW MANUFACTURING V.A. BASED ON UNIDO STUDY

| | ELASTICITY COEFFICIENT | |
|---|---|---|
| | PER CAPITA GDP | POPULATION |
| i) LARGE COUNTRIES | 1.92 | 0.35 |
| SMALL COUNTRIES | | |
| ii) - WITH MODERATE RESOURCES | 1.82 | 0.49 |
| - WITH AMPLE RESOURCES | | |
| iii) - PRIMARY ORIENTATION | 1.58 | -0.10 |
| iv) - INDUSTRIAL ORIENTATION | 1.77 | 0.11 |
| v) CENTRALLY PLANNED ECONOMIES | 1.24 | -0.41 |

SOURCE : APPENDIX 4.2.1

TABLE 4.2.5

PROJECTED NEW DOMESTIC PRODUCTION GROWTH 1985 - 1995, BASED ON METHOD (b)

| EPU SCENARIOS | GDP GROWTH P.A. % rg | POP. GROWTH P.A. % rp | PER CAPITA GDP GROWTH P.A. % r(g/p) | IMPLIED NEW DOMESTIC PRODUCTION GROWTH P.A. % rd | |
|---|---|---|---|---|---|
| | | | | (i) | (ii) |
| LOW | 6 | 2.4 | 3.5 | 6.6 | 7.7 |
| MEDIUM | 7 | 2.4 | 4.5 | 8.4 | 9.6 |
| HIGH | 8 | 2.4 | 5.5 | 10.2 | 11.5 |

NOTES (i) $\beta$ =1.77, $\gamma$ =0.11

(ii) $\beta$ =1.82, $\gamma$ =0.49

### 4.2.5 Method (c)

In this third method, one shall attempt to project the growth of NEM domestic demand by utilizing the relationship of GDCF (Gross Domestic Capital Formation) growth to that of GDP. Appendix 4.2.3 shows the time-series data for GDCF and GDP in Malaysia over the period 1970-1983. A simple regression estimate is then made for the functional form

$GDCF = \alpha\ (GDP)^{\beta}$ where $\beta$ = elasticity coefficient [(or $\ln (GDCF) = \ln \alpha + \beta \ln (GDP)$)].

Figure 4.2.1 shows the resulting regression fit. An elasticity of 1.54 is obtained. If we assume that this elasticity coefficient remains constant over the next decade, the growth rate of GDCF can be projected over 1985-1995 using EPU's alternative GDP growth scenarios (see Table 4.2.6). The medium forecast of GDCF growth rate over 1985-1995 is 11% p.a., with the low and high projection being 9.4% p.a. and 12.6% p.a. respectively.

Since a significant proportion of NEM products contribute towards GDCF, the growth of NEM demand can be forecasted based on the projected GDCF if we know how the (NEM investments goods/GDCF) ratio varies over time. Based on the only available data for 1973 and 1981, the share of NEM goods in total GDCF for Malaysia in 1973 and 1981 can be estimated. However as the subgroups studied here are assumed to reflect the character of NEM, the share of selected NEM goods in total GDCF for

FIGURE 4.2.1

GDCF GROWTH IN RELATION TO CDP GROWTH

Log GDCF vs. Log GDP (1970 - 1983)
Regression equation : Y'=1.543X-6.881

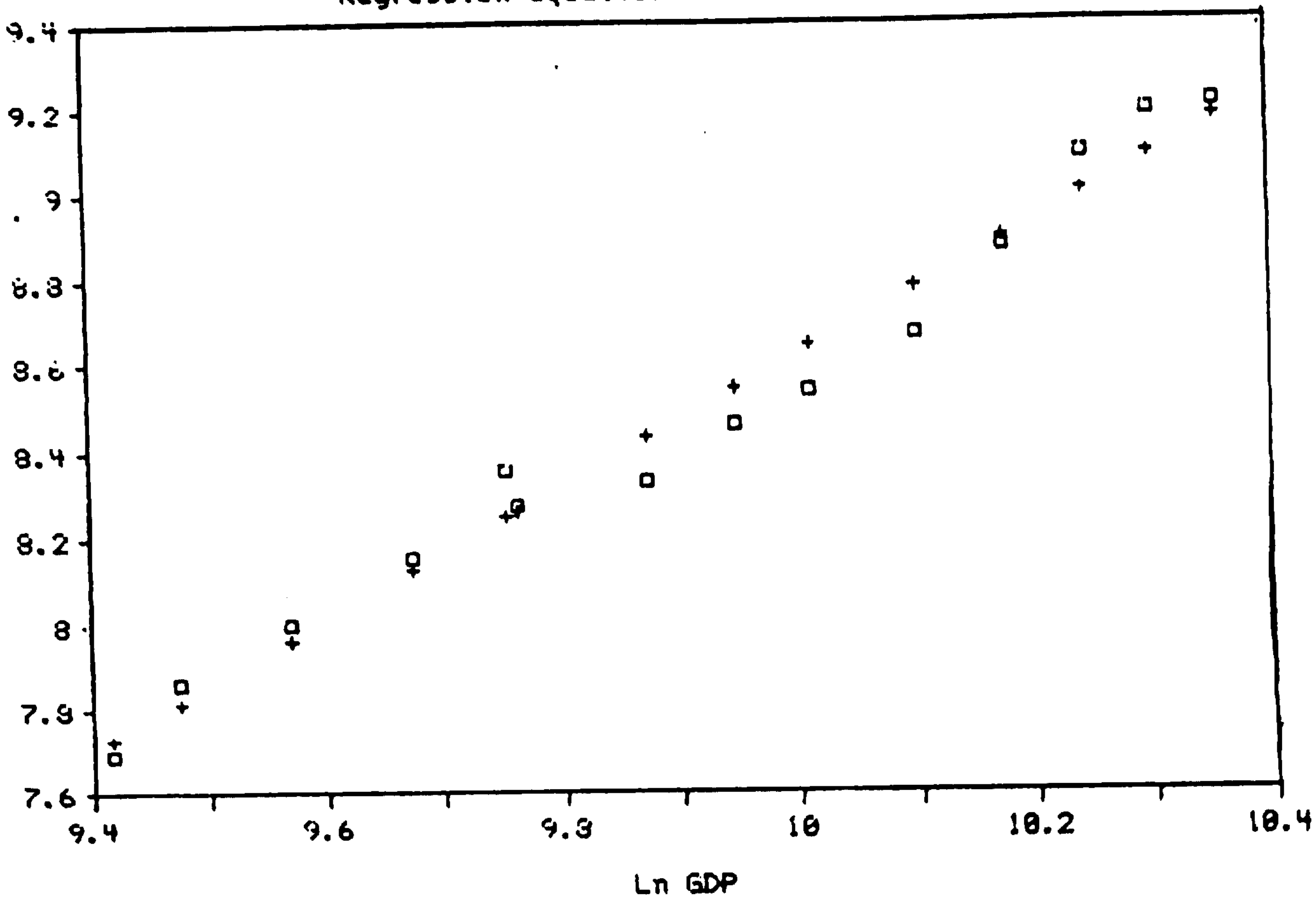


TABLE 4.2.6

PROJECTED GDCF GROWTH RATE, M'SIA 1985 - 95

| EPU SCENARIOS | GDP GROWTH %p.a. r | GDCF GROWTH %p.a. r | NEW DOMESTIC DEMAND %p.a. r |
|---|---|---|---|
| LOW | 6 | 9.4 | 9.9 |
| MEDIUM | 7 | 11.0 | 11.6 |
| HIGH | 8 | 12.6 | 13.3 |

NOTES: $r_c = \left[(1 + r_g/100)^{\beta} - 1\right] \times 100 \qquad \beta = 1.54$

$r_d = \left[(1 + r_c/100)^{\beta'} - 1\right] \times 100 \qquad \beta' = 1.05$

Malaysia can be estimated as shown in Table 4.2.7. A slight increase from about 5.9% in 1973 to 6.2% in 1981 is observed, implying an arc elasticity of about 1.05. The estimated proportion of this selected NEM expenditure in total GDCF appears low in comparison with other reference countries (see Table 4.2.8) and suggests that either the selected NEM domestic demand has been slightly under-estimated or that the GDCF was slightly over-estimated. The latter possibility is very likely as 1973 and 1981 were both years in which property prices were escalating, thus biasing the share of landed properties and construction investments in total GDCF to be above average. In any case, international comparative experience does suggest that the share of NEM expenditure in total GDCF tend to fluctuate considerably from year to year. Thus a slight secular trend of increase for rapidly industrializing countries appear likely. In view of this, we shall make two alternative assumptions ;

i. The share remains constant, i.e. NEM expenditure will grow at the same rate as GDCF implying the same rate for selected NEM subgroups.

ii. The share will increase with the same elasticity of 1.05 as estimated for 1973-81

The case of alternative (ii) implies that NEM domestic demand will grow at about 11.6% p.a. under the medium projection (see Table 4.2.6), and 9.9% to 13.3% under the low and high scenarios respectively.

TABLE 4.2.7

SELECTED NEM PRODUCT GROUPS AS SHARE OF GDCF, 1973 - 1981

| YEAR | NEM DOMESTIC DEMAND (1984 PRICES) $ billion | GDCF (1984 PRICES) $ billion | % |
|---|---|---|---|
| 1973. | 0.464 | 7.878 | 5.9% |
| 1981 | 1.235 | 19.952 | 6.2% |

ARC ELASTICITY OF SELECTED NEM RELATIVE TO GDCF 1.05

NOTE : ALL PRICES ARE CONVERTED TO 1984 PRICES

TABLE 4.2.8

NEM EXPENDITURE AS SHARE OF TOTAL
GDCF SELECTED COUNTRIES, 1975

| COUNTRY | NEM/GDCF |
|---|---|
| SOUTH KOREA | 18.4 |
| THAILAND | 17.6 |
| BRAZIL | 23.1 |
| MEXICO | 12.8 |
| U.K. | 21.4 |
| JAPAN | 10.8 |
| U.S. | 18.0 |
| W.GERMANY | 16.2 |
| INDIA | 12.9 |

SOURCE : CALCULATED FROM WORLD BANK
WORLD TABLE VOL. I

4.2.6 Comparison and Evaluation of Findings from the 3 Different Projection Methods

The projection results obtained by the 3 different projection methods are summarized and compared in Table 4.2.9. For the medium scenario of GDP growth assured by EPU, the projected growth rate of NEM domestic demand for selected subgroups ranges from 9.6% p.a (under method (b)) to 12.2% (under method (a)). For all except method (b), the projected growth rate of NEM domestic demand for selected subgroups will be higher than the growth rate of all manufacturing production as forecasted by EPU. This is what it should be in view of the increasing shift towards the capital goods sector in the future industrialisation strategy of the country. This suggests that a stronger structural shift towards NEM demand should be expected over the next decade than the previous. In light of this strategy assumption and earlier discussion, the most reasonable projection figures appear to be method (c) (ii) (see boxed figures in Table 4.2.9), and we recommend that this projection method and findings be adopted. Table 4.2.10 shows the projected value of NEM domestic demand for selected products (in 1984 prices) over 1985-95 under the above selected projection method. (The growth rate of GDP over 1981-85 is assumed to be 6.2% p.a. based on estimate provided by EPU). As can be seen, under the medium growth scenario of EPU, NEM domestic demand for selected products is expected to increase from about $1.821 billion in 1995-1984 constant price to $5.46 billion by 1995 (1984 constant price), an increase of about 3.0 times over the decade. Under

TABLE 4.2.9

COMPARISON OF ALTERNATIVE PROJECTION RESULTS FOR NEM DOMESTIC DEMAND, 1985

| EPU SCENARIOS | GDP % P.A. | GROWTH % D85 DEMAND GROWTH % | | | | EPU PROJECTED GROWTH RATE OF ALL MANUF. (% P.A.) |
|---|---|---|---|---|---|---|
| | | METHOD (a) | METHOD (b) | METHOD (c) | | |
| | | | | (i) | (ii) | |
| LOW | 6.0 | 10.4 | 7.7 | 9.4 | 9.9 | 8.5 |
| MEDIUM | 7.0 | 12.2 | 9.6 | 11.0 | 11.6 | 10.2 |
| HIGH | 8.0 | 14.0 | 11.5 | 12.6 | 13.3 | 12.1 |

SOURCE : EPU AND EARLIER TABLES

TABLE 4.2.10

PROJECTED DOMESTIC DEMAND OF SELECTED NEW PRODUCTS
(1984 CONSTANT PRICE), 1981 - 1995

| PROJECTION ASSUMPTIONS | $r_g$ | $r_d$ |
|---|---|---|
| 1981 - 1985 | 6.2 | 10.2 |
| | | |
| 1985 - 1995 | | |
| LOW | 6.0 | 9.9 |
| MEDIUM | 7.0 | 11.6 |
| HIGH | 8.0 | 13.3 |

| YEAR | DD FOR SELECTED NEW PRODUCT GROUPS $ BILLION (1984 CONST. PRICE) |
|---|---|
| 1981 | 1.235 |
| | |
| 1985 | 1.821 |
| | |
| 1990 | |
| LOW | 2.919 |
| MEDIUM | 3.152 |
| HIGH | 3.400 |
| | |
| 1995 | |
| LOW | 4.680 |
| MEDIUM | 5.456 |
| HIGH | 6.348 |

the "low" scenario, the projected value will be \$4.6 billion, while under the "high" scenario, it may reach as much as \$6.35 billion.

## 4.2.7 Projection of Domestic Demand By Major Product Groups

The projection of domestic demand by individual major product subgroups can be carried out using method similar to (c) (ii). We have

$$r_{di} = \left[ \left( 1 + \frac{r_c}{100} \right)^{\beta_i} - 1 \right] 100$$

where $r_{di}$ = projected growth rate of domestic demand for product ground

$\beta_i$ = elasticity of $d_i$ growth relative to GDCF growth, estimated by:

$$\beta_i = \frac{\log_e (\text{demand}_{81}/\text{demand}_{73})}{\log_e (\text{GDCF}_{81}/\text{GDCF}_{73})}$$

$$= 2.478 \log_e \frac{(\text{demand}_{81})}{(\text{demand}_{73})}$$

($\text{demand}_{81}$ = demand for product i in 1981)
($\text{demand}_{73}$ = demand for product i in 1973)

$$r_c = 9.7\% \text{ p.a. over } 1981\text{-}85$$

$$= \left.\begin{array}{l} 9.4\% \text{ Low} \\ 11.0\% \text{ Medium} \\ 12.6\% \text{ High} \end{array}\right\} \text{ over } 1983\text{-}95$$

Table 4.2.11 summarises the projection results for selected product groups where data are available :

TABLE 4.2.11

PROJECTED GROWTH IN DOMESTIC DEMAND FOR SELECTED NEW PRODUCT GROUPS, 1981 - 1995
(1981 CONSTANT PRICE)

| PRODUCT GROUPS | DOMESTIC DD 1981 MILLION | GROWTH % 1981 - 1985 | D85 DEMAND 1985 MILLION | GROWTH % 1981 - 1995 | D85 DEMAND 1995 MILLION |
|---|---|---|---|---|---|
| SELECTED AGRICULTURAL MACHINERY | 145.7 | 13.4 | 240.9 | | |
| LOW | | | | 13.0 | 818.1 |
| MEDIUM | | | | 15.3 | 1,000.7 |
| HIGH | | | | 17.5 | 1,208.9 |
| SELECTED ENGINES AND TURBINES | 207.3 | 16.7 | 384.5 | | |
| LOW | | | | 16.2 | 1,725.7 |
| MEDIUM | | | | 19.0 | 2,189.6 |
| HIGH | | | | 21.9 | 2,789.3 |
| METAL AND WOODWORKING | 186.8 | 10.3 | 276.5 | | |
| LOW | | | | 10.0 | 717.14 |
| MEDIUM | | | | 11.7 | 836.04 |
| HIGH | | | | 13.4 | 972.35 |
| MATERIAL HANDLING AND EQUIPMENT | 158.2 | 9.4 | 226.6 | | |
| LOW | | | | 9.1 | 541.40 |
| MEDIUM | | | | 10.7 | 626.20 |
| HIGH | | | | 11.9 | 697.40 |

NOTE:PRODUCT GROUPS REFER TO PRODUCTS UNDER APPENDIX 1.2.3
NO DISAGGREGATED DATA FOR MATERIAL HANDLING EQUIPMENT IN 1981. HOWEVER AS THERE IS NO KNOWN LOCAL PRODUCTION , DOMESTIC DD = IMPORTS - EXPORTS.

## 4.2.8 Agricultural Machinery

The likely growth in the domestic demand for agricultural machinery over the next decade is to a certain extent influenced by government's policy towards farm mechanization especially for the padi sector. Historically the spread of farm mechanization in the padi sector in other countries have tended to exhibit a "S" curve behavior.

Table 4.2.12 shows the growth in powered tillers utilization in padi cultivation in Japan, Taiwan and Korea over 1947-1971. As can be seen, Japan, has reached the saturation phase by the late 1960s while Korea is just starting to take off. Taiwan has reached a stage somewhere in between. Table 4.2.13 shows similar growth behavior for tractor utilization by selected reference countries. Table 4.2.14 shows farm machinery in selected reference countries in the ESCAP region in the 1970s. The data serve to indicate that widely varying levels of farm mechanization exists for different countries at different growth phases.

By all indications, Malaysia is currently only in the "take off" stage as far as padi farm mechanization is concerned, and hence the prospect for future market expansion is great. A rough indication of the likely magnitude of market size for selected agricultural machines in Malaysia's padi sector can be made in the estimate below:

TABLE 4.2.12

NUMBER OF POWER TILLERS IN USE, TOTAL AND NUMBER PER 1,000 HECTARES OF PADDY LAND, JAPAN, TAIWAN, AND KOREA

| YEAR | JAPAN | | TAIWAN | | KOREA | |
|---|---|---|---|---|---|---|
| | POWER TILLERS IN USE | | POWER TILLERS IN USE | | POWER TILLERS IN USE | |
| | TOTAL NUMBER | NO. PER 1,000 HECTARES OF PADDY LAND a | TOTAL NUMBER | NO. PER 1,000 HECTARES OF PADDY LAND b | TOTAL NUMBER | NO. PER 1,000 HECTARES OF PADDY LAND c |
| 1947 | 8,000 | 2.3 | - | - | - | - |
| 1949 | 10,000 | 2.9 | - | - | - | - |
| 1951 | 16,000 | 4.7 | - | - | - | - |
| 1953 | 35,000 | 10.2 | - | - | - | - |
| 1955 | 89,000 | 26.1 | - | - | - | - |
| 1956 | - | - | 51 | 0.1 | - | - |
| 1957 | 227,000 | 66.5 | 171 | 0.3 | - | - |
| 1958 | - | - | 591 | 1.1 | - | - |
| 1959 | 514,000 | 150.5 | 2,253 | 4.3 | - | - |
| 1960 | - | - | 3,699 | 7.0 | - | - |
| 1961 | 1,020,000 | 298.7 | 5,304 | 10.1 | 30 | 0.03 |
| 1962 | 1,414,000 | 414.1 | 7,495 | 14.2 | 93 | 0.1 |
| 1963 | 1,812,000 | 530.6 | 9,070 | 17.2 | 286 | 0.2 |
| 1964 | 2,183,000 | 639.2 | 10,192 | 19.3 | 950 | 0.8 |
| 1965 | 2,490,000 | 729.1 | 12,204 | 23.1 | 1,217 | 1.0 |
| 1966 | 2,725,000 | 797.9 | 14,263 | 27.0 | 1,661 | 1.4 |
| 1967 | 2,971,000 | 870.0 | 17,231 | 32.5 | 3,925 | 3.3 |
| 1968 | 3,030,000 | 887.3 | 21,144 | 39.8 | 6,331 | 5.3 |
| 1969 | - | - | 24,631 | 46.7 | 8,938 | 7.4 |
| 1970 | 3,159,000 | 952.0 | - | - | 12,989 | 10.8 |
| 1971 | 3,197,000 | 936.2 | - | - | 17,136 | 14.2 |

SOURCE : JAPAN, FARM MACHINERY YERABOOK, 1971
TAIWAN: PENG TIEN-SONG, J.C.R.B., IN AGRICULTURAL MECHANIZATION IN S.E. ASIA, SPRING, 1971, FARM MACHINERY RESEARCH CORP.; TOKYO.
KOREA: "PROSPECTS FOR FARM MECHANISATION IN KOREA", AERI, REPORT-1. MAF, OCT.1, 1970: ENGLISH TRANSLATION BY USAID/KOREA.

a) 3,415,000 HECTARES
b) 528,927 HECTARES
c) 1,205,023 HECTARES
d) THE 1971 FIGURE FOR KOREA IS FROM N.A.C.F., AS SHOWN IN TABLE AP. IV. 3.

TABLE 4.2.13

GROWTH OF TRACTORS IN SELECTED COUNTRIES (IN THOUSANDS)

| YEAR | JAPAN 2 WHEEL | JAPAN 4 WHEEL | GERMANY | DENMARK | FRANCE | UNITED KINGDOM (G.B. + N. IRELAND) | UNITED STATES | SPAIN | YUGLOSLAVIA | KOREA REPUBLIC 2 WHEEL | KOREA REPUBLIC 4 WHEEL | INDIA | MEXICO | PHILIPPINES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1910 | | | | | | | 10 | | | | | | | |
| 1920 | | | | | | 10 | 246 | | | | | | | |
| 1930 | | | | | 27 | 30 | 920 | | | | | | 4 | |
| 1938/39 | 3 | | 30 | 4 | 36 | 55 | 1,545 | 3 | | | | | 5 | 2 |
| 1945/47 | 8 | | 69 | 4 | 77 | 244 | 2,613 | 5 | | | | 5 | | 1 |
| 1950 | 16 | | 140 | 17 | 137 | 325 | 3,394 | 10 | 6 | | | 9 | 23 | |
| 1955 | 82 | | 462 | 58 | 305 | 436 | 4,345 | 25 | 10 | | | 21 | | |
| 1960 | 514 | | 857 | 111 | 680 | 456 | 4,688 | 39 | 36 | 1 | | 31 | 55 | 8 |
| 1965/66 | 2,725 | 39 | 1,164 | 161 | 996 | 482 | 4,787 | 148 | 45 | 11 | | 54 | | |
| 1970 | 3,201 | 267 | 1,371 | 175 | 1,230 | 514 | 4,619 | 260 | 80 | 44 | 0 | 148 | 91 | 11 |
| 1975/76 | 3,183 | 721 | 1,425 | 185 | 1,363 | 541 | 4,469 | 379 | 226 | 60 | 1 | 228 | 102 | |
| 1979 | 3,168 | 1,096 | 1,456 | 190 | 1,430 | 508 | 4,350 | 492 | 385 | | | 310 | 114 | |

SOURCE: BISWANGER (1984)

TABLE 4.2.14

PRODUCTION AND UTILIZATION OF FARM MACHINERY IN SELECTED COUNTRIES IN THE ESCAP REGION (UNITS)

| COUNTRY AND YEARS | MOTORS | ENGINES | | POWER TILLERS | | 4 - WHEEL TRACTORS | | POWER SPRAYERS/DUSTERS | | POWER THRESHERS | | PUMPSETS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LOCALLY MADE | LOCALLY MADE | IMPORTED | LOCALLY MADE | IMPORTED | LOCALLY MADE | IMPORTED | LOCALLY MADE | IMPORTED | LOCALLY MADE | IMPORTED | LOCALLY MADE | IMPORTED |
| MALAYSIA | | | | | | | | | | | | | |
| 1971 | - | - | - | - | - | - | 1,213 | - | - | - | - | - | - |
| 1978 | - | - | - | - | - | - | 14,100 | - | - | - | - | - | - |
| INDIA | | | | | | | | | | | | | |
| 1969/1970 | 0.71 (a) | 88,855 | - | 314 | - | 18,210 | 10,478 | 50000 (b) | - | 30,000 | - | 350,000 | - |
| 1976/1977 | 1.1 (a) | 161,900 | - | 1,759 | - | 33,146 | 8,548 | 50000 (b) | - | 30,000 | - | 350,000 | - |
| NEPAL | | | | | | | | | | | | | |
| 1970/1971 | - | - | - | - | 48 | - | 318 | - | - | - | - | - | 485 |
| 1977/1978 | - | - | - | - | 86 | - | 64 | - | - | - | - | - | 1,100 |
| PAKISTAN | | | | | | | | | | | | | |
| 1972 | 53,580 | 89,378 | - | - | - | - | 31,869 | - | 285 | 1,408 | - | 1,408 | - |
| 1978/1979 | 71,077 | 107,406 | - | - | - | - | 74,041 | - | 3,238 | 15,600 | - | 15,600 | - |
| PHILIPPINES | | | | | | | | | | | | | |
| 1970 | - | - | 850 | 85 | 900 | - | 974 | - | 55 | 80 | 60 | 250 | 2,000 |
| 1978 | - | - | 40,562 | 6,278 | 1,676 | - | 1,286 | - | 37 | 1,500 | 10 | 1,600 | 1,800 |
| REP. OF KOREA | | | | | | | | | | | | | |
| 1970 | - | - | - | 4,774 | - | - | - | 25,556 | - | 3,547 | - | 22,392 | - |
| 1979 | - | - | - | 67,761 | - | - | 604 | 74,957 | - | 11,618 | - | 29,831 | - |
| THAILAND | | | | | | | | | | | | | |
| 1970 | - | - | 48,234 | 14,400 | - | 895 | 688 | 2,000 | - | - | - | 5,796 | 136,686 |
| 1979 | - | - | 159,365 | 54,124 | - | 4,920 | 3,559 | 6,106 | 32,059 | 700 | - | 40,000 | 281,668 |

SOURCE : ASIAN PRODUCTIVITY ORGANIZATION, FARM MECHANIZATION IN ASIA (1983)

(a) MILLION HP

(b) INCLUDES POWER AND MANUAL TYPES

| Indicative target intensity of usage by 1995 | Cummulative Market Size in 1995 |
|---|---|
| power tillers - 50/1,000 ha. padi land (~562,000 ha. padi land in 1980) | ~ 28,100 units |
| tractor (2-wheel) - 30/1,000 ha. padi land | ~ 16,000 units |
| rice transplanters - 100/1,000 ha. | ~ 56,200 units |
| combine harvestors - 10/1,000 ha. | ~ 5,600 units |

In addition to the padi sector the FELDA schemes sector and private estate sector would also generate significant demand for agricultural machinery over the next decade. In 1981, the rubber, oil palm and cocoa estates utilized about $43 million of agricultural machinery. These should expand rather rapidly over the next 10 years as the labor shortage problem is encouraging the private plantation owners to introduce greater mechanization, such as latex extraction gum, mechanised palm oil fruit harvestors, etc. Overall, a total market size of close to $1.0007 billion for all agricultural machinery has been projected by 1995 (see Table 4.2.11).

4.2.9 Metal and Wood-Working Machinery

The major source of growth here will be the various metal and wood working machine tools. The growth of the Malaysian car industry and the expected expansion of the fabricated metal products and wooden furniture industry will expand the demand for machine tools significantly over the next 10 years (see Table 4.2.11).

Table 4.2.15 shows the main EEC countries producing machine tools. In 1980, they produced about US$9 billion and nearly 70% of this value was exported world-wide (about US$6.2 billion). (EEC Asean Industrial Sectoral Conference, March 1983)

Traditionally, the domestic demand for the machine tool industry in West Germany has been dependent on the automotive and construction industries. In 1978 export sales rose by 1% to 4.9 billion DM but in real terms a fall of 3%. According to preliminary estimates from VDMA, the association of German machinery manufacturers, machine tool exports rose by 3.9% in 1979. This represented a drop in real terms of about 1%. Thus the present picture for German machine tool exporters is further stagnation.

In Great Britain, again investment in the motor industry is a key determinant in machine tool demand. In the past couple of years, the machine tool industry has benefited from the Ford engine plant at Bridgend. For this industry, product development is the key word for survival. In the past couple of years ie. around 1980, several

TABLE 4.2.15

PRODUCTION OF MACHINE TOOLS, COMPONENTS AND PARTS IN THE MAIN EEC COUNTRIES AND EXPORTS (IN MILLION US-$) - 1980

| Country | Total machinery turnover | Machine tool production value | % | Machine tool exports | % of production |
|---|---|---|---|---|---|
| FRG | 67,122 | 4,600 | 47.6 | 3,082.2 | 67 |
| GB | 39,145 | 1,255 | 13.0 | 886.5 | 70 |
| France | 18,778 | 1,100 | 15.5 | 722.9 | 66 |
| Italy | 21,907 | 1,500 | 17.6 | 1,038.7 | 89 |
| Belg/Lux. | 4,548 | 257 | 2.8 | 205.6 | 80 |
| Netherl. | 5,338 | 197 | 2.0 | 137.9 | 70 |
| Denmark | 2,837 | 143 | 1.5 | 85.9 | 70 |
| TOTAL | 159,675 | 9,052 | 100.0 | 6,159.7 | 68 |

Source: VDMA Statistical Handbook, Frankfurt, 1982.
Statistical offices in EEC-countries, 1981.
American Machinist, Washington, Feb. 1980.

companies have started manufacturing NC lathes. They include Alfred Herbert, TI Churchill, Warner and Swasey, Webster and Bennet, and the 600 Group.

Judging from the experience of these industrial "giants" in machine tools, the metal working industry in Malaysia will also be dependent on the the automotive industry and the construction industry. With the boom in the construction sector tapering off, the impetus for growth will come from the motor industry. In 1978, machinery accounted for $39.375 million and this demand is expected to be higher for the coming decade. The outlook for this subgroup is brighter for Malaysia than for the countries discussed earlier.

### 4.2.10 Other Sub-groups

There is insufficient reliable data to support a discussion on engines and turbines and material handling equipment for this section.

## 4.3 Analysis and Forecast of World Market Demand

NEM goods is an important part of the world trade in manufactured goods. This section reviews the past trend and characteristics of the world export market for NEM products and projects its likely growth scenarios for the next 10 years. An attempt is then made to assess Malaysia's likely market share potential within this dynamically expanding segment of world trade.

Table 4.3.1 summarizes the aggregate growth trend of the world trade in NEM relative to world trades in general over the decade 1970-80. As can be seen, world export of NEM goods increased from about US$38.3 billion in 1970 to US$206.8 billion in 1980 or an average growth rate of 18.4% p.a. This growth rate is slightly lower than that of all machinery and transport equipment combined (19% p.a.), all manufactured goods (19.4%p.a.) and all traded goods (20.4% p.a.). Consequently, the share of NEM goods in world export has declined slightly over the decade (12.2% to 10.3%). Similarly, its share in all manufactured goods and all machinery goods have also dropped slightly (21.9% to 20.2% and 42.7% to 40.5% respectively).

Table 4.3.2 (a) shows the growth in total world and LDC machinery and transport equipment export (SITC 7) over 1995 - 1980. As can be seen, the developed market economics (DMEs) continue to dominate the world's trade in machinery goods; LDC's share of machinery export, although rising rapidly, is still small as of 1980 (about 5% of the total export market). The combined production of machinery goods by all LDCs in 1980 amounted to only US$27.3 billion. On the other hand, LDCs have been importers of machinery goods in the late 1950s, 20-25% in the 1960s and up to almost 30% again since the late 1970s. (See Table 4.3.2(b)). This glaring imbalance indeed epitomizes the industrial structural difference between the advanced and less developed countries, with the former dominating in capital goods manufacturing and exporting while the latter concentrated in primary products processing or light manufac-

TABLE 4.3.1

AGGREGATE TREND IN NEM PRODUCT EXPORT AND WORLD TRADE, 1970 - 1980

| | WORLD EXPORT | | AVERAGE GROWTH % P.A. 1970 - 1980 |
|---|---|---|---|
| | 1970 | 1980 | |
| | (US $ BILLION f.o.b.) | | |
| a) TOTAL EXPORT GOODS | 315.01 | 2,015.50 | 20.40 |
| b) TOTAL MANUFACTURED GOODS (SITC 5 TO 8 LESS 67 & 68) | 174.50 | 1,025.90 | 19.40 |
| c) MACHINERY & TRANSPORT EQUIPMENT (SITC 7) | 89.80 | 511.00 | 19.00 |
| d) NEM PRODUCTS (SITC 71) | 38.30 | 206.80 | 18.40 |
| - AS % OF (a) | 12.20 | 10.30 | |
| - AS % OF (b) | 21.90 | 20.20 | |
| - AS % OF (c) | 42.70 | 40.50 | |

SOURCE : COMPILED AND CALCULATED FROM UN (1983)

TABLE 4.3.2

TREND OF TOTAL WORLD EXPORT AND IMPORT OF MACHINERY AND TRANSPORT EQUIPMENT PRODUCTS (SITC 7) 1970 - 1980

| | WORLD<br>$ BILLION U.S. | DMES<br>$ BILLION U.S. | LDCS<br>$ BILLION U.S. | LDC SHARE<br>OF WORLD (%) |
|---|---|---|---|---|
| a) EXPORT | | | | |
| 1955 | 16.92 | 14.65 | 0.13 | 0.8 |
| 1960 | 27.77 | 23.84 | 0.19 | 0.7 |
| 1965 | 45.59 | 39.27 | 0.39 | 0.9 |
| 1970 | 89.77 | 78.62 | 1.43 | 1.6 |
| 1975 | 244.44 | 212.67 | 7.12 | 2.9 |
| 1980 | 511.02 | 427.01 | 27.32 | 5.3 |
| b) IMPORT | | | | |
| 1955 | 16.92 | 8.16 | 5.39 | 31.9 |
| 1960 | 27.77 | 14.68 | 8.03 | 28.9 |
| 1965 | 45.59 | 27.76 | 11.40 | 25.1 |
| 1970 | 89.77 | 59.45 | 19.28 | 21.5 |
| 1975 | 244.44 | 140.99 | 70.65 | 28.9 |
| 1980 | 511.02 | 308.48 | 147.73 | 28.9 |

SOURCE : CALCULATED FROM UN (1983)

turing. While the above observation applies to all machinery goods as a whole, the same pattern basically applies to the NEM goods sector as well.

Table 4.3.3 and Table 4.3.4 show the share of production and export in NEM goods by economic groupings and major exporting nations. As can be seen while the LDCs as a whole accounted for over 10% of the world's manufacturing value added in 1979 their share of the world's production of NEM goods was only 4.7% (degree of specialization = 0.46 only.) Although the situation has improved somewhat over the years (degree of specialization = 0.31 in 1970), the lag remains serious. Indeed, the top 6 exporting nations of NEM goods are all advanced industrial economies in the OECD, and these 6 exporters alone account for over 70% of the world's total export of NEM (see Table 4.3.4 (US, West Germany and Japan) alone account for 1/2 of the world's NEM products exported in 1982. The only major change in this pattern of export market concentration over 1970-1982 was the rising importance of Japan. Over 1970-1982, Japan rose from rank 6 to rank 3 in terms of NEM export values and its share in total NEM export more than doubled over the period.

Table 4.3.5 shows that the share of NEM goods in total world machinery export has declined slightly from 43.6% in 1963 to 40.5% in 1980, while that of electrical machinery and transport equipment have increased. The latter increases reflect the growing importance of electronic products (both consumer electronics and industrial electronics) as well as automobiles in world export.

TABLE 4.3.3

SHARE OF WORLD PRODUCTION OF NEM VALUE ADDED BY ECONOMIC GROUPING

| | NEM VALUE ADDED | | | ALL MANUF. VALUE ADDED | | |
|---|---|---|---|---|---|---|
| | 1970 | 1975 | 1979 | 1970 | 1975 | 1979 |
| DEVELOPING ECONOMIES | 2.7 | 4.6 | 4.7 | 8.7 | 10.2 | 10.2 |
| DEVELOPED MARKET ECONOMIES | 80.9 | 72.9 | 70.6 | 72.7 | 67.0 | 66.5 |
| CENTRALLY PLANNED ECONOMIES | 16.4 | 22.5 | 24.7 | 18.6 | 22.8 | 23.4 |
| ALL | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

SOURCE : UNIDO (1982) : TABLE 3

TABLE 4.3.4

SHARE OF WORLD EXPORT OF NEW PRODUCTS BY MAJOR EXPORTING NATIONS, 1970-1982

| | (SITC 71) | | (SITC REV. 2 - (71 - 74) | |
|---|---|---|---|---|
| | 1970 | | 1982 | |
| | $ MILLION | % | $ MILLION | % |
| UNITED STATES | 8,380.1 | 22.3 | 34,395.5 | 28.7 |
| WEST GERMANY | 7,620.3 | 20.3 | 29,956.3 | 18.0 |
| JAPAN | 2,006.2 | 10.5 | 14,576.9 | 8.8 |
| UNITED KINGDOM | 3,941.1 | 6.7 | 11,363.8 | 6.8 |
| ITALY | 2,499.1 | 5.3 | 18,491.9 | 11.1 |
| FRANCE | 2,248.5 | 6.0 | 10,528.3 | 6.3 |
| OTHERS | 10,847.2 | 28.9 | 47,082.5 | 28.3 |
| ALL | 37,533.6 | 100.0 | 166,369.4 | 100.0 |

SOURCE : UN (1970, 1982)

TABLE 4.3.5

COMPOSITION OF WORLD EXPORT OF MACHINERY PRODUCTS (SITC 7), 1963 - 1960

| SITC CODE | PRODUCT GROUP | 1963 | 1970 | 1975 | 1978 | 1980 |
|---|---|---|---|---|---|---|
| 71 | NON ELECTRICAL MACHINERY (NEM) | 43.6 | 42.7 | 42.2 | 39.8 | 40.5 |
| 72 | ELECTRICAL MACHINERY (EM) | 18.1 | 19.2 | 19.4 | 20.9 | N.A. |
| 73 | TRANSPORT EQUIPMENT (TE) | 32.9 | 36.3 | 37.5 | 38.0 | N.A. |
| | OTHERS UNSPECIFIED | 5.4 | 1.8 | 0.8 | 1.3 | N.A. |
| 7 | TOTAL PRODUCTS MACHINERY | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

SOURCE : UNECE (v.y.), UN (1983)

Table 4.3.6 shows the changing composition of world NEM export over 1963-1980 by subgroups at the 3 digit SITC level. While the share of power generating machinery (mainly engines and turbines), office machinery and "other special industrial machinery" have increased over the period, that of agricultural machinery, metal working and textile/leather machinery have declined relatively. The relative decline of the latter reflect largely the slower growth of the sectors utilizing these machinery (agriculture, textile, metal products), while the relative expansion of the former reflect the general expansion of mechanization in manufacturing as a whole (power generating machinery, general industrial machinery) as well as the increasing growth of office employment and the services sector.

The significant under representation of LDCs in machinery export as a whole has already been indicated earlier (Tables 4.3.3 - 4.3.4.) Table 4.3.7 shows that share of LDC in NEM export by individual product subgroups are uniformly low. For NEM goods as a whole, total LDC export in 1980 amount to only US$5.9 billion, or less than 3% of total world NEM export. Compared to its share in all world trade (27%), all world manufacturing goods export (9.2%) and all world machinery exports (5.3%), LDC's share of NEM export is indeed significantly low. Only 6.2% of LDC's manufactured export in 1980 are in the NEM category, compared to over one-fifth in the case of the world as a whole. The participation of LDC

TABLE 4.3.6

PRODUCT COMPOSITION OF WORLD EXPORT OF NON ELECTRICAL MACHINERY, 1963 - 1978

| SITC GROUPS (3-DIGITS) | 1963 | 1970 | 1975 | 1978 | 1980 |
|---|---|---|---|---|---|
| 711 POWER GENERATING MACHINERY | 11.9 | 12.8 | 13.5 | 15.1 | 13.2 |
| 712 AGRICULTURAL MACHINERY | 11.5 | 7.3 | 8.5 | 7.3 | 7.5 |
| 715 METAL WORKING MACHINERY | 9.9 | 8.2 | 7.1 | 6.5 | 6.6 |
| 717 TEXTILE & LEATHER MACHINERY | 8.7 | 8.2 | 6.6 | 5.5 | 5.4 |
| 714 OFFICE MACHINERY | 6.9 | 11.5 | 9.2 | 10.6 | 14.0 |
| 718 SPECIAL INDUSTRIAL MACHINERY | 14.7 | 13.6 | 14.7 | 14.1 | 13.5 |
| 719 OTHER SPECIAL MACHINERY | 36.2 | 38.4 | 40.4 | 41.0 | 39.8 |
| TOTAL NEM (71) | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| NEM % OF ALL MACHINERY (7) | 43.6 | 42.7 | 42.3 | 39.8 | 40.5 |

SOURCE : UNECE (v.y.), UN (1983)

TABLE 4.3.7

LDC'S SHARE OF WORLD EXPORT OF NEM GOODS, SITC 3 DIGIT LEVEL, 1970 - 1980

| NEM SUBGROUP | WORLD EXPORT ($ BILLION S f.o.b.) | | LDC'S EXPORT ($ BILLION S f.o.b.) | | LDC'S SHARE OF WORLD EXPANSION | |
|---|---|---|---|---|---|---|
| | 1970 | 1980 | 1970 | 1980 | 1970 | 1980 |
| 711 | 5.81 | 27.30 | 0.07 | 0.85 | 1.20 | 3.10 |
| 712 | 2.67 | 15.52 | 0.01 | 0.28 | 0.40 | 1.80 |
| 714 | 4.39 | 29.04 | 0.10 | 1.24 | 2.30 | 4.30 |
| 715 | 3.07 | 13.67 | 0.02 | 0.41 | 0.70 | 3.00 |
| 717 | 3.09 | 11.13 | 0.04 | 0.35 | 1.30 | 3.10 |
| 718 | 5.04 | 27.87 | 0.07 | 0.78 | 1.40 | 2.80 |
| 719 | 14.23 | 82.29 | 0.14 | 1.94 | 1.00 | 2.40 |
| ALL (71) | 38.30 | 206.82 | 0.45 | 5.85 | 1.20 | 2.80 |
| TOTAL EXPORT | 315.01 | 2,015.54 | 54.10 | 549.01 | 17.20 | 27.20 |
| % | 12.20 | 10.30 | 0.80 | 1.10 | | NIL |
| TOTAL MANUF. GOODS (SITC 5 TO 8 LESS (67 + 68 ) | 174.50 | 1,025.90 | 8.82 | 94.43 | 5.10 | 9.20 |
| % | 21.90 | 20.20 | 5.10 | 6.20 | | |

SOURCE : UN (1983)

in world NEM export is lowest for agricultural machinery (1.8%) and highest in office machinery (4.3%).

The low penetration of LDCs into world export of NEM goods as of early 1980s notwithstanding, the prospect for improving performance in the future decade is very bright indeed, if the past trend over 1970-1980 is indicative (See Table 4.3.8). Over the decade of 1970-1980, LDCs as a whole has achieved significantly higher growth rate in export expansion than the DMEs in practically every NEM product subgroups, the highest growth being achieved by agricultural machinery (34.6% p.a.) and metal-working (36.4% p.a.)

### 4.3.1 Projection of Future Growth in World NEM Export, 1985-1995

Any attempt to project the future growth of NEM export in the world market will have to be based on assumption about what the overall scenario of economic growth in the world economy will be in general and the structural shift in world production and trade between the DMEs and LDCs in particular. In the wake of the recent recession in the world market economy and the as yet uncertain recovery that the world economy is entering over the last 2 years, there are as yet no agreements among economic forecasting and planning authorities worldwide as to what the growth scenario might be over the next decade. The OECD secretariat, for example, has been consistently pessimistic concerning the world economic outlook, while the World Bank has

TABLE 4.3.8

GROWTH RATE OF WORLD NEM EXPORT (SITC 71,) 1970 - 1980

| SITC GROUPS (3-DIGITS) | WORLD EXPORT 1970 - 1980 % GROWTH RATE P.A. | DME'S EXPORT 1970 - 1980 % GROWTH RATE P.A. | LDC'S EXPORT 1970 - 1980 % GROWTH RATE P.A. |
|---|---|---|---|
| 711 | 16.7 | 18.8 | 28.4 |
| 712 | 19.3 | 18.2 | 34.6 |
| 714 | 20.8 | 19.0 | 28.7 |
| 715 | 16.1 | 16.1 | 36.4 |
| 717 | 13.7 | 12.8 | 25.8 |
| 718 | 18.7 | 19.2 | 28.0 |
| 719 | 19.2 | 19.2 | 30.0 |
| ALL (71) | 20.4 | 19.0 | 29.2 |

SOURCE : UN (1983)

probably been more optimistic generally, with the IMF perhaps somewhere in between. The financial debt crisis and the continued shortcomings of the international monetary system plus the rise of protectionism as a threat to open market trading system have been identified as the two most critical issues the resolution of which will significantly affect the outlook of economic growth and trade over the next decade (see e.g. UN World Economic Survey 1982-83 OECD Economic Outlook 1983).

The rapid expansion of world trades over the 1970-1980 decade has been slowed down drastically over 1979-1983. World trades in many commodities have even declined absolutely over the period 1980-82. Although update data are not available to analyze the world export of NEM goods over the 1980-1985 period statistically, it is reasonable to assume that the growth rate of aggregate NEM export achieved over 1970-1980 has been at least halved during 1980-1985. As such, a more appropriate long-term world market growth trend should be the average growth rate over the 15 year period 1970-1985 rather than the 10 year period 1970-80, as the latter figures would over-state the actual growth achieved historically. The overall average growth rate over 1970-85 can be estimated based on the above assumptions as follow:

| | % p.a. 1970-80 | % p.a. 1980-85 | | % p.a. 1970-85 |
|---|---|---|---|---|
| World | 20.4 | 10.2 | assumed halved | 16.9 |
| LDCs | 29.2 | 14.6 | | 24.1 |

Average growth rate of 16.9% per annum and 2.41% per annum are derived based on the above estimation.

In the absence of a consensus view of world economic outlook for the next decade, we shall project the future growth of world NEM export based on the following three alternative assumed scenarios :

a) Medium Scenario : Continuation of past 15 years (1970-85) growth trend

b) Optimistic scenario : 20% higher than the average growth rate assumed in (a)

c) Pessimistic scenario: 20% lower than the average growth rate assumed in (a)

Based on the above assured scenarios, the future growth of NEM export trades are projected as shown in Table 4.3.9. The total value of world NEM product export is expected to increase to US$1600 billion by 1995 under the medium scenario, US$2,130 billion if the optimistic assumption

TABLE 4.3.9

PROJECTED WORLD EXPORT OF NEW GOODS, 1995

| | EXPORT OF NEW GOODS (US $BILLION) | | | | |
|---|---|---|---|---|---|
| | 1980 | 1985 | 1995 | | |
| | | | LOW | MEDIUM | HIGH |
| WORLD | 206.8 | 336.0 | 1,192.0 | 1,601.0 | 2,133.0 |
| LDCS | 5.85 | 11.60 | 67.80 | 101.30 | 146.90 |
| % | 2.8 | 3.5 | 5.7 | 6.3 | 6.9 |

SOURCE : BASED ON ASSUMPTION GIVEN IN TEXT applies, and US$1190 billion in the pessimistic case. The share of world export by the LDCs will expand to 5.7%- 6.9% under the pessimistic and optimistic scenarios respectively, with 6.3% being likely under the medium assumption.

### 4.3.2 Likely Market Share Potential of Malaysia in Total World NEM Market Demand

As shown in Section 3 earlier, Malaysia's export of NEM products has been insignificant both in terms of its share within the national export as well as in terms of its share in world market. Table 4.3.10 summarizes the situation. As can be seen, Malaysia's export of NEM goods in 1980 (about US$100 million) was only about about 0.05% of the total world NEM export and 1.8% of LDC's NEM export. Compared to 1970, Malaysia's share of the total world market has improved marginally, but it has declined relative to the LDC's export market. As a share of total manufacturing export from Malaysia, NEM export has also declined (from 6% in 1970 to 4% in 1980). Thus, in terms of past performance, Malaysia's export of NEM products has not only be negligible, but declining relative to the national and LDC trend as well. From a policy perspective, such a worsening trend is obviously undesirable and should be countered in the future.

The characteristics of the NEM industry and the potential competitiveness of Malaysia relative to other reference countries in the production and export of NEM sector goods has already been reviewed in Section 3 (See Section 3.9) where the factor endowment comparative advantage of Malaysia

TABLE 4.3.10

MALAYSIA'S NEM EXPORT AS SHARE OF WORLD EXPORT MARKET, 1970 - 1980

| YEAR | NEM EXPORT (US $BILLION) | | | | | MALAYSIA'S NEM EXPORT AS % OF MALAYSIA'S EXPORT | |
|---|---|---|---|---|---|---|---|
| | WORLD | LDC | MALAYSIA | % LDC | % WORLD | TOTAL EXPORT | MANUF. EXPORT |
| 1970 | 38.30 | 0.45 | 0.012 | 2.70 | 0.03 | 0.70 | 6.10 |
| 1980 | 206.80 | 5.85 | 0.104 | 1.80 | 0.05 | 0.80 | 4.30 |

SOURCE : COMPILED FROM UN (1983)
NOTE : THE DATA ARE FROM A DIFFERENT CAUSE THAN THOSE USED IN SECTION III
AND HENCE SLIGHT DISCREPANCY IN ESTIMATES EXISTS.

has also been examined relative to other reference countries. To recapitulate briefly, the production of NEM goods is basically of a footloose nature and depends more on access to market and the availability of engineering/technical manpower and skilled production workers than on raw material resources. Economies of scale and agglomeration factor is of great significance, thus confering to nations which already have a sizeable domestic market base a scale advantage. A high commitment to basic R&D by both the private and public sector is necessary to maintain or reinforce technological advantage by the leading manufacturers/exporters, while for the "imitating" or "follower" nations (which penetrate and capture market share through selling substitute products at lower price) the existence of a sizable core enterprising engineering/technological entrepreneurs (who can "reverse-engineer" and reduce production cost) if necessary.

The relatively fast growth of NEM export by LDCs over the last decade has been the result of both the increase of foreign joint-venture investment by the leading manufacturers from the DMEs to the LDCs as well as the expansion of indigenous engineering/technical entrepreneurship in selected NICs (Hong Kong, Taiwan, Singapore etc.) As Table <u>4.3.11</u> below shows the NIC nations like Hong Kong, S.Korea, Singapore and Brazil have been able to achieve significant expansion of NEM export over the 1970-80 decade starting from relatively small bases. The four NICs mentioned together achieved export growth of 37.4% per annum compared to only 29.2% for all LDCs and 20.4% for all world NEM export. Their collective share of total world

TABLE 4.3.11

SHARE OF SELECTED NICS IN WORLD NEM EXPORT, 1970 - 1980

| | NEM EXPORT (US $BILLION) | | |
|---|---|---|---|
| | 1970 | 1980 | % P.A. |
| TOTAL WORLD EXPORT | 38.30 | 206.820 | 20.4 |
| TOTAL LDC EXPORT | 0.45 | 5.850 | 29.2 |
| SOUTH KOREA | 0.0163 | 0.5195 | 41.4 |
| HONG KONG | 0.0083 | 0.3664 | 46.0 |
| SINGAPORE | 0.0621 | 1.1625 | 34.0 |
| BRAZIL | 0.0630 | 1.5502 | 37.8 |
| ALL 4 NICS | 0.1502 | 3.6000 | 37.4 |
| % OF WORLD | 0.4 | 1.7 | |
| % OF LDC | 33.0 | 62.0 | |

SOURCE : ESTIMATED FROM UN(1983)

export of NEM goods thus rose from 0.4% in 1970 to 1.7% in 1980; relative to the LDCs, the increase was from 33% to 62%.

The example of the above-mentioned NICs being able to effectively penetrate the world NEM export market shows that similar potential exists for other industrializing nations like Malaysia provided that they can achieve the necessary cost competitiveness. Emphasis on skilled manpower development and engineering/technological entrepreneurship has been the cornerstone for the success of each of these mentioned NICs (as well as of Taiwan). In the case of South Korea, for example, government policy has actively encouraged R&D and technical innovation in the capital goods manufacturing sector (See, e.g. Einsu Kim, "Technological innovations in Korea's capital goods industry", ILO-WEP/WP92). Similarly, Singapore has adopted a variety of policy instruments for encouraging productivity enhancement, assisting small-scale manufacturing entrepreneurs and promoting high-technology foreign-investment, especially in the capital goods sector.

Table 4.3.12 highlights the difference in manufacturing export structure between such export-oriented NIC countries and other new rapidly industrializing countries ("NECs") like Malaysia. As can be seen, while all three machinery groups (NEM, Electrical and Transport Equipment) are among the top seven manufactured exports of the NICs by 1979, only Electrical Machinery is among the top seven manufactured export groups among the NECs. NEM goods in particular achieved a share of 8.4% in the total export of manufactured products

TABLE 4.3.12

TOP SEVEN EXPORT PRODUCTS OF NICs AND NECs, 1970 AND 1979 (2-digit SITC)

| Rank | NICs | | | | NECs | | | |
|---|---|---|---|---|---|---|---|---|
| | 1970 | | 1979 | | 1970 | | 1979 | |
| | Product | Share[a] | Product | Share[a] | Product | Share[a] | Product | Share[a] |
| 1 | Clothing . . . . | 15.95 | Clothing . . . . . | 13.93 | Wood & Cork Manufactures . . . | 18.14 | Textile Yarns & Fabrics . . . . . | 23.40 |
| 2 | Miscellaneous Manufactures . . . | 11.05 | Electrical Machinery . . . . | 12.21 | Textile Yarns & Fabrics . . . . . | 16.31 | Clothing . . | 15.64 |
| 3 | Textile Yarns & Fabrics . . . . | 10.89 | Transport Equipment . . . . | 9.07 | Non-metal Mineral Manufactures . . . | 11.74 | Electrical Machinery . . . . | 7.41 |
| 4 | Electrical Machinery . . . . | 8.75 | Textile Yarns & Fabrics . . . . . | 8.88 | Iron & Steel . . . . | 8.30 | Wood & Cork Manufactures . . . | 7.27 |
| 5 | Transport Equipment . . . . | 7.11 | Non-electrical Machinery . . . . | 8.41 | Fertilisers . . . . | 5.90 | Chemical Elements & Compounds . . . | 6.65 |
| 6 | Non-Electrical Machinery . . . . | 6.85 | Miscellaneous Manufactures . . . | 7.06 | Miscellaneous Manufactures . . . | 4.40 | Non-metal Mineral Manufactures . . . | 6.27 |
| 7 | Non-metal Mineral Manufactures . . . | 6.08 | Iron & Steel . . . . | 6.09 | Leather, Fur & Manufactures . . | 3.64 | Miscellaneous Manufactures . . . | 6.17 |
| | Total . . . . . . | 67.6 | | 67.5 | | 68.5 | | 77.8 |

[a] Share of total manufactured exports in per cent.

NICs (partly based on the OECD study of newly industrialising countries):
Argentina, Brazil, Greece, Hong Kong, India, Israel, Mexico, Portugal, Singapore, South Korea, Spain, and Yugoslavia

NECs:
Colombia, Cyprus, Indonesia, Jordan, Malaysia, Morocco, Peru, Philippines, Sri Lanka, Thailand, Tunisia, and Uruguay.

SOURCE: HAVRYLYSHYN, O. ET. AL., "IS THERE CAUSE FOR EXPORT OPTIMISM?" WELTWIRTSCHAFTLICHES ARCHIV, VOL. 4 (1982) among the NICs in 1979, significantly higher than the 6% achieved for all LDCs (or the 4% achieved by Malaysia in 1980).

In summary, it can be concluded given the right policy framework, the potential for Malaysia to penetrate into the world export market of NEM exists, although much of this export expansion would probably only come after the country has succeeded in expanding production to serve its own domestic market base which is currently highly dependent on import. The economy of scale effect and the technological learning experience from expanding production for domestic market (e.g. the national car project) will generate cumulative and spin-off effects towards export expansion. In view of this, we can reasonably posit the following alternative NEM export growth scenario over the decade 1985-95 :

a) Medium Growth Scenario :

Malaysia will achieve at least the average past growth of all LDCs (about 24% p.a over 1970-85)

b) Optimistic Growth Scenario :

Malaysia will achieve the average past growth rate of the major NICs (about 30% p.a over 1970-85)

c) Pessimistic Growth Scenario :

Malaysia will achieve only the average past growth rate of total world export (about 17% p.a. over 1970-85)

The growth of NEM export over 1981-1985 is assumed to be half of the 1985-1995 medium growth rate (i.e.about 12% p.a.). Table 4.3.13 summarizes the projection results based on the above assumptions.

### 4.3.3 Product Groups With Growing External Market Potentials

The past trend analysis by SITC sub-groups presented earlier has already identified those SITC groups (3-digit level) that have been expanding their export market very dynamically to be :

- Agricultural Machinery (712)
- Special Industrial Machinery (718)
- Other General Industrial Machinery (719)
- Office Machining and Equipment (714)

These broad product groups will provide the greatest potential for market penetration in the future. At a more disaggregated level, the following product subgroups are known to be expanding at above normal pace :

- Engines and turbines
- Machine tools
- Printing/bookbinding machinery/equipment

TABLE 4.3.13

PROJECTED EXPORT OF NEW PRODUCTS FROM MALAYSIA, 1985 - 1995
(IN CONSTANT 1984 PRICES, $MILLION)

| 1981 | ESTIMATED 1985 | | 1990 | 1995 |
|---|---|---|---|---|
| 30.5 | 53.8 | LOW | 118.0 | 259.0 |
| | | MEDIUM | 158.0 | 462.0 |
| | | HIGH | 200.0 | 742.0 |

SOURCE : BASED ON ASSUMPTION GIVEN IN TEXT

- Pumps and centrifuges
- Mechanical handling equipment
- Powered mill/cutting machinery
- Miscellaneous civil engineering equipment

Of particular reference to Malaysia on view of its comparative advantage is the export market potential of rubber products industrial machinery and various estate processing machinery. Although not the fastest expanding NEM goods in the world export market, they hold special potential for Malaysia due to its domestic market base advantage.

4.4 Projection of Total Market Demand, Production and Export/Import

Having projected the likely growth in domestic and external market demand for NEM products in the two sections earlier, we are now in a position to combine these projection findings to derive an overall projection of total market demand, production and export/import trend. Table 4.4.1 summarizes the result as well as their derivation. Note that all values are expressed in constant 1984 prices.

From a total estimated demand of about $1.87 billion in 1985, the NEM market in selected subgroups is projected to grow to about $5.91 billion by 1995 under the medium scenario, a growth of about 3.2 times. The share of import in satisfying the total domestic market demand is expected to decline rather slowly to 50% in 1990

TABLE 4.4.1

PROJECTED TOTAL DEMAND, PRODUCTION & EXPORT/IMPORT OF SELECTED NEM PRODUCTS
IN MALAYSIA, 1985 - 1995 ($ BILLION 1984 CONSTANT PRICE)

| | 1985 | 1990 | | | 1995 | | |
|---|---|---|---|---|---|---|---|
| | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH |
| 1) TOTAL DOMESTIC DEMAND | 1.82 | 2.92 | 3.15 | 3.40 | 4.68 | 5.45 | 6.35 |
| 2) TOTAL EXPORT | 0.05 | 0.12 | 0.16 | 0.20 | 0.26 | 0.46 | 0.74 |
| 3) TOTAL DEMAND (2) + (1) | 1.87 | 3.04 | 3.31 | 3.60 | 4.94 | 5.91 | 7.09 |
| 4) IMPORT AS % OF DOMESTIC DEMAND | 55.00 | 50.00 | 50.00 | 50.00 | 40.00 | 40.00 | 40.00 |
| 5) TOTAL IMPORT | 1.00 | 1.46 | 1.58 | 1.70 | 1.87 | 2.18 | 2.54 |
| 6) TOTAL DOMESTIC PRODUCTION | 0.87 | 1.58 | 1.73 | 1.90 | 3.07 | 3.73 | 4.55 |
| 7) IMPLIED EXPORT AS % OF DOMESTIC PRODUCTION | 5.8 | 7.6 | 9.2 | 10.5 | 8.5 | 12.3 | 16.3 |
| 8) (VA/OUTPUT) RATIO | 0.40 | 0.45 | 0.05 | 0.45 | 0.45 | 0.45 | 0.45 |
| 9) TOTAL NEM V.A. | 0.35 | 0.71 | 0.08 | 0.86 | 1.38 | 1.68 | 2.05 |
| 10) TOTAL MANUF. V.A. | 14.75 | 21.88 | 24.19 | 26.70 | 33.20 | 39.13 | 45.81 |
| 11) NEM AS % MANUF. | 2.4 | 3.2 | 0.3 | 3.2 | 4.2 | 4.3 | 4.5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 12) % GROWTH RATE OF NEM PRODUCTION | 1985 - 1990 | LOW | 12.7 | 1985 - 1995 | LOW | 14.2 |
| | | MEDIUM | 14.5 | | MEDIUM | 16.8 |
| | | HIGH | 16.9 | | HIGH | 19.1 |

and 40% in 1995 (See discussion in notes attached to the Table 4.4.1). Consequently, domestic production is expected to increase from about $0.8 billion in 1985 to about $3.73 billion. This implies a rapid growth rate of value added of 14.5% p.a. over 1985-95 and even faster growth rate of 16.8% per annum over 1990-95.

Since these growth rates are faster than the projected growth rates of all manufacturing value added, the share of NEM in total manufacturing value added thus increase from about 2.4% in 1985 to 3.2% in 1990 and further to 4.3% in 1995. From our earlier analysis (See Table 4.2.2), the 1990 share is comparable to that achieved by LDCs as a whole (about 3.4% ), while the share in 1995 is (about 5%) approaching the share achieved in 1978 by the LDCs. This suggests that the projected growth in NEM production is consistent with the desired and achievable industrial restructuring trend for the country's manufacturing sector.

The growth of NEM export, while rather rapid (24% for the medium scenario), will still contribute relatively little to domestic production growth due to the small base from which it begins. Export as a share of domestic production is expected to increase from 5.7% in 1985 to 12.3%, by 1995. Total export in 1995 will be close to half a billion dollars.

Notes to Table 4.4.1

(1) and (2) ; derived from Section 4.2 and 4.3 in particular Tables 4.2.10 and 4.3.13.

TABLE 4.4.2

COMPOSITION OF NEM PRODUCTION OUTPUT, SELECTED REFERENCE COUNTRIES

| NEM SUBGROUPS | JAPAN 1976 | UNITED STATES 1975 | WEST GERMANY 1977 | FRANCE 1977 | MALAYSIA 1995 |
|---|---|---|---|---|---|
| ENGINES AND TURBINES | 2.9 | 8.7 | 7.8 | 4.6 | APPROX. 5 |
| AGRICULTURAL MACHINERY | 8.6 | 10.4 | 7.6 | 10.8 | APPROX. 5-20 |
| METAL WORKING MACHINERY | 8.7 | 10.6 | 10.6 | 6.9 | APPROX. 10 |
| SPECIAL INDUSTRIAL MACHINERY | 17.2 | 22.5 | 19.2 | 14.5 | |
| OFFICE, COMPUTING AND ACCOUNTING MACHINERY | 11.3 | 12.1 | 7.9 | 15.7 | APPROX. 65-70 |
| NEM N.E.C. | 51.4 | 35.7 | 46.8 | 47.6 | |
| ALL NEM | 100 | 100 | 100 | 100 | 100 |

SOURCE : UNECE (1979) FOR OECD COUNTRIES

### 4.4.1 Import Share of Domestic Demand

The share of import in domestic demand in 1981 was estimated to be about 55%. Indicative import trend over 1981-83 suggests that this share has declined over 1981-85. The pace of import-substitution achievable over the decade 1985-95 even under favourable policy encouragement is expected to be slow due to the tremendous diversity of specialized machines involved. From international comparative experience, it is not likely nor even desirable that a small domestic market economy will be able to diversify enough to produce more than a fraction of the many specialized industrial machinery involved. Even NICs like Singapore, Taiwan and Hong Kong, which export considerable amount of NEM goods, also import significant amount of NEM goods at the same time. Indeed, the intra-trade coefficient for the NEM sector is among the highest, indicating the great heterogenity of its products. In view of this, we have assured that the decline in import as share of domestic demand will be slight from 1985-90 (55% to 50%), but increased somewhat from 1990-1995 (50% to 40%) as the NEM base of the country widens.

### 4.4.2 (VA/Output)-Ratio

The value of this ratio was about 0.4 in 1981 which we assume continued unchanged to 1985. From estimates based on UNIDO's study (UNIDO (1982), the average for LDCs NEM sector was about 0.45, while that for DME's was closer to 0.50. We thus assume that, as the NEM sector of Malaysia develops, its VA/output ratio will approach that for the LDC as a whole. The value of 0.45 is therefore used from 1990 onwards.

These projected values are derived from forecasts given by EPU (adjusted from 1970 constant price to 1984 constant price using the (current GDP/constant GDP)-ratios the deflator factor).

It must be emphasized that the above projection is meant to be indicative of the overall trend and magnitude only based on what we consider to be the most reasonable assumptions. The simplicity of the projection worksheet approach adopted allow the government industrial planners to analyze the implications of alternative assumptions if necessary (e.g. faster rate of export growth).

### 4.4.3 Projection of NEM Product Subgroups

In both Section 4.2 and Section 4.3, the major NEM product subgroups that will have above average market growth potentials have already been identified and analyzed. Data limitations do not allow us to provide reliable projection of the total market demand for each specific product subgroups individually. However, it is instructive to compare the likely NEM production structure of Malaysia with that of selected OECD Countries which have technologically advanced NEM industries (See Table 4.4.2). In these OECD countries, the subgroups of "office/computing machinery", "special industrial machining" and other NEM industrial machining" together represented the bulk of their NEM output (72-80%), indicating the great diversity of industrial machining production in general and the growing importance of office machining/equipment in particular. An indicative target share of about 65%-70% for Malaysia in 1995 appears reasonable. The target share of agricultural machinery in NEM production in Malaysia will probably be higher than the OECD Countries in view of the importance of agriculture in Malaysia's economy. The share of engines and turbines will probably be around 5% of total NEM output, with machine tools around 10% appears reasonable especially in view of the stimulating effect of the Malaysian Car Industry and the expansion of the fabricated metal industries and wood working industry.

# PART V DEVELOPMENT STRATEGY AND INVESTMENT CRITERIA

# PART V DEVELOPMENT STRATEGY AND INVESTMENT CRITERIA

## 5.1 Introduction

The objective of this section is to present an integrated and comprehensive strategy for the development of the machinery industry over the next 10 years. The strategy is based on the findings of the detailed analysis of the current status and potential of the industry as provided in Sections II, III and IV.

The development strategy of the machinery industry is formulated within the context of the broad development objectives of the manufacturing sector. The framework for this section will first review the general industrial development strategies for the government since the late 1950s. Next, the industrial development framework of the FMP-MTR is reviewed. This is particularly important in the discussion of the general direction pursued in the next decade by the industrial development strategy formulated by the government.

This will be followed by a review of the development objectives for the machinery industry and the implication of the machinery industry has on the broad development objectives and general direction of the economy over the next decade. Finally, the components that form the basis of the strategy are identified.

First and foremost, it is more relevant to review the Past Industrial Development Strategy and Future Growth Scenario of the Machinery Sector.

## 5.2 Sources of Growth

### 5.2.1 Limitations of Data

The review and analysis on the sources of growth for the machinery industry in Malaysia is beset by numerous problems. First, comparable data on the machinery manufacturing activities are available for Peninsular Malaysia only. There is a total lack of this data for Sabah and Sarawak. Nonetheless, the manufacturing activities in these two states are insignificant. Secondly, the classification and definitions of the census data have changed substantially over the years, resulting in a relatively shorter time series review. These classifications and definitions changes are applicable to both the SITC and MIC. For a further discussion on this limitation, refer to the general discussion on limitations in Section I of this Report.

### 5.2.2 Phases of Growth of the Manufacturing Sector

The important issue in the growth of the machinery industry relates to the roles played by import substitution and export expansion in the industry.

The industrial manufacturing growth strategy of Malaysia can be analysed along 3 main phases.

Phase 1 corresponds to the industrial policies of the 1960s which emphasised manufacturing growth via import-substitution. However, from 1968 onwards right into the 1970s, industrial growth had shifted its emphasis. Export oriented industrialisation was the main thrust in this Phase 2 industrialisation campaign. The late 1970s and early 1980s period marked the third phase of the whole industrialisation process. This is characterised by increasing import-substitution for intermediate goods and producer/consumer durables, and increasing export of higher value added resource-based goods.

Table 5.2.1 summarises the structural growth pattern of the manufacturing industry, corresponding to the Phase I and Phase 2 development strategy.

### 5.2.3 Import Substitution Phase

Until 1968, import substitution was the main source of growth which accounted for 52% of the total manufacturing output growth. This is basically made up of non-durable consumer products such as clothes and shoes, and intermediate input, such as textile fabric and wood, for the non-durable consumer goods. As for the investment of goods industry, of which the machinery sector is a part, import substitution was also the main source of growth. Import substitution accounted for 56% of the growth in the investment goods industry. While expansion of domestic demand had

TABLE 5.2.1

SOURCES OF OUTPUT GROWTH IN ALL MANUFACTURING, PENINSULAR MALAYSIA, 1959 - 1979

| | DOMESTIC DEMAND EXPANSION | IMPORT SUBSTITUTION | EXPORT EXPANSION |
|---|---|---|---|
| **ALL MANUFACTURING** | | | |
| 1959 - 1968 | 40.1 | 52.0 | 7.9 |
| 1968 - 1979 | 70.0 | 23.6 | 6.4 |
| **ALL CONSUMER GOODS INDUSTRIES** | | | |
| 1959 - 1968 | 38.1 | 54.6 | 7.3 |
| 1968 - 1979 | 67.4 | 25.1 | 7.5 |
| **ALL INTERMEDIATE GOODS INDUSTRIES** | | | |
| 1959 - 1968 | 35.0 | 51.8 | 13.2 |
| 1968 - 1979 | 76.1 | 0.0 | 23.9 |
| **ALL INVESTMENT GOODS INDUSTRIES** | | | |
| 1959 - 1968 | 40.3 | 55.5 | 4.2 |
| 1968 - 1979 | 52.7 | -6.7 | 54.0 |

SOURCE : LEO, H.E.

also been an important source of growth, the contribution made by export expansion was insignificant.

Despite the introduction of tariff protection and other quantitative restrictions for imports, the tariff protection has been very modest. On the whole, the government adopted a relatively liberal, market-oriented type of economic policy. Under such circumstances, it can be inferred that the production of import substitution products was able to attain some degree of competitiveness in the domestic market.

Moreover, as the import substitution phase is based on imported raw materials or imported intermediate products, a few other distinctive features can also be observed. Despite the fact that import substitution prevailed as the main source of growth for all the consumer, intermediate and investment goods industries, the import share of these goods had changed substantially during this period. The import of investment and intermediate goods had increased proportionately more than the decline in the imports of consumer goods.

Between 1961 and 1970, import share of consumption goods (food, beverages, tobacco and consumer durables) decreased from 47% to 27%. At the same time, the share of imported investment goods increased from 17% to 27% while the intermediate goods for manufacturing from 8% to 21%. (H. Osman Rani, 1982).

## 5.2.4 Export Oriented Phase

During this period, industrial legislations such as the Investment Incentives Act of 1968 was enacted during this period. The incentives implemented included

a) Increased tariff protection for input industry.

b) Tax conversions to encourage greater labour utilisation, use of domestic raw materials, location of industries in priority areas, and increase in efficiency.

c) Tariff subsidies for export promotion

These policies are aimed mainly at domestic market expansion for consumer non-durable and durable product (e.g. automobiles) as well as expansion of labour-intensive assembly industry (e.g. electronics). The impact of these various incentives on the machinery sector is examined under Section 3.8.

Inevitably, domestic demand expansion was the most important source of output growth, accounting for 70% of the total manufacturing growth. With the exception of the investment goods industry, the other manufacturing sector did not enjoy much benefits from the export oriented policy. Notwithstanding the fact that the share of manufactures in goods exports increased from 10% in the 1960s to about 20% by the end of 1970s, the contribution made by export expansion to the overall output growth of the manufacturing sector was minimal.

In the case of the investment goods industries, export expansion was in fact the main source of growth, even though domestic demand expansion was equally important.

With rising significance of domestic demand expansion in the 1970s, certain observations may be made. First, the increase protection made exporting less attractive than selling on the home market. Second, the overall growth of the economy provided the opportunity for domestic manufacturers to produce increasingly more for the home market without having to fight very hard for the market shares with foreign suppliers. And finally, the low contribution to the industry growth made by export expansion suggests that the penetration of locally produced goods into the world market had been slow and this was partly due to its lack of international competitveness as a whole.

### 5.2.5 Second-Phase Import Substitution

The late 1970s and early 1980s period marked the third phase of manufacturing growth. This consists mainly of increasing export higher value added resource-based goods (rubber products, wood products, etc) and increasing import-substitution for intermediate goods such as petrochemicals, steel and cement, and producer/consumer durables.

### 5.2.6 Overall Sources of Growth in the Machinery Sector

Table 5.2.2 shows the sources of output growth in the machinery sector. The domestic demand expansion had been the major source of growth for the machinery sector. During the transitory phase (1968 to 1973) for the manufacturing sector as a whole from import substitution to export oriented industrialisation, the domestic demand expansion accounted for about 60% of machinery output growth. The contribution made by import substitution was equally significant, contributing about 46% of the growth. The large increase in domestic demand have been met with an equally substantial increase in locally produced output and coupled with a lesser proportionate increase in imports. Between 1968 and 1973, while domestic demand increased by 2.7 times, local production expanded by 3.8 times. At the same time, the ratio of import to domestic demand decreases from 0.66 to 0.48. The export expansion had negative contribution to growth.

However, this growth structure changed somewhat in subsequent years. Between 1973 and 1981, predominantly export-oriented industrialisation phase, the importance of the domestic demand expansion to the growth of the machinery sector is magnified. This was mainly due to the negative contribution to growth made by the import substitution and export expansion factor.

TABLE 5.2.2.

SOURCES OF OUTPUT GROWTH IN THE MACHINERY SECTOR, PENINSULAR MALAYSIA, 1968 - 1981

| | DOMESTIC DEMAND EXPANSION | IMPORT SUBSTITUTION | EXPORT EXPANSION |
|---|---|---|---|
| MACHINERY SECTOR | | | |
| 1959 - 1973 | 59.9 | 46.1 | -6.0 |
| 1973 - 1981 | 129.4 | 26.3 | -3.1 |
| INDUSTRY | | | |
| a) ENGINES AND TURBINES | | | |
| 1973 - 1981 | 8,506.1 | -7598.7 | -807.4 |
| b) AGRICULTURAL MACHINERY | | | |
| 1973 - 1981 | 53.0 | 56.0 | -9.0 |
| c) METAL AND WOODWORKING MACHINERY | | | |
| 1973 - 1981 | 111.1 | -10.0 | -1.2 |
| d) MACHINERY AND PARTS N.E.C. | | | |
| 1973 - 1981 | 106.8 | -5.7 | -1.1 |

SOURCE: THE DETAILED CALCULATIONS ARE PROVIDED IN APPENDICES 5.2.1 - 5.2.5

The lack of incentives granted to the machinery sector had resulted in the relatively low rate of import substitution and export expansion activities within the machinery sector. The other factors that contributed to the subdued export performance had been the lack of promotional activities and international competitiveness. Hence, existing machinery firms relied heavily on domestic market for its growth in manufacturing activities.

### 5.2.7 Sources of Growth of the Various Machinery Industries

The structure of growth for the machinery sector as a whole (positive domestic demand expansion, negative export expansion) was also reflected at the micro level in the various industries, except agricultural machinery.

In the case of the Engines and Turbines, Metal and Wood Working and Machinery and Equipment n.e.c. industries, their negative import substitution occurred as a result of a larger increase in the proportion of machinery imports required to satisfy the domestic demand. This was most pronounced in the case of the Engines and Turbines Industry, which recorded a 75.99% import substitution contribution to its overall growth. Much of this predicament was due to the saturation of the domestic market with used diesel engine imports. The local output of machinery dropped dramatically from $18 million to $9.6 million between 1978 and 1981. Even then, this decrease in production is underestimated because the figure for 1978 (unlike the 1981 figure) is a survey study and not derived from the census.

In the case of agricultural machinery industry, the import substitution provided the main source of growth between 1973 and 1981. It contributed about 56% of the growth. The contribution made by domestic demand expansion had been equally significant. Local production increased by more than 10 times to cope with the 6 times increased in domestic demand while the proportion of imports needed to satisfy the domestic demand fell from 0.78 to 0.54. This may be attributed to favourable government attitude towards this industry. Compared to the other machinery industries (except machinery and equipment n.e.c.), the agricultural industry was the least disadvantaged. In terms of inter-industry incentives distribution, the agricultural machinery took up about 65% of the total capital investment that was granted tax incentives between 1970 and 1982.

All the machinery industries had negative export expansion contributions to their growth. The Engines and Turbines industry had the highest negative value. These negative values are due to the fact that the proportion of export to domestic demand decreased over the years. Local manufacturers had not taken much opportunity to expand on their production to cater for the export market. This poor export performance was due to factors like lack of export incentives, price uncompetitiveness as a result of underutilisation of production capacity, difficulty in locating foreign customers and perceived greater risk and cost associated with exports.

## 5.3 Future Scenario of the Machinery Sector

### 5.3.1 Fourth Malaysian Plan and Mid-Term Review

As the economy moves into the third phase of industrial development, there is a transition gap which has been recognised lately. This is reflected in the industrial development objectives highlighted in the Fourth Malaysian Plan and its Mid-Term Review. The objectives listed down are as follows,

a) to achieve the NEP objectives particularly in respect of greater Bumiputra participation in the sector in terms of equity, employment, marketing and professional services;

b) to disperse industries away from the urban centres to the less developed areas through the development of industrial estates and related infrastructural facilities with the aim of achieving a balanced industrial growth among regions;

c) to expand and diversify the manufacturing base so as to generate high value added and to increase foreign exchange earnings through the development of ro-and other resource-based industries [illegible] which the country has comparative advantage;

d) to gradually promote the establishment of high technology precision-based industries with the view of upgrading the associated technical skill of Malaysian workers in such industries;

e) to stimulate the growth of small-scale industries by providing financial and technical assistance as well as training and marketing facilities; and

f) to establish heavy industries with a view to reducing the dependence on foreign countries for the supply of machinery and intermediate inputs, exploiting forward and backward linkages in industrial development, creating spin-off effects for the growth of small and medium-scale industries and developing the technological capability of the manufacturing sector.

### 5.3.2 Role of Machinery Sector in Industrialisation Process

Manufacturing continues to play a strategic role in the achievement of the NEP. The overall strategy of the NEP for industrial development is expansion and diversification. To this end, manufacturing is expected to be the leading growth sector. Under the 3 alternative scenarios of optimistic, most likely and pessimistic, the projected growth rates of the national GDP as provided by EPU are 6%, 7% and 8% respectively for

1985-95. Manufacturing is expected to contribute 23%, 24.6% and 26.3% respectively for the 3 alternative scenarios in 1985.

The machinery sector has not really developed distinctly into the 3 phases of industrial growth. However it could assist the economy during this transitional period towards the 3rd phase of growth. It is a strategic sector forming the base for successful industrialisation. ...ch, it has a potentially important role to ... .y in economic development in that,

o The machinery sector is characterised by vertical disintegration which supports small and large scale size firms. This heterogenity often results in specialisation of products and services. This in turn results in an expansion and diversification of the manufacturing base. It should be noted that small is not synonymous to poor economic performance. This is discussed in Appendix 5.3.1.

o Specialisation in the sector often results in the manufacture of products which have higher value-added potential.

o As the sector develops, it encourages and promotes greater inter-industry linkages with other industries like the industrial equipment manufacturing industry.

- This in turn creates demand and new markets for new services and products like forging, die-casting and precision grinding resulting in greater diversification and sophistication of the manufacturing base.

- Being a knowledge and skill intensive sector, its development provides opportunities for upgrading skills and knowledge of the employees.

- Other spin-offs of diversification and expansion are greater opportunities for Bumiputra equity and employment participation.

- As the sector develops, it acts as a medium for the diffusion of new technology transfer. This is the accumulation of engineering skills and mechanical knowledge which stimulates new ideas and innovations leading to better quality products.

- Development of this sector is potentially profitable. Given the fact that the overall protection structure discriminates against the machinery sector and that it has comparative disadvantage, it has managed to survived to reap positive return to investment.

- The development of the sector will also enable the heavy industry to develop towards economies of scale. As the sector is dependent on component parts, it creates additional demand for the products (basically component parts) manufactured by the heavy industry.

- o The sector will provide the thrust for relatively greater independent industrialisation process. This is in line with our national philosophy of BERDIKARI (self reliance)

### 5.3.3 Development Objectives for Machinery Sector

The development objectives advocated for the machinery sector is not done in isolation. It rests on the assumption of its direct linkage with the manufacturing industry as a whole; the development of the machinery sector is dependent on the development of the manufacturing sector. Under the NEP, the manufacturing sector is expected to be the largest contributor to GDP by 1990. Such being the case, the expansion of the manufacturing sector can provide a strong basis for the development of the machinery sector.

The above review has numerous implications for the development of the machinery sector. These can be formulated in the following objectives :

a) To stimulate the development of the machinery sector by encouraging a greater degree of manufacturing activity of machinery in line with an overall industrialisation effort towards a relatively more independent industrialisation.

b) To develop stronger backward linkages by stimulating the development of the supporting or ancillary industries and activities so as to provide the necessary backup to the machinery sector.

c) To create a larger domestic market for he manufactured products of the machinery sector. This is related to attempt at increasing the forward linkages o the sector whereby there is a greater utilisation of local machinery as investment goods by local manufacturing firms.

d) To formulate and maintain quality control standards for the machinery sector.

e) To upgrade the level of productivity, competitiveness and efficiency in the sector. Its other goal will be to modernise and upgrade the level of technology utilised by the sector.

f) To facilitate the dissemination of skill, mechanical knowledge, technology information and expertise within the sector.

g) To facilitate greater and faster technology transfer.

h) To encourage the production of higher value added products.

i) To encourage small firms to modernise by creating environment conducive for such purposes. To encourage the further development of smaller firms towards specialisation in component products manufacturing so that the sector can reap the benefits of economies of scale.

### 5.3.4 Components of Development Strategy

In formulating a development strategy for the machinery sector, it is essential to take into account the various component elements of the strategy.

| | | |
|---|---|---|
| o Product Strategy | : | Identification of priority products that best satisfy the basic criteria for achieving the different objectives |
| o Promotional Strategy | : | A set of proposals for helping to create conditions conducive to the development of he industry in general and the identified priority products in particular. |
| o Development Pattern Strategy | : | Identification and selection of specific development pattern suitable for the development of the local machinery sector. |

### 5.3.5 Product Strategy

In identifying the priority products for development, a basic set of criteria which is applicable to the manufacturing sector as a whole is commonly utilised. This criteria for product evaluation include,

- Comparative advantage of the country in producing the products: the higher the better;

- Market demand potential: either for import substitution, export expansion or domestic market expansion;

- Value added contribution: the higher, the better;

- Appropriateness of technology: the more the selected technology provides skill transfer and spin-off effects, the better;

- Utilisation of local materials and natural resources: the higher, the better.

Before analysing in detail each industry (Engines and Turbines, Agricultural Machinery and Equipment, Metal and Wood Working Machinery, and Material Handling Machinery and Equipment Industries) using the above criteria, it is perhaps important to spell out the limitations. First, there is limitation of information on each machinery industry with regards to the above criteria. And secondly, the above criteria is too narrow for a proper evaluation of the machinery industries.

The breakdown of intra-industrial information are limited to information on comparative advantage, market demand potential and value added. There is no breakdown data and discussion for appropriateness of technology, linkage and multiplier effect, and utilisation of local materials and natural resources. Having outlined the limitation, we shall now proceed to review each criteria.

To begin with, the machinery sector does not have comparative advantage. Its comparative disadvantage is reflected by the high Domestic Resource Cost Index of greater than 1.0. One exception to the rule is the machinery and equipment n.e.c. industry (in which material handling machinery is found). It has comparative advantage.

From the market demand projections, the engines and turbines has the highest market demand potential among the machinery products. This is followed by the other products in the following order - agricultural machinery and equipment, metal and wood working machinery, and material handling machinery and equipment. At present, the local market is dominated by foreign imports.

The value-added criteria proves too elusive a yardstick for the ranking of various machinery industries. The rank of each individual industry will differ depending on whether the absolute value of value-added or value-added per worker or value-added per unit output is used. Generally, it is true to say that the machinery sector enjoys positive value added from its manufacturing activity.

With regards to appropriateness of technology, the machinery sector as a whole is a skilled labour and capital intensive industries. With the advent of computerised production process in the machinery sector, which has the tendency to displace labour, the appropriateness of production technology is questionable. On the other hand, the technology of the machinery sector can have beneficial spin-off effects (like developing higher skilled labour force, linkages, etc.)

In the case of linkages and multiplier effects, the machinery sector has weak linkages and a high multiplier leakage from the local economy. The limitation of data does not allow for inter-machinery industry comparison. Finally, the machinery sector utilises low level of natural resources and local materials. This is because the iron ore resources is limited while local material input is expensive and restricted (as a result of underdeveloped ancillary activities).

Using the above criteria, the conclusion arrived at can hardly provide any strong justification for the development of the machinery industries. The problem is rooted in its state of underdevelopment. In this respect, other criteria are proposed for purpose of evaluation.

o Contribution to the Autonomous Industrialisation Process : the greater, the better.

- Return to Capital Investment : the higher, the better.
- Transfer of vital technology necessary to indutrialisation.
- Complimentary role to automotive industry/construction and the springboard for further industrialisation.
- Complements objective to realise industrial maturity.
- Reducting the economy's dependence on imported investment goods
- Reduction in the loss of foreign exchange. The heavy reliance on manufactured imports and the dependence on primary commodity for exports does not work to the advantage of the local economy. The terms of trade discriminate against primary commodities and favour manufactured products.
- Enormous linkage potential.
- This is where the fundamental level of industrialisation is found. This include the ancillary activities of foundry works, forging, hot rolling, cold rolling, drawing, extrusion works, sintering works, machining, electroplating and press works.

These criteria are proposed on the basis that the machinery sector is unique as compared to other manufacturing industries. The contribution to the autonomous industrialisation process criteria is used because of the recognition of the machinery sector as an investment goods industry. Hence, an increase in the production of machinery will enable the economy to move towards a greater degree of independent industrialisation. As for the second criteria, it reflects the economically-vibrant nature of the local machinery sector. The sector managed to reap positive return to capital invested despite the fact that the sector is discriminated against in terms of protection structure and has comparative disadvantage.

Metal working machinery forms the most vital link to the whole process of independent industrialisation. It is the means of production of machinery, be it for its own duplication (that is, reproducing metal working machinery) or for the production of other machinery. In terms of Gross Return to Capital Investment, the Engines and Turbines Industry heads the list. It is followed by the Agricultural Machinery, Machinery and Equipment n.e.c. and Metal and Wood-working Machinery Industries.

Bearing in mind all the various criteria-evaluations, Table 5.3.1 attempts to map out the priority products of the machinery sector. The recommended priority products for promotion are spread across 15 years. This is done in recognition of the fact that a longer time is required to build up the machine building capa-

TABLE 5.3.1

Recommended Priority Products for Development over the next 15 years.

| PRIORITY PRODUCTS | REASONS |
|---|---|
| A) Short Term (1-5 years) : 1985-1990 | |
| o Simple Metal Working Machinery | o Contribution to the independent Industrialisation process |
| - Metal Presses | o High Value Added to output |
| - Jigs and Fixtures | o Positive Gross Return to Capital Investment |
| - Die and Die Sets | |
| - Gauges and Measuring Tools | o To support heavy industries |
| - Power Driven Hand Tools | |
| o Wood Working Machinery | o To expedite resource based manufacturing |
| - Power Driven Hand Tools | |
| - Drillers | |
| - Sawing machine | |
| - Planers | |
| - Shapers | |
| - Lathes | |
| o Agricultural Machinery | o To improve agricultural productivity |

TABLE 5.3.1 (CON'T)

| PRIORITY PRODUCTS | REASONS |
| --- | --- |
| - Mechanised Farm Implements ( illers, crop cutters, rotavators, hole diggers, slashers, measure spreaders, cultivators, mulchers, rippers and the like) | o High Value Added to labour<br>o High Market demand potential<br>High gross return to capital investment |
| o Engines and Turbines | For multiple uses<br>High market demand potential |
| - Small low power petrol engines and diesel engines | High Value Added to labour and output<br>High gross return to capital investment |
| B) <u>Medium Term (5-10 years) : 1990-1995</u> | |
| o <u>Complete General-Purpose Metal Working Machinery</u> | o To encourage desirable skills necessary for full scale industrialisation |
| o - Universal lathes | |
| - Drilling machines | |
| - Milling machines | |
| - Shapers | |
| - Hacksawing machines | |
| - Universal and plain cutters | |
| - Tool-guiding machines | |
| - Boring machines | |
| - Universal cylindrical grinding and surface grinding machines | |
| - Metal industrial moulds | |

TABLE 5.3.1 (CON'T)

| PRIORITY PRODUCTS | REASONS |
|---|---|
| - Forging machines | |
| - Metal presses* | |
| - Jigs and fixtures* | |
| - Die and die sets* | |
| - Gauges and measuring tools* | |
| - Power drive hand tools | |
| o <u>Material Handling Machinery</u> | o Needed by a more developed manufacturing sector |
| - Conveyors | o Has comparative advantage |
| - Forklift truck | o Positive Value Added |
| - Hoists | o Positive gross return to capital investment |
| o <u>Agricultural Machinery</u> | o Expansion of domestic manufacturing of agricultural machinery |
| - Small tractors | |
| - Threashers | |
| - Light harvestors | |
| - Transplanters | |
| - Previously listed mechanised farm implements* | |
| o <u>Engines and Turbines</u> | o To increase the range of engines for production engines* |
| - Petrol engines and diesel | |
| C) <u>Long Term (more than 10 years) : after 1995</u> | |

TABLE 5.3.1 (CON'T)

| PRIORITY PRODUCTS | REASONS |
|---|---|
| o Precision Manufacturing Machinery<br>- Precision metal working machinery<br>- Precision measuring equipment | o To achieve industrial maturity |
| o Automated Machinery | o To complete the industrial revolution in Malaysia |

Note * This is a tentative group of priority product. Whether another 5 years of priority listing will be granted to these products or not will depend on whether there are grounds for doing so. Hence, these products must be reviewed at the end of 1990.

bility in Malaysia. The country is starting at a near-zero position. The various basis for the product selection are also summarised.

However, given the nature of the machinery products itself, it is too shortsighted to limit the discussion of the priority list to the end product per se. This is because the machinery is made up of numerous component parts and among these parts, there are some common elements which are applicable to all the machinery products. It is therefore essential to identify these parts for promotion as well. Table 5.3.2 summarises the common machine parts to be recommended for priority listing.

### 5.3.6 Product Promotional Strategy

To complement the selection of priority products some form of of promotional activity is required. This section will briefly discuss the general and overall strategy for product promotion. The detail recommendations are discussed Section VII.

a) Promotion of Heavy Industries

A direct spin-off from the promotion of heavy industry is increase in the demand for machinery. This is particularly true of the metal working machinery. In addition, the close link between the heavy industry and machinery industry will enable the latter to realise a greater degree of product development.

TABLE 5.3.2

RECOMMENDED PRIORITY PRODUCTS (COMMON MACHINE PARTS) FOR DEVELOPMENT OVER THE NEXT 10 YEARS

| PRIORITY PRODUCT | | |
|---|---|---|
| A) CONNECTING MACHINE ELEMENTS | B) MACHINE ELEMENTS FOR TRANSMISSION OF MACHINE MOVEMENT | C) FLUID CONTROL PARTS |
| - SCREW (BOLT AND NUT) | - AXLE AND SHAFT | - PRESSURE CONTAINER |
| - RIVET | - SLIDE AND ROLLER BEARING | - PIPE |
| - KEY | - SPLINE | - TUBE |
| - COTTER | - SPLINE FITTING | - JOINT |
| - WEDGE | - SCREW AND BALL SCREW | - VALVE |
| - PIN | - COUPLING | - COCK |
| - SPRING | - FRICTION WHEEL | - VANE |
| - TAPER SHANK | - GEAR AND GEARING | - BLADE |
| - TAPERED HOLE | - CAM | - RUNNER |
| - BAJONET | - BELT | - IMPELLER |
| | - PULLLEY | - NOZZLE |
| | - CHAIN | - SEALING DEVICES (PACKING, GASKET, ETC) |
| | - SPROCKET | |
| | - CLUTCH | |
| | - FLY WHEEL | |
| | - BRAKE | |
| | - SPRING | |
| | - DAMPER | |

SOURCE : ADAPTED KONOSUKE ODAKA (1983), THE MOTOR VEHICLE INDUSTRY IN ASIA - A STUDY OF ANCILLARY FIRM DEVELOPMENT, SINGAPORE UNIVERSITY PRESS

b) Promotion of Utilisation of Local Machinery by Local Industries

As the economy gears itself towards rapid industrialisation over the next decade, it potentially opens up a huge market for machinery products. The harnessing of this opportunity can only be realised if local industries are encourage to use locally-made machinery products in their manufacturing process.

c) Encourage Joint-Venture between Foreign and Local Capital to Produce Priority Products

Any joint venture between foreign and local capital in the machinery sector should be encouraged to produce goods in the priority list. One advantage of joint-venture is the possibility of technology transfer. This is potentially beneficial in cases where the technology required is difficult or too expensive to acquire. However, it has to be aware that the restrictive conditions imposed by the supplier with regards to technology transfer have tended to disadvantage the local firms. Hence, it is the prerogative of the local firms not to be made disadvantage and that genuine transfer of technical know-how takes place.

d) Provision of Investment Incentives

To encourage manufacturers to produce priority goods, it is also essential to provide some form of investment incentives to both the existing and potential manufacturers (this is particularly true of credit facilities). In the past, investment incentives structure have not favoured the machinery sector. Given the importance of the machinery sector in the whole industrialisation process, the above trend in incentives allocation has to be reversed.

e) Protection for Products against Imports

It is important for a local industry producing priority products to be ensured of a sizeable market. This is to ensure that local production will not face excess capacity and will reap economies of scale. This is essential for the development of an infant industry. Unequal basis of competition with foreign products can only serve to destroy the whole local industry before it has the chance to develop, mature and "stand on its own feet".

f) Research and Development Incentives

As the machinery sector is a very creative and innovative industry, the research and development aspect of the sector is of primary importance. In order to stimulate product development of the sector, research and development incentives, such as tax exemption to the private sector to conduct such activity, need to be provided.

g) Quality Control

Promotion of the locally produced machinery has to be accompanied by quality control activity. More sophisticated machines, rather than visual aids, need to be introduced for quality control purposes.

h) Promotional Board

The public and private organisations should encourage the promotion of locally produced machinery. This would encompass the orientation of the activities of industry and trade association, federation of industries, industries promotion boards and the like towards promoting local machinery.

5.3.7 Development Pattern Strategy (See Appendix 5.3.2)

As can be seen from Table 5.3.1, the time frame for the development of machinery sector is spread across 15 years. The pattern of development attempts to systematise the industrialisation process and to avoid the pitfalls experienced by other countries which underwent late industrialisation. We shall briefly review the experiences of Korea, Taiwan and Japan.

a) Brief Summary of the Korean Experience (See Appendix 5.3.3)

- o The Act for Promotion of Machinery had played a significant role in the development of the machinery sector. It had enable machinery firms to develop by enabling them to get access to loans on a long-term basis and at low preferential interest rates.

- o To stimulate the demand for the local machinery, a two pronged strategy was introduced. First, import of machinery was restricted. And secondly, promotional loans were also extended to manufacturers who use locally produced machinery. In addition, a 10% tax deduction on their investment was also granted.

- o However, though there have been steady growth in the machinery sector, the increase in demand was not satisfactory. The products manufactured did not attained any significant improvement in competitiveness (in terms of durability and precision). In addition, the sector lacked sales and marketing expertise.

- o Liberalisation of imports was subsequently introduced to promote greater effective investment allocation and efficiency via foreign competition. Absolute protection is to be replaced by stronger promotional measures such as tax benefits, technical assistance, government financed training, support for research and development, and adjustable tariff rates.

b) Brief Summary of the Taiwanese Experience (See Appendix 5.3.4)

- o After a decade of promotional effort, the machinery sector of Taiwan has emerged into one of the most important machinery manufacturers among the late developers. From a position of dependence on machinery imports, it has now become a producer and exporter of lathes, turning, milling, drilling and grinding machines, and of late, manufacturing plants.

- o Part of the success story was due to the government's national policy of emphasising initial investments in economic infrastructure and heavy industries.

- o The production structure is made up of many small firms, medium-sized business backed by more capital and increasing number of really large firms.

- o Nonetheless, there are numerous obstacles that the machinery sector still faces. They are,

  - bottlenecks in supplies from abroad

- inadequate quality on some of the domestic intermediate products
- shortage of technically specialised manpower.

c) Brief Summary of the Japanese Experience (See Appendix 5.3.5)

o Japan has come from a position of being way behind major European and US companies in production and design capability as late as early 1960s to the present status of being a leading producer and technological innovator of machinery.

o This success can be attributed to its conscious policies towards the development of the machinery sector. This effort commenced as early as the mid-1950s with a three pronged approach.

First, the Japanese government banned machinery imports which local companies were producing. Secondly, a "rationalisation" approach was taken whereby the local companies were encouraged to form cartels to purchase parts, import materials, set standards, set prices, allocate products and establish guidelines for technology improvement. And finally, the government also provided subsidies for the development of the machinery industry. Loans from the Japan Development Bank and Small Business Finance Corporation, and preferential tax rates were provided to encourage joint investment and mergers. Special Depreciation Laws were also enacted to promote mechanisation and to encourage the purchase of Japanese made machinery.

Initial measures focus on basic components and simple machinery. This include bearings, springs, gears, simple presses, castings and machine tools. During the 10 year period, industry associations were formed and modernisation was encouraged within the small companies. The flow of industrial information was also encouraged.

- From mid-1960s, emphasis shifted to making the companies internationally competitive. As it progressed, the Japanese government shifted its policy from massive aid and very close direction to a looser form of assistance and cooperation. The machinery makers have had to undertake massive research and development in unfamiliar fields in order to remain competitive in the industry.

d) Proposed Framework for Development of Machinery Sector in Malaysia

- The development process should follow systematic phases of growth.

Phase I Emphasis to be placed in the development of all the basic machinery components and simple machinery.

PhaseII Production of more complex but general-purpose machinery.

Phase III Production of sophisticated machinery and advanced production technology of the machinery sector.

The detailed framework has been highlighted in Table 5.3.1 and Table 5.3.2.

o The development of manufacturing activity should follow the following activity programme for existing firms.

- Servicing activity (repair and maintenance) to include simple component manufacturing.

- Some component parts manufacturing to more complex structured parts manufacturing.

- Component parts manufacturing to assembly activities.

- Assembly activities to include greater degree of component manufacturing activities.

New plant set-ups (particularly where foreign investment is involved, see Appendix 5.3.6) to be encouraged to go into assembly of machinery so as to ensure subsequent spin-offs in terms of technology transfer and new domestic demand for local components.

- o To ensure a demand for locally produced component parts and machinery products, the goods must be competitive and of high quality. This can only be possible provided production technology is high and efficient.

  - Need to import sophisticated production technology (including computer controlled machinery) in the immediate future.

  - Need to import precision measuring equipment for quality control activity.

  During the third phase of the proposal, the manufacturing of these production technology shall be explored.

- o In addition, the research and development capacity needs to be developed.

  - Legislation to ensure genuine transfer of technology and technical know-how.

- Setting up technical group (comprising of foreign and local experts) to provide assistance. Technical assistance from UNIDO will be of help.

- Setting up a central unit for research and development activity to complement private initiatives in this area.

- The research and development activity will foster the development of indigenous technological capabilities and accumulation of technological knowledge.

o The domestic demand is to provide the base for the development of the machinery sector. It will have two phases.

Phase I the local market will be well protected from foreign competition. This is the rationalisation and consolidation process. The three tier-policy approach need to be adopted. This will entail policy to encourage domestic utilisation of local machinery in manufacturing activity; policy to encourage greater locally manufactured component parts to be used in assembly works and policy to stimulate growth of ancillary activities and component parts manufacturing.

Phase II the reduction in the domestic market protection via lesser stringent protection policy. This is to ensure that the machinery firms will gear its production process towards greater efficiency and competitiveness. An over-protected industry will be parasitic to the economy. This phase will be introduced once the products are off the priority list.

While exports expansion should be encouraged, it needs to be supported by coherent promotional activities and sales and marketing expertise.

# PART VI INVESTMENT PLAN

## PART VI INVESTMENT PLAN

### 6.1 Introduction

The objectives of this section is to determine two related aspects of investment. The first objective is to determine the level of investment required for minimum domestic production so as to ensure that the total supply will be able to satisfy the domestic demand. The second objective is to determine the level of new employment and production generated.

### 6.2 Aggregate Sectoral Investment Requirements And Employment Generation Over 1985 - 1995

The subsequent projections are all based upon the projected output growth in Chapter IV. However, the discussion in this section has to be interpret with caution. Because of data incompatibility, the analysis will occassionally resort to the utilisation of information which extents to cover the broader category of machinery and equipment n.e.c. Nonetheless, wherever possible, attempts will be made to isolate out the material handling machinery and equipment for study.

### 6.2.1 Past Growth Trend Of Output, Capital And Employment

Table 6.2.1 shows the past growth trend of output, capital and employment ratios in the machinery sector in Malaysia between 1973-1981. As can be observed, the values for various years have been inflated to constant 1984 prices. This is to ensure consistency in the analysis. However, these projected figures are based on the aggregated values of the engines and turbines, agricultural machinery and equipment, metal and wood working machinery, and machinery and equipment n.e.c. industries.

Between 1973 and 1981, it is observed that the growth rate of capital (fixed assets) was higher than that of the machinery output. The growth rate per annum of capital was 11.7 % while output growth was 10.2%. The growth of labour was the lowest. These were reflected in the high growth rate of capital/labour ratio (5.6%), lower growth rate of output/labour ratio (4.3%) and a declining growth rate of output/capital ratio (-1.4%). However, the subsequent analysis will focus on the two key variables; capital-output ratio (Y/K) and capital-labour ratio (K/L).

TABLE 6.2.1

PAST GROWTH TREND OF OUTPUT, CAPITAL & EMPLOYMENT RATIOS IN MACHINERY INDUSTRY, MALAYSIA, 1973 - 1981

| | | 1973 | 1981 | GROWTH RATE P.A. 1973 - 1981 | GROWTH RATIO 1981-1985 | GROWTH RATIO 1985-1995 | GROWTH RATIO 1990-1995 | 1985 | 1990 | 1995 |
|---|---|---|---|---|---|---|---|---|---|---|
| OUTPUT (Y) | CURRENT PRICES | 132 | 491 | 17.8 | | | | | | |
| ($ MILLION) | 1984 PRICES | 255 | 556 | 10.2 | | | | | | |
| CAPITAL (K) | CURRENT PRICES | 35 | 143 | 19.2 | | | | | | |
| ($ MILLION) | 1984 PRICES | 67 | 162 | 11.7 | | | | | | |
| LABOUR (L) | | 10,229 | 15,915 | 5.7 | | | | | | |
| Y/K ($ MILLION) | | 3.8 | 3.4 | -1.4 | 0.9 | 1.3 | 1.3 | 3.2 | 4.1 | 5.2 |
| Y/L | CURRENT PRICES | 12.9 | 30.9 | 11.5 | | | | | | |
| ($'000) | 1984 PRICES | 24.9 | 34.9 | 4.3 | 1.2 | 1.2 | 1.2 | 41.3 | 51.0 | 62.9 |
| K/L | CURRENT PRICES | 3.4 | 9.0 | 12.9 | | | | | | |
| ($'000) | 1984 PRICES | 6.6 | 10.2 | 5.60 | 1.2 | 1.3 | 1.3 | 12.7 | 16.7 | 21.9 |

NOTE : OUTPUT-CAPITAL RATIO IS ASSUMED TO DECLINE AT 1.4 % BETWEEN 1981 AND 1985
THE SUBSEQUENT GROWTH RATE RATIO IS ASSUMED TO BE 5 % FOR THE PERIOD 1985 - 1995

6.2.2 Projected Growth Of Capital And Labour

In deriving the appropriate projections for the year 1995, the following assumptions have been made. The output-capital ratio is assumed to decline at 1.4% between 1981 and 1985. A subsequent growth rate of 5% is assumed for the period 1985-1995.

Table 6.2.2 summarises the projected growth of capital and labour over the period up to 1995. The values projected are based upon the previously projected figures for Y/K ratio, K/L ratio and projected output figures .

Between 1985 and 1995, the projected output is expected to be about $2.9 billion. The capital investments in fixed assets is expected to increase from about $0.27 billion to a region of between $0.69 and $0.88 billion. If the medium value is treated as the most likely case, then a capital investment of $0.72 billion is projected. Hence, about 0.45 billion investments is required between 1985 and 1995; a third of these investments is to invested in the first 5 years.

In terms of total employment, the likely growth rates are expected to be relatively lower with 3.1% for 1985 - 1990 and 5.6% for 1990-1995 (the respective growth rates of capital were 8.9% and 11.5%). By 1995, a total employment of between 26,959 and 39,954 is estimated. the likely total employment is projected at 32,753. This means that about 11,336 jobs will be created during 1985-1995. About a third of these new jobs will be created within the first 5 years.

TABLE 6.2.2

PROJECTED GROWTH OF .APITAL IN THE MACHINERY SECTOR, 1985 - 1995

| | 1981 | 1985 | | 1990 | 1995 | CHANGE 1985 - 1990 | IMPLIED GROWTH RATE P.A. | CHANGE 1990 - 1995 | IMPLIED GROWTH RATE P.A. |
|---|---|---|---|---|---|---|---|---|---|
| OUTPUT ($ MILLION) | 556 | 870 | LOW | 1,580 | 3,070 | 710 | 12.7 | 1,490 | 14.2 |
| | | | MEDIUM | 1,710 | 3,730 | 840 | 14.5 | 2,020 | 16.9 |
| | | | HIGH | 1,900 | 4,550 | 1,030 | 16.9 | 2,650 | 19.1 |
| CAPITAL ($ MILLION) | 162 | 272 | LOW | 385.4 | 590.4 | 113.4 | 7.2 | 205.0 | 8.9 |
| | | | MEDIUM | 417.1 | 717.3 | 145.1 | 8.9 | 300.2 | 11.5 |
| | | | HIGH | 463.4 | 875.0 | 191.4 | 11.2 | 411.6 | 13.6 |
| LABOUR (BASED ON K/L) | 15,915 | 21,417 | LOW | 23,078 | 26,959 | 1,661 | 1.5 | 3,881 | 3.2 |
| | | | MEDIUM | 24,976 | 32,753 | 3,559 | 3.1 | 7,777 | 5.6 |
| | | | HIGH | 27,749 | 39,954 | 6,332 | 5.3 | 12,206 | 7.6 |

As was pointed out earlier, the above analysis is based upon the projections which covered a broader machinery group. To narrow the analysis to merely the required aggregated group (i.e. engines and turbines, agricultural machinery and equipment, metal and wood working machinery, and material handling machinery and equipment ), attempts have been made to aggregate the projections of each industries under study. Table 6.2.3 is the outcome of this effort.

As can be seen from the Table, the projected output for 1995 is expected to vary from $2.9 to $4.4 billion. The most likely output is projected at $3.6 billion. This means that about $3.4 billion of output is expected between 1985 and 1995. About $0.9 to $1.3 billion capital investment is required between the 10 years period. The likely capital investments required is $1.1 billion; four-tenth of these investments is projected for the first five years. As for employment creation, about 17,692 jobs are expected to be created from 1985 to 1995.

The apparent differences in the former and latter projections are due to different assumptions applied in the two cases.

Besides utilising different machinery group for making the projections, the first set of projections is based on imports and exports domestic market shares of previous years while the latter set of projections is based on a targetted domestic market share and export growth rate of previous years (refer to 6.3.2 and Section VII).

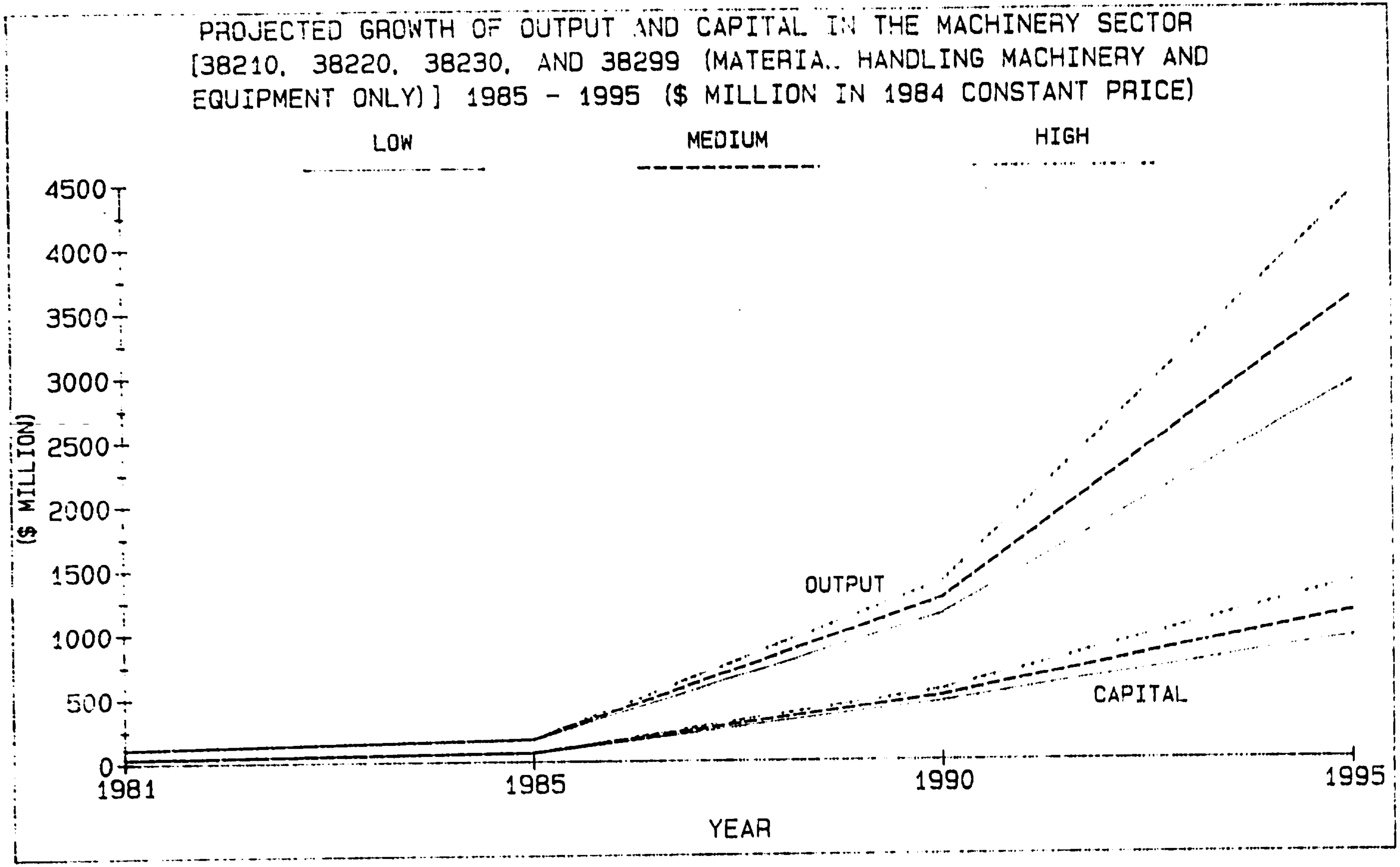
TABLE 6.2.3

PROJECTED GROWTH OF CAPITAL AND LABOUR IN THE MACHINERY SECTOR
[38210, 38220, 38230 AND 38299 (MATERIAL HANDLING MACHINERY AND EQUIPMENT ONLY)]
1985 - 1995 (IN 1984 CONSTANT PRICE)

| | 1981 | 1985 | | 1990 | 1995 | CHANGE 1985 - 1990 | IMPLIED GROWTH RATE P.A. | CHANGE 1990 - 1995 | IMPLIED GROWTH RATE P.A. |
|---|---|---|---|---|---|---|---|---|---|
| OUTPUT | | | LOW | 1,145.51 | 2,934.50 | 966.22 | 44.9 | 1,788.99 | 20.7 |
| ($ MILLION) | 111.01 | 179.29 | MEDIUM | 1,265.64 | 3,597.95 | 1,086.35 | 47.8 | 2,332.31 | 23.2 |
| | | | HIGH | 1,393.73 | 4,397.10 | 1,214.44 | 50.7 | 3,003.37 | 25.8 |
| CAPITAL | 38.60 | 74.52 | LOW | 464.66 | 949.45 | 390.14 | 44.2 | 484.79 | 15.4 |
| ($ MILLION) | | | MEDIUM | 509.23 | 1,145.01 | 434.71 | 46.9 | 635.78 | 17.6 |
| | | | HIGH | 556.92 | 1,378.58 | 482.40 | 49.5 | 821.66 | 19.9 |
| LABOUR | 2620 | 3842 | LOW | 13,356 | 17,578 | 9,515 | 28.3 | 4222 | 5.6 |
| (BASED ON K/L) | | | MEDIUM | 14,748 | 21,535 | 10,906 | 30.9 | 6786 | 7.9 |
| | | | HIGH | 16,219 | 26,215 | 12,378 | 33.4 | 9996 | 10.1 |

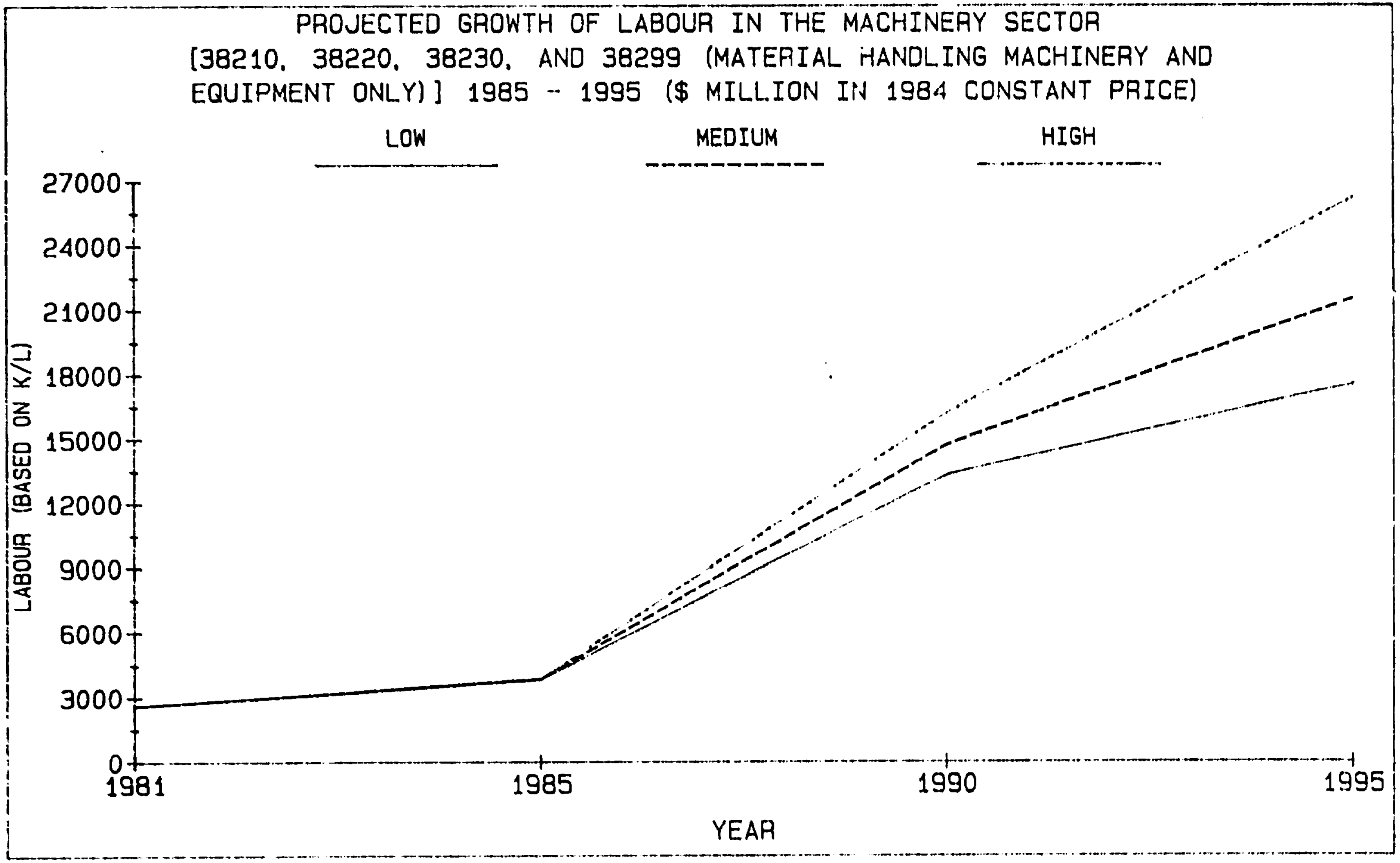
NOTE : DERIVED FROM TABLES 6.3.5, 6.3.8, 6.3.11 AND 6.3.13

FIGURE 6.2.1




VI.8

FIGURE 6.2.2


PROJECTED GROWTH OF LABOUR IN THE MACHINERY SECTOR
[38210, 38220, 38230, AND 38299 (MATERIAL HANDLING MACHINERY AND
EQUIPMENT ONLY)] 1985 - 1995 ($ MILLION IN 1984 CONSTANT PRICE)
LOW
MEDIUM
HIGH
LABOUR (BASED ON K/L)
27000
24000
21000
18000
15000
12000
9000
6000
3000
0
1981
1985
1990
1995
YEAR

In addition, the relatively lower projections in the former case are due to the fact that it was not possible to incorporate the growth of the material handling machinery into the projections. This is because the projections are based on previous trend and there is no previous manufacturing activity in the material handling machinery industry (except for trading activity). In the second set of projections, targets are explicitly spelt out for the material handling machinery industry (to carry out manufacturing activity). With this in mind, the projections for each industry shall now be examined.

## 6.3 Investments Requirements And Employment Generation By Industry Sub-Groups Over 1985-1995

Before going into the discussion of the projections for the period 1985-1995, a review of the past trends of the various industries will be carried out first.

### 6.3.1 Past Growth Trend Of Output, Capital And Employment By Industry

The estimated ratios of Y/K and K/L between 1973-1981 for the 4 machinery industries are shown in Table 6.3.1. The subsequent analysis will focus on the ratios based on 1984 prices.

To begin with, it can be concluded that there is no uniform trend within each industry. Despite the fact that the industries, except agricultural machinery and equipment depicted declining output/capital ratio, the magnitudes of decline

TABLE 6.3.1

ESTIMATED Y/K AND K/L RATIOS BY MAJOR MACHINERY INDUSTRY SUBGROUPS, 1973 - 1981

| | Y/K ($ MILLION) | | | K/L ($'000) | | |
|---|---|---|---|---|---|---|
| | 1973 | 1981 | % P.A. | 1973 | 1981 | % P.A. |
| a. CURRENT PRICES | | | | | | |
| ENGINES AND TURBINES | 3.67 | 3.00 | -2.49 | 2.86 | 10.40 | 17.51 |
| AGRICULTURAL MACHINERY | 3.19 | 4.15 | 3.34 | 8.61 | 1.11 | -22.59 |
| METAL & WOODWORKING MACHINERY | 3.58 | 1.28 | -12.06 | 2.92 | 1.96 | -4.86 |
| MACHINERY & EQUIPMENT N.E.C. | 3.76 | 3.62 | -0.47 | 3.40 | 8.14 | 11.53 |
| b. 1984 PRICES | | | | | | |
| ENGINES AND TURBINES | 3.70 | 3.00 | -2.6 | 5.50 | 11.70 | 9.90 |
| AGRICULTURAL MACHINERY | 3.23 | 4.16 | 3.10 | 16.40 | 12.50 | -3.3 |
| METAL & WOODWORKING MACHINERY | 3.56 | 1.28 | -12.0 | 5.60 | 22.10 | 18.70 |
| MACHINERY & EQUIPMENT N.E.C. | 3.76 | 3.62 | -0.2 | 6.60 | 9.20 | 4.20 |

were substantial different. While the machinery and equipment n.e.c industry experienced a low negative growth rate (-0.2 %), the metal and wood working machinery industry had the highest negative growth rate (-12.0 %). The engines and turbines industry suffered from a moderate decline (-2.6%). These declining Y/K ratios has two important implications.

First, the end result of the investments in the late 1970s yet to materialise in the early 1980s. And secondly, the investments in fixed assets had not been effective or productive. This is to be expected because substantial investments in production technology (machinery) in these industries were on outdated foreign machinery. As shown in Table 6.3.2, those industries with negative growth rates for Y/K ratio had a higher percentage of their fixed assets investments in machinery and equipment. They are in many ways inefficient. Unfortunately, the present domestic market is swamped with used machinery imports.

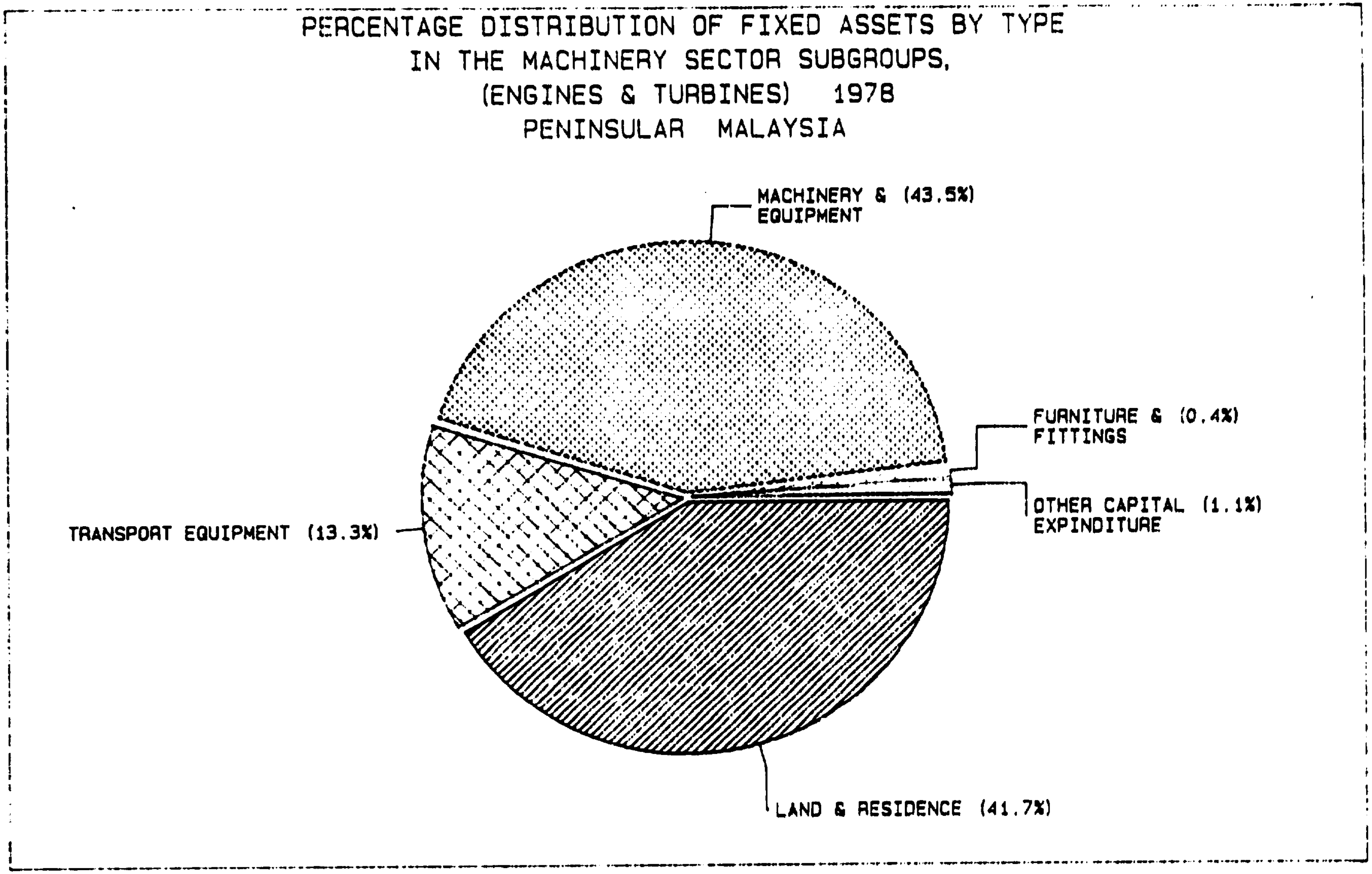
On the other hand, the agricultural machinery and equipment industry enjoyed increasing capital productivity over the years. Its growth rate of output/capital was estimated at 3.1% between 1973 and 1981. The attention and technical assistance provided by the Government to the development and modernisation of the agricultural sector in the national economy had partly contributed to the growth within the agricultural machinery and equipment industry.

TABLE 6.3.2

PENINSULAR MALAYSIA : PERCENTAGE DISTRIBUTION OF FIXED ASSETS BY TYPE IN THE MACHINERY SECTOR SUBGROUPS, 1978

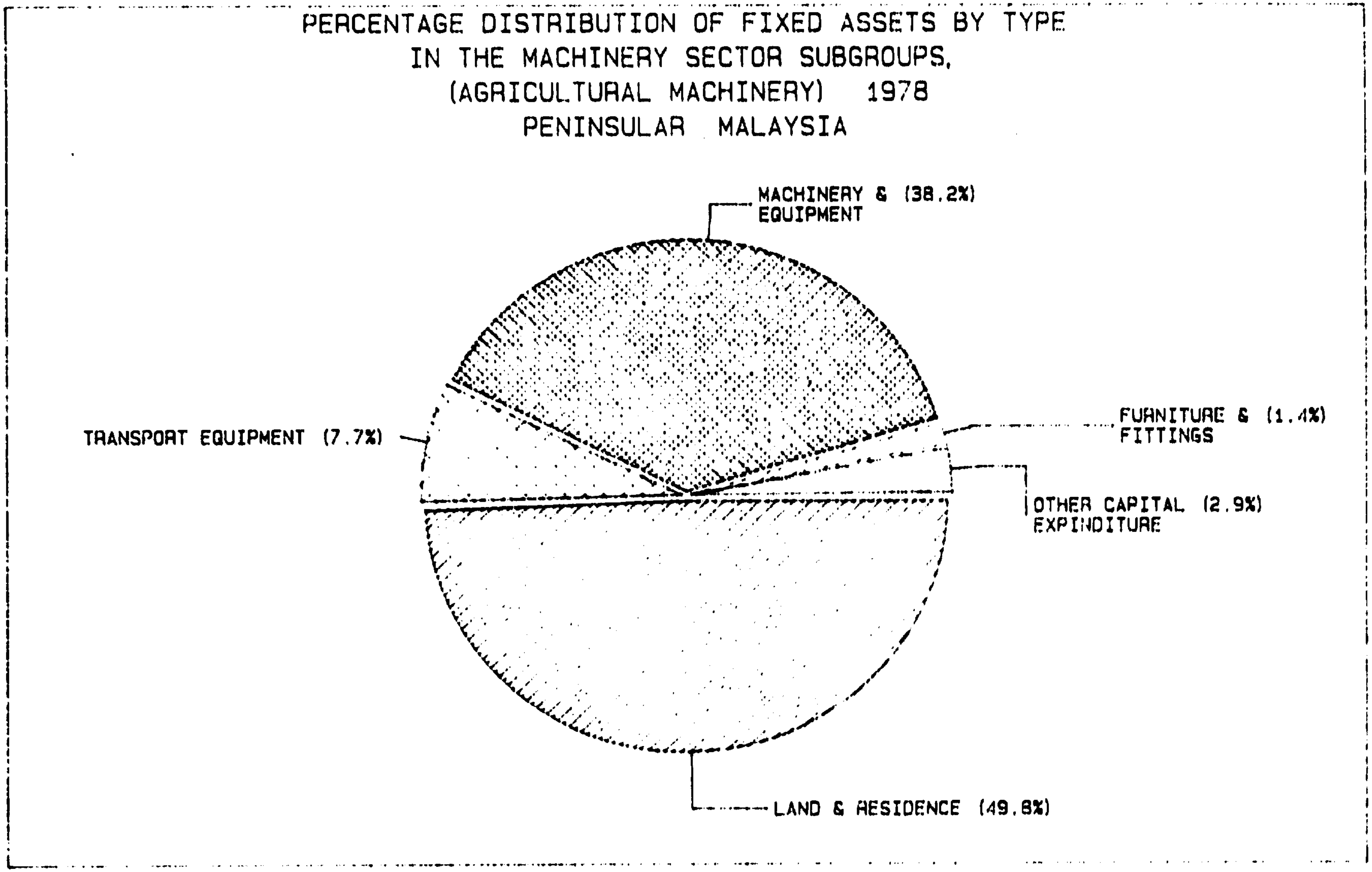
| | LAND & RESIDENCE | TRANSPORT EQUIPMENT | MACHINERY & EQUIPMENT | FURNITURE & FITTINGS | OTHER CAPITAL EXPENDITURE | TOTAL FIXED ASSETS |
|---|---|---|---|---|---|---|
| ENGINES AND TURBINES | 41.7 | 13.3 | 43.5 | 0.4 | 1.1 | 100.0 |
| AGRICULTURAL MACHINERY | 49.8 | 7.7 | 38.2 | 1.4 | 2.9 | 100.0 |
| METAL & WOODWORKING MACHINERY | 21.0 | 8.0 | 66.5 | 2.3 | 2.2 | 100.0 |
| MACHINERY & EQUIPMENT N.E.C. | 46.0 | 11.4 | 39.3 | 1.8 | 1.5 | 100.0 |

FIGURE 6.3.1



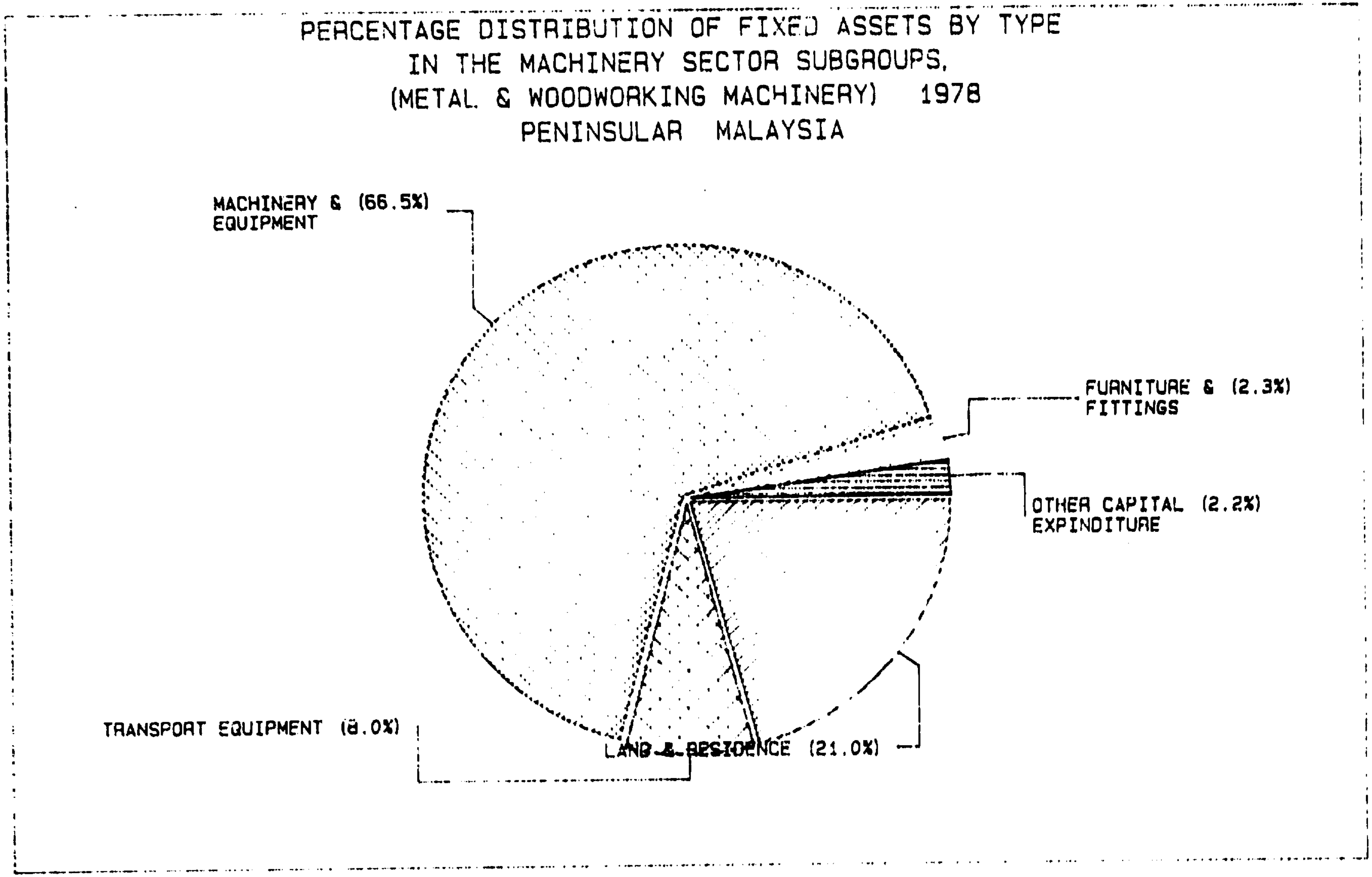

VI.14

FIGURE 6.3.2



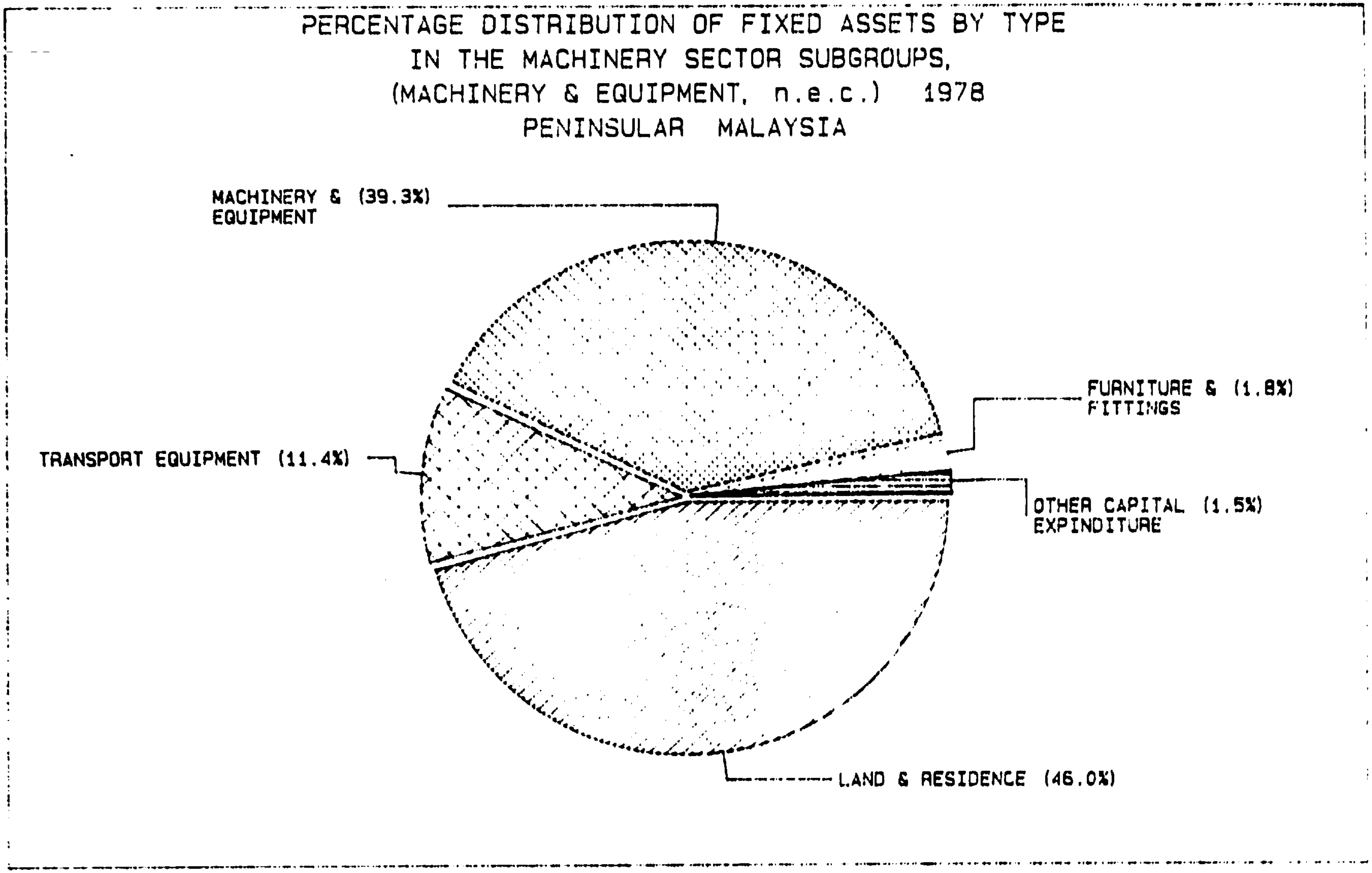
PERCENTAGE DISTRIBUTION OF FIXED ASSETS BY TYPE
IN THE MACHINERY SECTOR SUBGROUPS,
(AGRICULTURAL MACHINERY) 1978
PENINSULAR MALAYSIA
MACHINERY & EQUIPMENT (38.2%)
TRANSPORT EQUIPMENT (7.7%)
FURNITURE & FITTINGS (1.4%)
OTHER CAPITAL EXPINDITURE (2.9%)
LAND & RESIDENCE (49.8%)

FIGURE 6.3.3



PERCENTAGE DISTRIBUTION OF FIXED ASSETS BY TYPE
IN THE MACHINERY SECTOR SUBGROUPS,
(METAL & WOODWORKING MACHINERY) 1978
PENINSULAR MALAYSIA
MACHINERY & (66.5%) EQUIPMENT
FURNITURE & (2.3%) FITTINGS
OTHER CAPITAL (2.2%) EXPINDITURE
TRANSPORT EQUIPMENT (8.0%)
LAND & RESIDENCE (21.0%)

FIGURE 6.3.4


PERCENTAGE DISTRIBUTION OF FIXED ASSETS BY TYPE
IN THE MACHINERY SECTOR SUBGROUPS,
(MACHINERY & EQUIPMENT, n.e.c.) 1978
PENINSULAR MALAYSIA
MACHINERY & (39.3%) EQUIPMENT
FURNITURE & (1.8%) FITTINGS
TRANSPORT EQUIPMENT (11.4%)
OTHER CAPITAL (1.5%) EXPINDITURE
LAND & RESIDENCE (46.0%)

Like the output/capital ratio, the capital/labour ratios of the industries also exhibited different trends. Though the industries, except agricultural machinery and equipment industry, had positive K/L ratio-growth, the rate of growth differed between them. The highest annual growth in the metal and wood working machinery industry (18.7%). This suggest a high capital intentiveness within the industry. This was followed by the engines and turbines industry (9.9%) and machinery and equipment n.e.c. industry (4.2%) The agricultural machinery industry had a negative capital/labour ratio growth rate of -3.3%.

The overall trend suggests a greater degree of capital employment within the machinery industries over the years. The negative growth rate of the capital/labour ratio experienced by the agricultural machinery industry reflect the apprehension on the part of the domestic manufacturers with regards to the perceived future state of the agricultural machinery market.

### 6.3.2 Projected Growth of Capital and Labour by Industry

The subsequent discussion in this section will focus on the projections by industry - engines and turbines; agricultural machinery and equipment; metal and wood working, and material handling machinery and equipment. The discussion will center on the medium or most likely projections.

A. Engines And Turbines Industry

Tables 6.3.3, 6.3.4 and 6.3.5 illustrates the derivation of the projections for output, capital and employment for the engines and turbines industry. The projections are based upon several assumptions. They include :-

- Output-capital is assumed to declined at 2.6% for the period of 1981-1985 but will subsequently grow at 5% per annum during the period 1985-1995.

- Export growth will reflects past trend with 2% adjustments for high and low values.

- Domestic market shares for local produce are targetted at 45% by 1990 and 70% by 1995.

- Because of targetted objectives set for the development of the engines and turbines industry, the implied growth rate for the output is expected to be high.

Between 1985 and 1995, it is likely that there will be about $1.7 billion machinery output from the local industry. Of these, about a quarter is expected to be produced within the first five years.

The most likely capital requirements for such investment is $0.4 billion. In the case of manpower requirement, an employment of about 8,604 is required between 1985 and 1995.

TABLE 6.3.3

PAST GROWTH TREND OF OUTPUT, CAPITAL & EMPLOYMENT RATIOS IN ENGINES AND TURBINES INDUSTRY, MALAYSIA, 1973 - 1981

| | 1973 | 1981 | GROWTH RATE P.A. | GROWTH RATIO | | | 1985 | 1990 | 1995 |
|---|---|---|---|---|---|---|---|---|---|
| | | | 1973 - 1981 | 1981-1985 | 1985-1995 | 1990-1995 | | | |
| OUTPUT (Y) ($ MILLION) | 17.0 | 10.8 | -5.5 | | | | | | |
| CAPITAL (K) ($ MILLION) | 4.6 | 3.6 | -3.0 | | | | | | |
| LABOUR (L) | 840.0 | 307.0 | -11.8 | | | | | | |
| Y/K ($ MILLION) | 3.70 | 3.00 | -2.6 | 0.90 | 1.28 | 1.28 | 2.70 | 3.45 | 4.40 |
| Y/L ($'000) | 20.2 | 35.2 | 7.2 | 1.32 | 1.28 | 1.28 | 46.49 | 65.82 | 93.18 |
| K/L ($'000) | 5.5 | 11.7 | 9.9 | 1.46 | 1.60 | 1.60 | 17.07 | 27.37 | 43.88 |

NOTE : OUTPUT-CAPITAL RATIO IS ASSUMED TO DECLINE AT 2.6 % FOR THE PERIOD 1981 - 1985 AND SUBSEQUENTLY GROW AT 5 % PER ANNUM DURING THE PERIOD 1985 - 1995

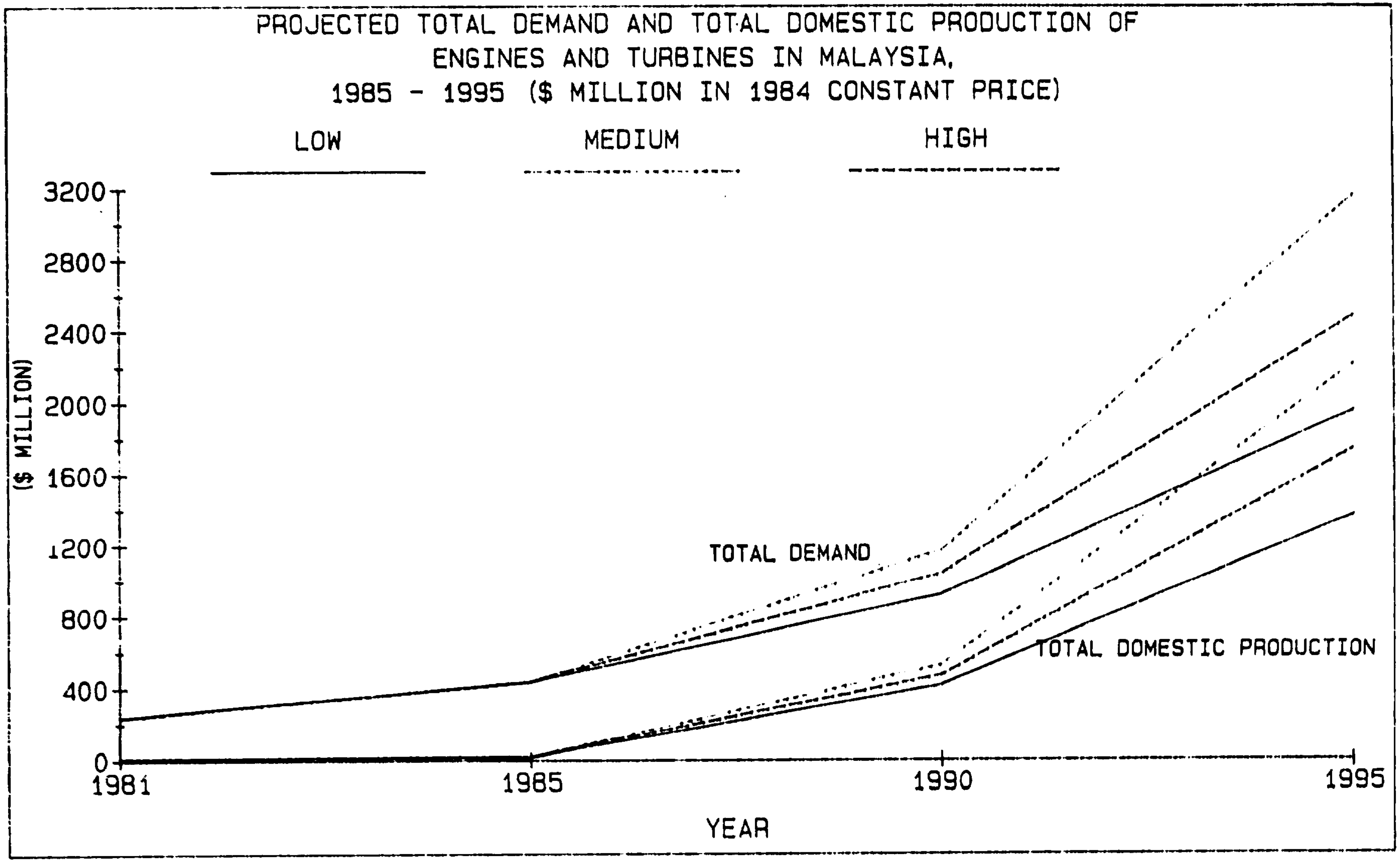
TABLE 6.3.4

PROJECTED TOTAL DEMAND, PRODUCTION AND EXPORT/IMPORT OF ENGINES & TURBINES
IN MALAYSIA, 1985 - 1995 ($ MILLION 1984 CONSTANT PRICE)

| | 1981 | 1985 | 1990 | | | 1995 | | |
|---|---|---|---|---|---|---|---|---|
| | | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH |
| 1) TOTAL DOMESTIC DEMAND | 234.50 | 435.00 | 921.30 | 1,037.80 | 1,170.50 | 1,951.80 | 2,476.40 | 3,154.70 |
| 2) TOTAL EXPORT | 2.66 | 3.09 | 3.38 | 3.72 | 4.10 | 3.70 | 4.48 | 5.44 |
| 3) TOTAL DEMAND | 237.16 | 438.09 | 924.68 | 1,041.52 | 1,174.60 | 1,955.50 | 2,480.88 | 3,160.14 |
| 4) IMPORT % OF DOMESTIC DEMAND | 96.50 | 96.50 | 55.00 | 55.00 | 55.00 | 30.00 | 30.00 | 30.00 |
| 5) TOTAL IMPORT | 226.29 | 419.78 | 506.72 | 570.79 | 643.78 | 585.54 | 742.92 | 946.41 |
| 6) TOTAL DOMESTIC PRODUCTION | 10.87 | 18.31 | 417.96 | 470.73 | 530.82 | 1,369.96 | 1,737.96 | 2,213.73 |

* NOTE : EXPORT GROWTH 1973 - 1981 (in 1984 constant price) = 3.8% p.a.
FUTURE EXPORT GROWTH RATES ARE ASSUMED TO BE L=1.8%, M=3.8% AND H=5.8%

FIGURE 6.3.5




PROJECTED TOTAL DEMAND AND TOTAL DOMESTIC PRODUCTION OF ENGINES AND TURBINES IN MALAYSIA, 1985 - 1995 ($ MILLION IN 1984 CONSTANT PRICE)

TABLE 6.3.5

PROJECTED GROWTH OF CAPITAL AND LABOUR IN THE ENGINES & TURBINES SECTOR, 1985 - 1995

| | 1981 | 1985 | | 1990 | 1995 | CHANGE 1985 - 1990 | IMPLIED GROWTH RATE P.A. | CHANGE 1990 - 1995 | IMPLIED GROWTH RATE P.A. |
|---|---|---|---|---|---|---|---|---|---|
| OUTPUT ($ MILLION) | 10.87 | 18.31 | LOW | 417.96 | 1,369.96 | 399.65 | 86.90 | 952.00 | 26.80 |
| | | | MEDIUM | 470.73 | 1,737.96 | 452.42 | 91.40 | 1,207.23 | 29.90 |
| | | | HIGH | 530.82 | 2,213.73 | 512.51 | 96.10 | 1,682.91 | 33.10 |
| CAPITAL ($ MILLION) | 3.6 | 6.78 | LOW | 121.15 | 311.35 | 114.37 | 77.99 | 190.20 | 20.77 |
| | | | MEDIUM | 136.44 | 394.99 | 129.66 | 82.28 | 258.55 | 23.69 |
| | | | HIGH | 153.86 | 503.12 | 147.08 | 86.71 | 349.26 | 26.74 |
| LABOUR (BASED ON K/L) | 307 | 397 | LOW | 4,426 | 7,095 | 4,029 | 61.96 | 2,669 | 9.90 |
| | | | MEDIUM | 4,985 | 9,002 | 4,588 | 65.86 | 4,017 | 12.55 |
| | | | HIGH | 5,621 | 11,466 | 5,224 | 69.89 | 5,844 | 15.32 |

FIGURE 6.3.6

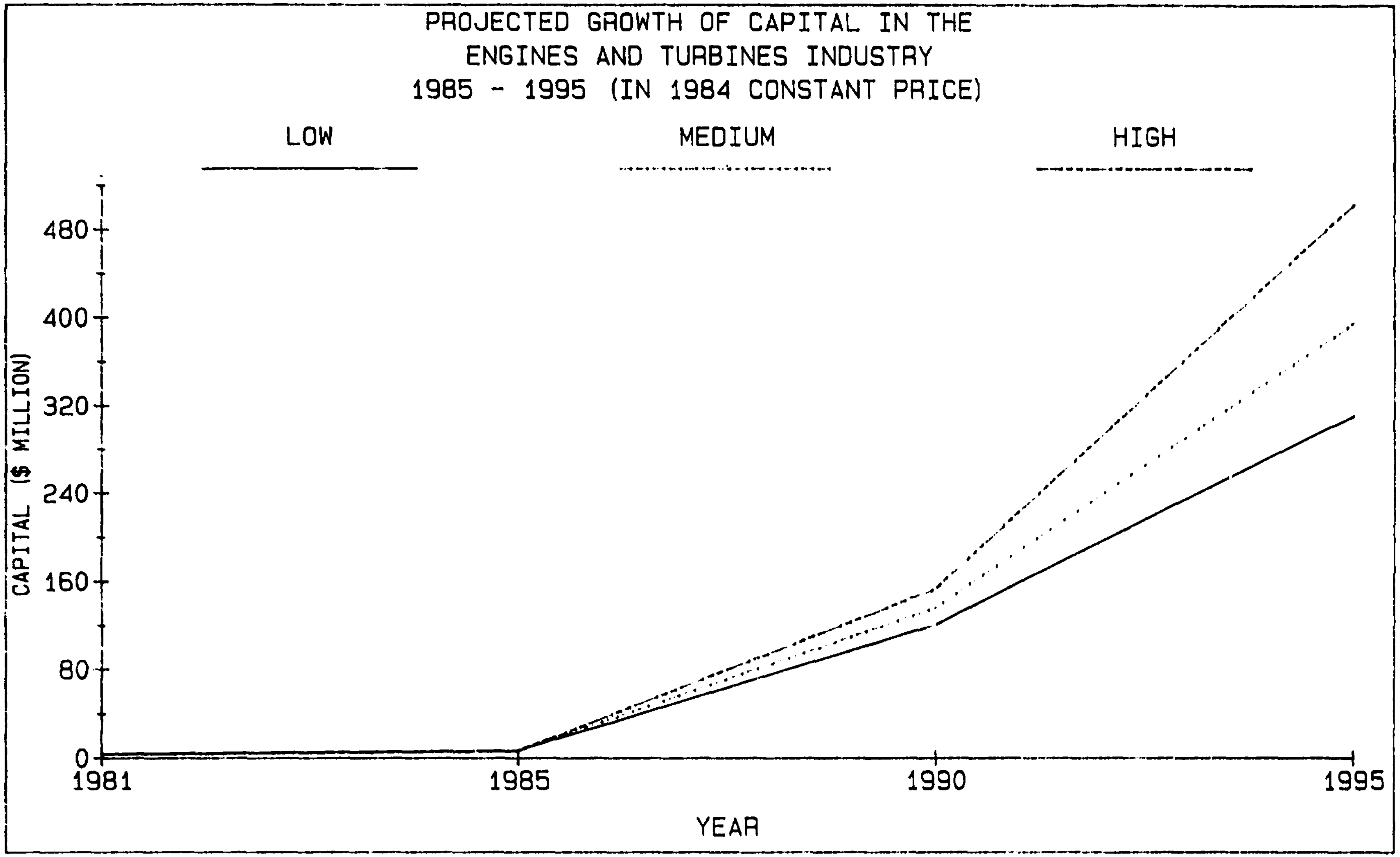
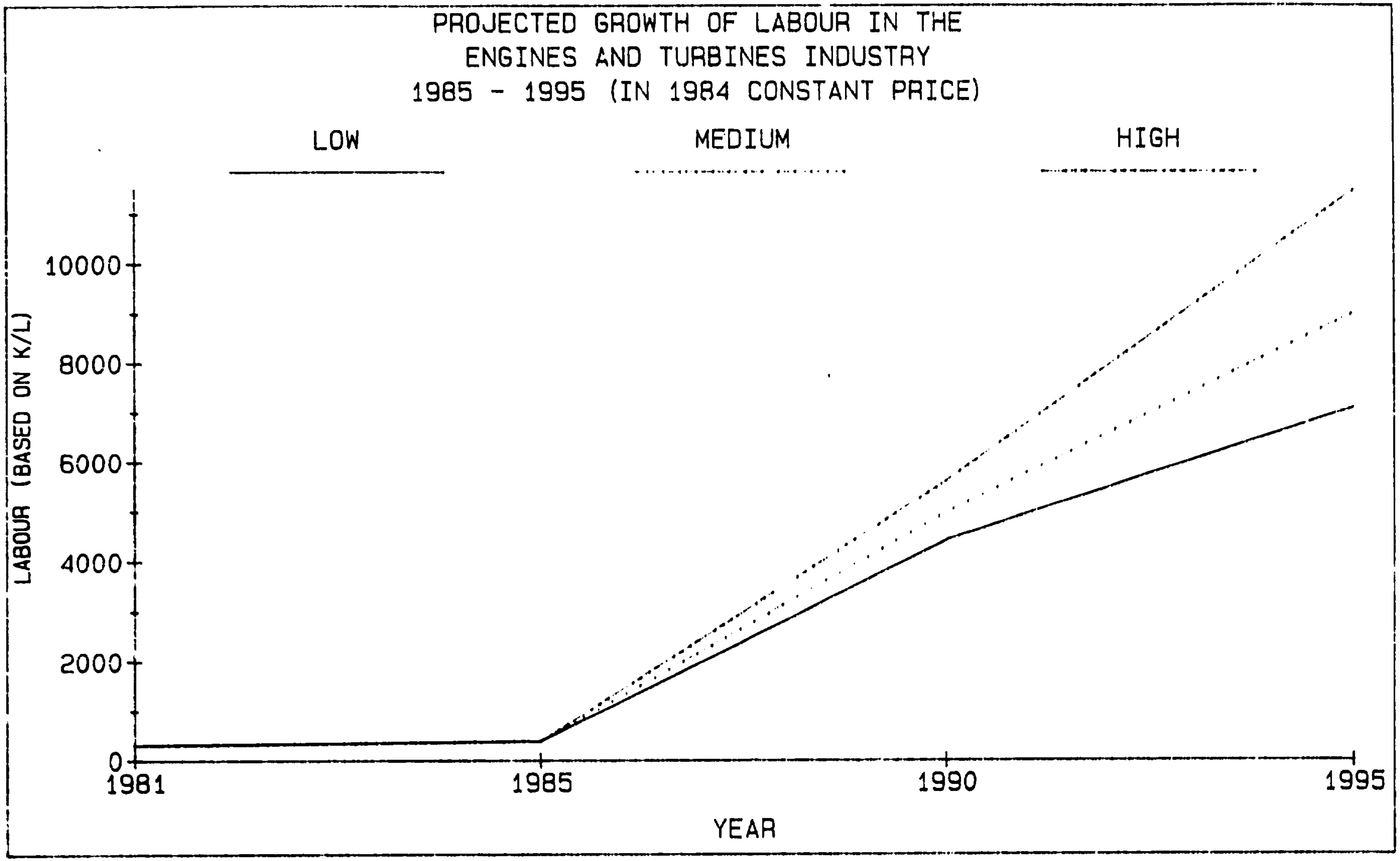

PROJECTED GROWTH OF CAPITAL IN THE
ENGINES AND TURBINES INDUSTRY
1985 - 1995 (IN 1984 CONSTANT PRICE)
LOW
MEDIUM
HIGH
CAPITAL ($ MILLION)
480
400
320
240
160
80
0
1981
1985
1990
1995
YEAR

FIGURE 6.3.7



PROJECTED GROWTH OF LABOUR IN THE
ENGINES AND TURBINES INDUSTRY
1985 - 1995 (IN 1984 CONSTANT PRICE)
LOW
MEDIUM
HIGH
LABOUR (BASED ON K/L)
10000
8000
6000
4000
2000
0
1981
1985
1990
1995
YEAR

B. <u>Agricultural Machinery and Equipment Industry</u>

Tables <u>6.3.6</u>, <u>6.3.7</u> and <u>6.3.8</u> illustrates the derivation of the projections for output, capital and employment for the agricultural machinery and equipment industry. The projections are based on the following assumptions.

- Output-labour and capital-labour are assumed to decline at 0.3% and 3.3% respectively for the period 1981 - 1985 and subsequently grow at 5% per annum during the period 1985 -1995.

- Export growth is based on past trend with 2% adjustments for high and low values.

- Targetted market share for the local produce is 70% by 1990.

As can be observed the implied growth rate is much lower than that of the engines and turbines industry. This is expected because of the relatively wider market base the agricultural machinery industry is currently enjoying. The projected production is about $0.7 billion between 1985 and 1995. The projected investments and employment generation are $97 million and 4,484 respectively.

TABLE 6.3.6

PAST GROWTH TREND OF OUTPUT, CAPITAL & EMPLOYMENT RATIOS IN AGRICULTURAL MACHINERY INDUSTRY, MALAYSIA, 1973 - 1981 (1984 PRICE)

| | 1973 | 1981 | GROWTH RATE P.A. 1973 - 1981 | GROWTH RATIO 1981-1985 | GROWTH RATIO 1985-1995 | GROWTH RATIO 1990-1995 | 1985 | 1990 | 1995 |
|---|---|---|---|---|---|---|---|---|---|
| OUTPUT (Y) ($ MILLION) | 13.0 | 79.8 | 25.50 | | | | | | |
| CAPITAL (K) ($ MILLION) | 4.0 | 19.2 | 21.70 | | | | | | |
| LABOUR (L) | 244.0 | 1535.0 | 25.80 | | | | | | |
| Y/K ($ MILLION) | 3.25 | 4.16 | 3.10 | 1.13 | 1.17 | 1.16 | 4.70 | 5.48 | 6.38 |
| Y/L ($'000) | 53.3 | 52.0 | -0.3 | 0.99 | 1.28 | 1.28 | 51.38 | 65.58 | 83.70 |
| K/L ($'000) | 16.4 | 12.5 | -3.3 | 0.87 | 1.28 | 1.28 | 10.93 | 13.95 | 17.80 |

NOTE : OUTPUT-LABOUR AND CAPITAL-LABOUR ARE ASSUMED TO DECLINE AT 0.3 % AND 3.3 % RESPECTIVELY FOR THE PERIOD 1981 - 85 AND SUBSEQUENTLY GROW AT 5 % PER ANNUM DURING THE PERIOD 1985 - 1995

TABLE 6.3.7

PROJECTED TOTAL DEMAND, PRODUCTION AND EXPORT/IMPORT OF AGRICULTURAL MACHINERY IN MALAYSIA, 1985 - 1995 ($ MILLION 1984 CONSTANT PRICE)

| | 1981 | 1985 | 1990 | | | 1995 | | |
|---|---|---|---|---|---|---|---|---|
| | | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH |
| 1) TOTAL DOMESTIC DEMAND | 164.80 | 272.50 | 501.90 | 555.20 | 610.20 | 925.30 | 1,131.80 | 1,367.30 |
| 2) TOTAL EXPORT | 3.40 | 3.70 | 3.77 | 4.17 | 4.59 | 3.85 | 4.69 | 5.69 |
| 3) TOTAL DEMAND | 168.20 | 276.20 | 505.67 | 559.37 | 614.79 | 929.15 | 1,136.49 | 1,372.99 |
| 4) IMPORT % OF DOMESTIC DEMAND | 53.60 | 53.60 | 30.00 | 30.00 | 30.00 | 30.00 | 30.00 | 30.00 |
| 5) TOTAL IMPORT | 88.33 | 146.06 | 150.57 | 166.56 | 183.06 | 277.59 | 339.54 | 410.19 |
| 6) TOTAL DOMESTIC PRODUCTION | 79.87 | 1[illegible]0.14 | 355.10 | 392.81 | 431.73 | 651.56 | 796.95 | 962.80 |

* NOTE : EXPORT GROWTH 1973 - 1981 (IN 1984 CONSTANT PRICE) = 2.4% P.A.
FUTURE EXPORT GROWTH RATES ARE ASSUMED TO BE L=0.4%, M=2.4% AND H=4.4%

FIGURE 6.3.8

PROJECTED TOTAL DEMAND AND TOTAL DOMESTIC PRODUCTION
OF AGRICULTURAL MACHINERY IN MALAYSIA,
1985 - 1995 ($ MILLION IN 1984 CONSTANT PRICE)

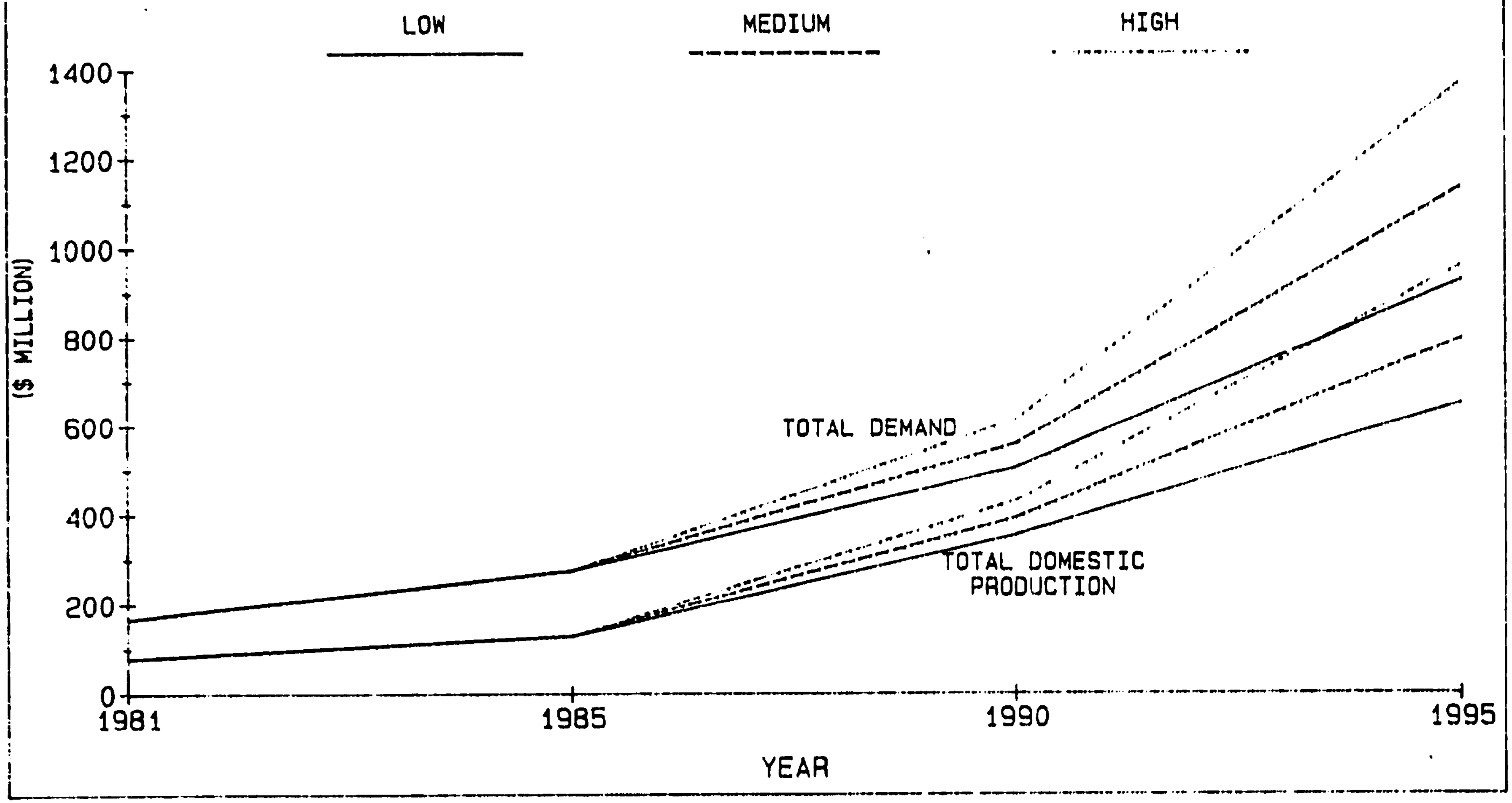


TABLE 6.3.8

PROJECTED GROWTH OF CAPITAL AND LABOUR IN THE AGRICULTURAL MACHINERY INDUSTRY, 1985 - 1995

| | 1981 | 1985 | | 1990 | 1995 | CHANGE 1985 - 1990 | IMPLIED GROWTH RATE P.A. | CHANGE 1990 - 1995 | IMPLIED GROWTH RATE P.A. |
|---|---|---|---|---|---|---|---|---|---|
| OUTPUT ($ MILLION) | 79.87 | 130.14 | LOW | 355.10 | 651.56 | 224.96 | 22.23 | 296.46 | 12.91 |
| | | | MEDIUM | 392.81 | 796.95 | 262.67 | 24.73 | 404.14 | 15.20 |
| | | | HIGH | 431.73 | 962.80 | 301.59 | 27.10 | 531.07 | 17.40 |
| CAPITAL ($ MILLION) | 19.2 | 27.69 | LOW | 64.80 | 102.13 | 37.11 | 18.54 | 37.33 | 9.53 |
| | | | MEDIUM | 71.68 | 124.91 | 43.99 | 20.95 | 53.23 | 11.75 |
| | | | HIGH | 78.78 | 150.91 | 51.09 | 23.26 | 72.13 | 13.88 |
| LABOUR (BASED ON K/L) | 1,535 | 2,533 | LOW | 4,645 | 5,738 | 2,112 | 12.89 | 1,092 | 4.31 |
| | | | MEDIUM | 5,138 | 7,017 | 2,605 | 15.19 | 1,879 | 6.43 |
| | | | HIGH | 5,647 | 8,478 | 3,114 | 17.39 | 2,830 | 8.47 |

FIGURE 6.3.9

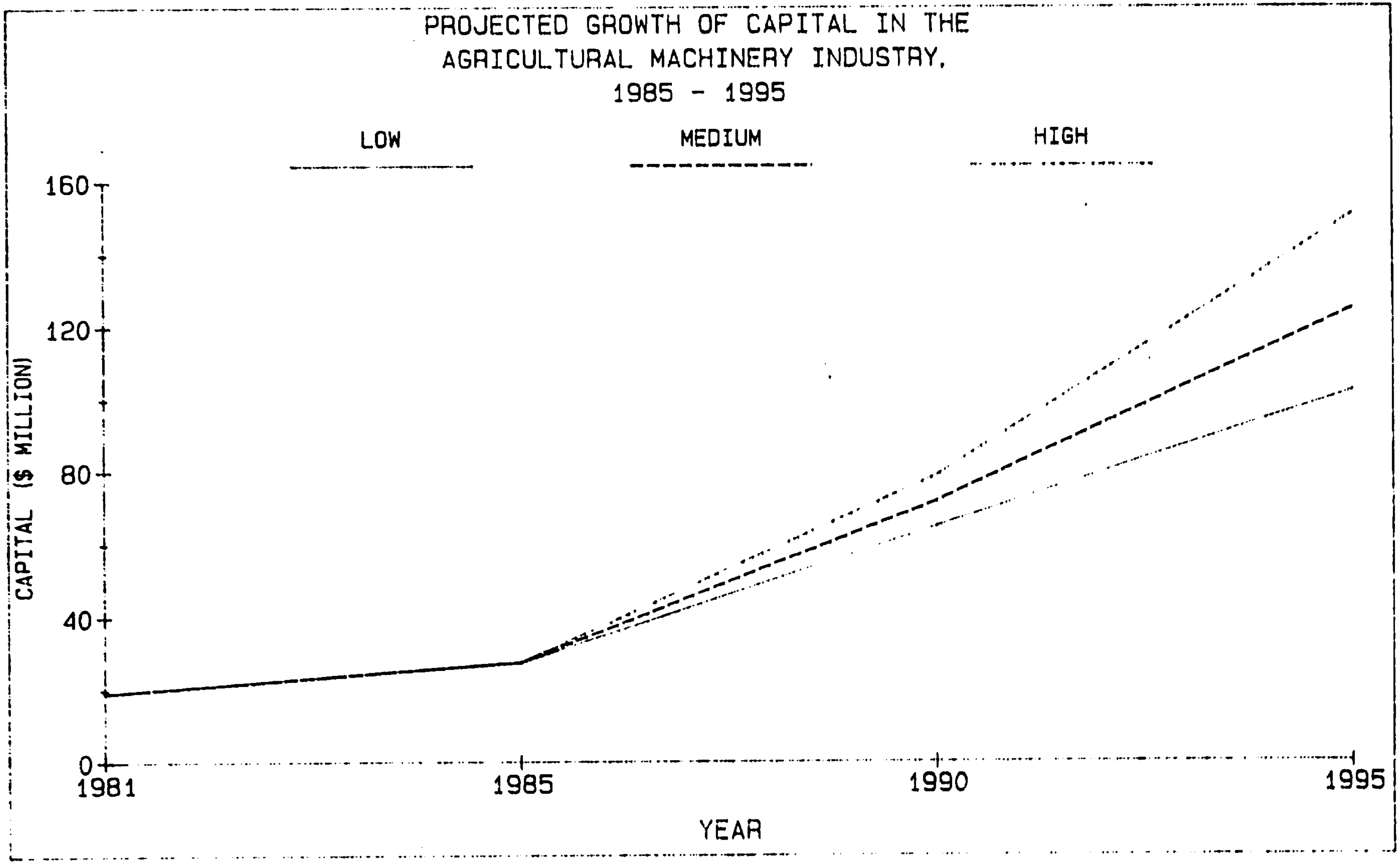
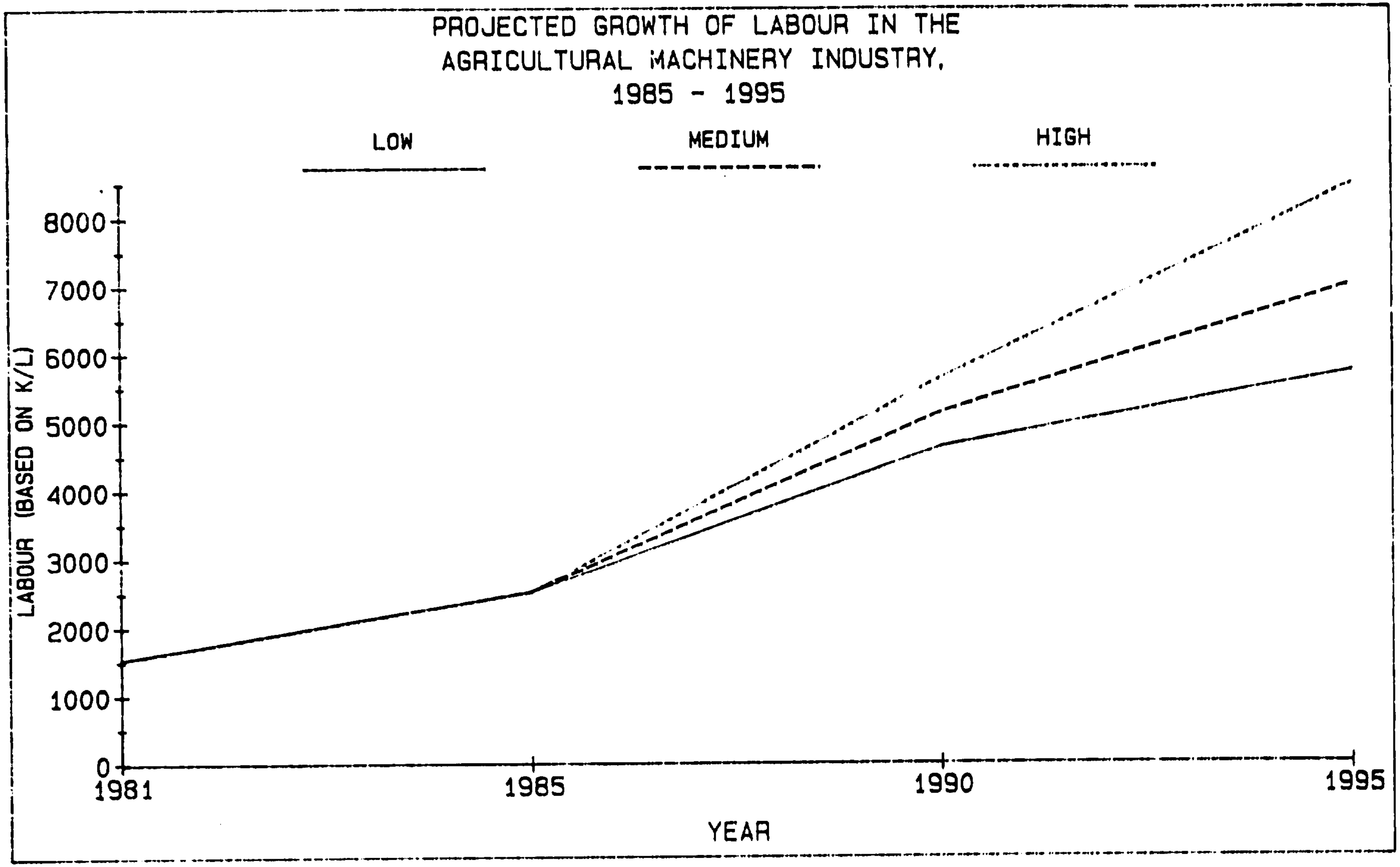

PROJECTED GROWTH OF CAPITAL IN THE
AGRICULTURAL MACHINERY INDUSTRY,
1985 - 1995
LOW
MEDIUM
HIGH
160
120
80
40
0
CAPITAL ($ MILLION)
1981
1985
1990
1995
YEAR

FIGURE 6.3.10


PROJECTED GROWTH OF LABOUR IN THE
AGRICULTURAL MACHINERY INDUSTRY,
1985 - 1995
LOW
MEDIUM
HIGH
LABOUR (BASED ON K/L)
8000
7000
6000
5000
4000
3000
2000
1000
0
1981
1985
1990
1995
YEAR

C. Metal and Woodworking Machinery Industry

Tables 6.3.9, 6.3.10 and 6.3.11 shows the derivation of the projections for output, capital and employment for the metal and wood working industry. Like the industries just discussed, several assumptions are also made in the projections.

- Output-capital ratio is assumed to declined at 12% for the period 1981-1985 and subsequently grow at 5% per annum during the period 1985-1995.

- Export growth is also based on patt trend 2% adjustment being made for high and low values.

- Market shares of local products targetted at 45% by 1990 and 70% by 1995.

The projected production is likely to be $0.66 billion; $0.23 billion in 1985 - 1990 and $0.43 billion in 1990 - 1995. The capital and manpower requirements are projected at $0.5 billion and 1,349 respectively. It should also be noted that this industry is more capital intensive than the rest of the industry. The displacement nature the production technology is shown by the projected reduction of employment in 1990-1995.

TABLE 6.3.9

PAST GROWTH TREND OF OUTPUT, CAPITAL & EMPLOYMENT RATIOS IN METAL AND WOODWORKING MACHINERY INDUSTRY
MALAYSIA, 1973 - 1981 (1984 PRICE )

| | 1973 | 1981 | GROWTH RATE P.A. | GROWTH RATIO | | | 1985 | 1990 | 1995 |
|---|---|---|---|---|---|---|---|---|---|
| | | | 1973 - 1981 | 1981-1985 | 1985-1995 | 1990-1995 | | | |
| OUTPUT (Y) ($ MILLION) | 8.2 | 20.3 | 11.99 | | | | | | |
| CAPITAL (K) ($ MILLION) | 2.3 | 15.8 | 27.24 | | | | | | |
| LABOUR (L) | 411.0 | 715.0 | 7.17 | | | | | | |
| Y/K ($ MILLION) | 3.56 | 1.28 | -12.00 | 0.60 | 1.27 | 1.28 | 0.77 | 0.98 | 1.25 |
| Y/L ($'000) | 19.95 | 28.39 | 4.51 | 1.19 | 1.24 | 1.25 | 33.87 | 42.23 | 52.65 |
| K/L ($'000) | 5.59 | 22.1 | 18.75 | 1.99 | 2.36 | 2.36 | 43.95 | 103.78 | 245.07 |

NOTE : OUTPUT-CAPITAL RATIO IS ASSUMED TO DECLINE AT 12 % FOR THE PERIOD 1981 - 85 AND SUBSEQUENTLY GROW AT 5 % PER ANNUM DURING THE PERIOD 1985 - 1995

TABLE 6.3.10

PROJECTED TOTAL DEMAND, PRODUCTION AND EXPORT/IMPORT OF METAL & WOODWORKING MACHINERY IN MALAYSIA, 1985 - 1995 ($ MILLION 1984 CONSTANT PRICE)

| | 1981 | 1985 | 1990 | | | 1995 | | |
|---|---|---|---|---|---|---|---|---|
| | | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH |
| 1) TOTAL DOMESTIC DEMAND | 211.30 | 312.70 | 503.60 | 543.80 | 586.40 | 811.00 | 945.60 | 1,099.80 |
| 2) TOTAL EXPORT | 5.76 | 9.26 | 15.32 | 16.76 | 18.30 | 25.36 | 30.34 | 36.18 |
| 3) TOTAL DEMAND | 217.06 | 321.96 | 518.92 | 560.56 | 604.70 | 836.36 | 975.94 | 1,135.98 |
| 4) IMPORT % OF DOMESTIC DEMAND | 93.10 | 93.10 | 55.00 | 55.00 | 55.00 | 30.00 | 30.00 | 30.00 |
| 5) TOTAL IMPORT | 196.72 | 291.12 | 276.98 | 299.09 | 322.52 | 243.30 | 283.68 | 329.94 |
| 6) TOTAL DOMESTIC PRODUCTION | 20.34 | 30.84 | 241.94 | 261.47 | 282.18 | 593.06 | 692.26 | 806.04 |

* NOTE : EXPORT GROWTH 1973 - 1981 (IN 1984 CONSTANT PRICE) = 12.6% P.A.
FUTURE EXPORT GROWTH RATES ARE ASSUMED TO BE L=10.6%, M=12.6% AND H=14.6%

FIGURE 6.3.11

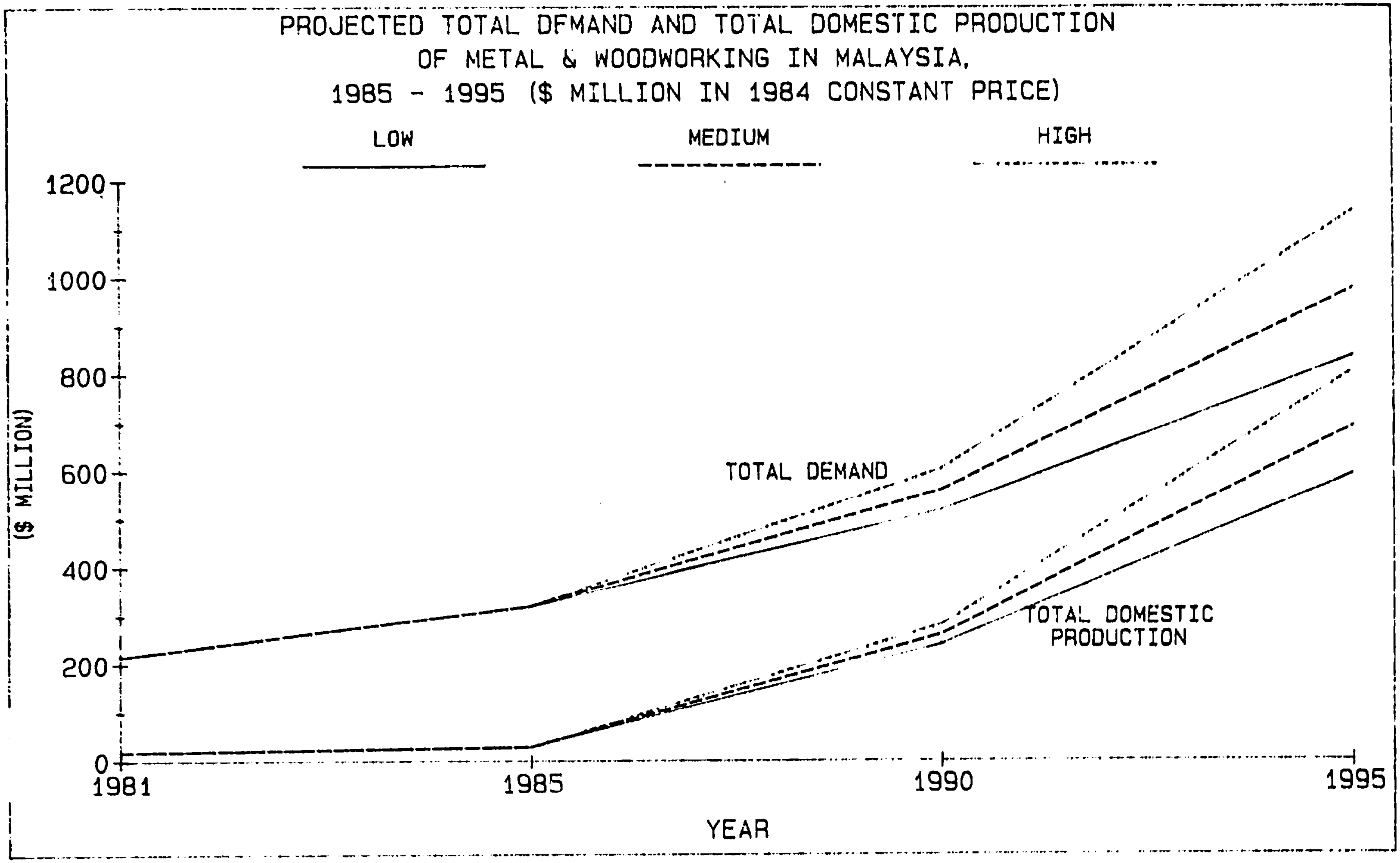

PROJECTED TOTAL DFMAND AND TOTAL DOMESTIC PRODUCTION
OF METAL & WOODWORKING IN MALAYSIA,
1985 - 1995 ($ MILLION IN 1984 CONSTANT PRICE)
LOW
MEDIUM
HIGH
($ MILLION)
1200
1000
800
600
400
200
0
TOTAL DEMAND
TOTAL DOMESTIC
PRODUCTION
1981
1985
1990
1995
YEAR

TABLE 6.3.11

PROJECTED GROWTH OF CAPITAL AND LABOUR IN THE METAL AND WOODWORKING MACHINERY, 1985 - 1995

| | 1981 | 1985 | | 1990 | 1995 | CHANGE 1985 - 1990 | IMPLIED GROWTH RATE P.A. | CHANGE 1990 - 1995 | IMPLIED GROWTH RATE P.A. |
|---|---|---|---|---|---|---|---|---|---|
| OUTPUT ($ MILLION) | 20.34 | 30.84 | LOW | 241.94 | 593.06 | 211.10 | 50.98 | 351.12 | 19.64 |
| | | | MEDIUM | 261.47 | 692.26 | 230.63 | 53.34 | 430.79 | 21.50 |
| | | | HIGH | 282.18 | 806.04 | 251.34 | 55.70 | 523.86 | 23.36 |
| CAPITAL ($ MILLION) | 15.8 | 40.05 | LOW | 246.88 | 474.45 | 206.83 | 43.87 | 227.57 | 13.96 |
| | | | MEDIUM | 266.81 | 553.81 | 226.76 | 46.12 | 287.00 | 15.73 |
| | | | HIGH | 287.94 | 644.83 | 247.89 | 48.37 | 356.89 | 17.50 |
| LABOUR (BASED ON K/L) | 715.0 | 911 | LOW | 2,379 | 1,936 | 1,468 | 21.16 | -442 | -4.03 |
| | | | MEDIUM | 2,571 | 2,260 | 1,660 | 23.05 | -311 | -2.54 |
| | | | HIGH | 2,775 | 2,631 | 1,863 | 24.94 | -143 | -1.06 |

FIGURE 6.3.12

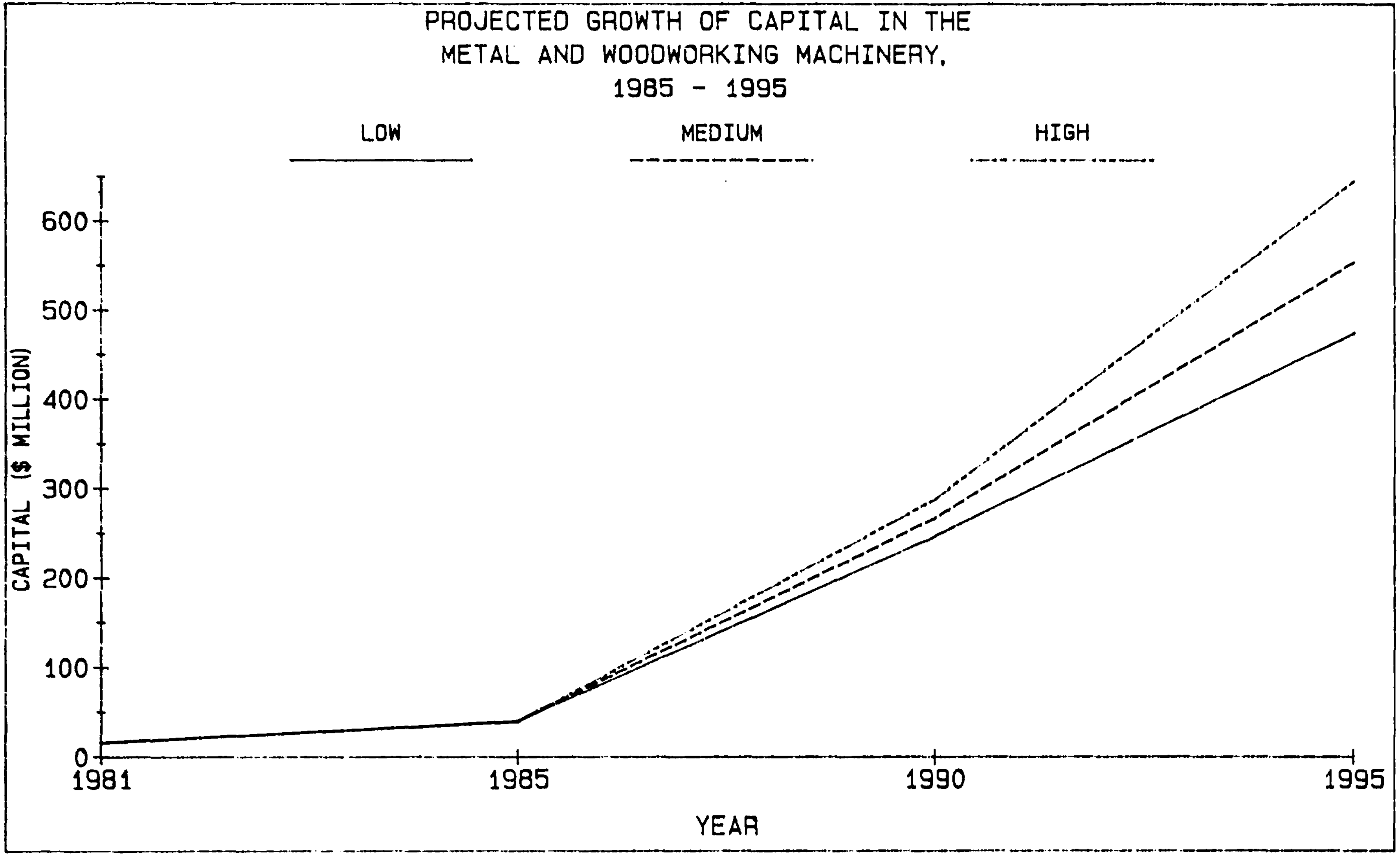
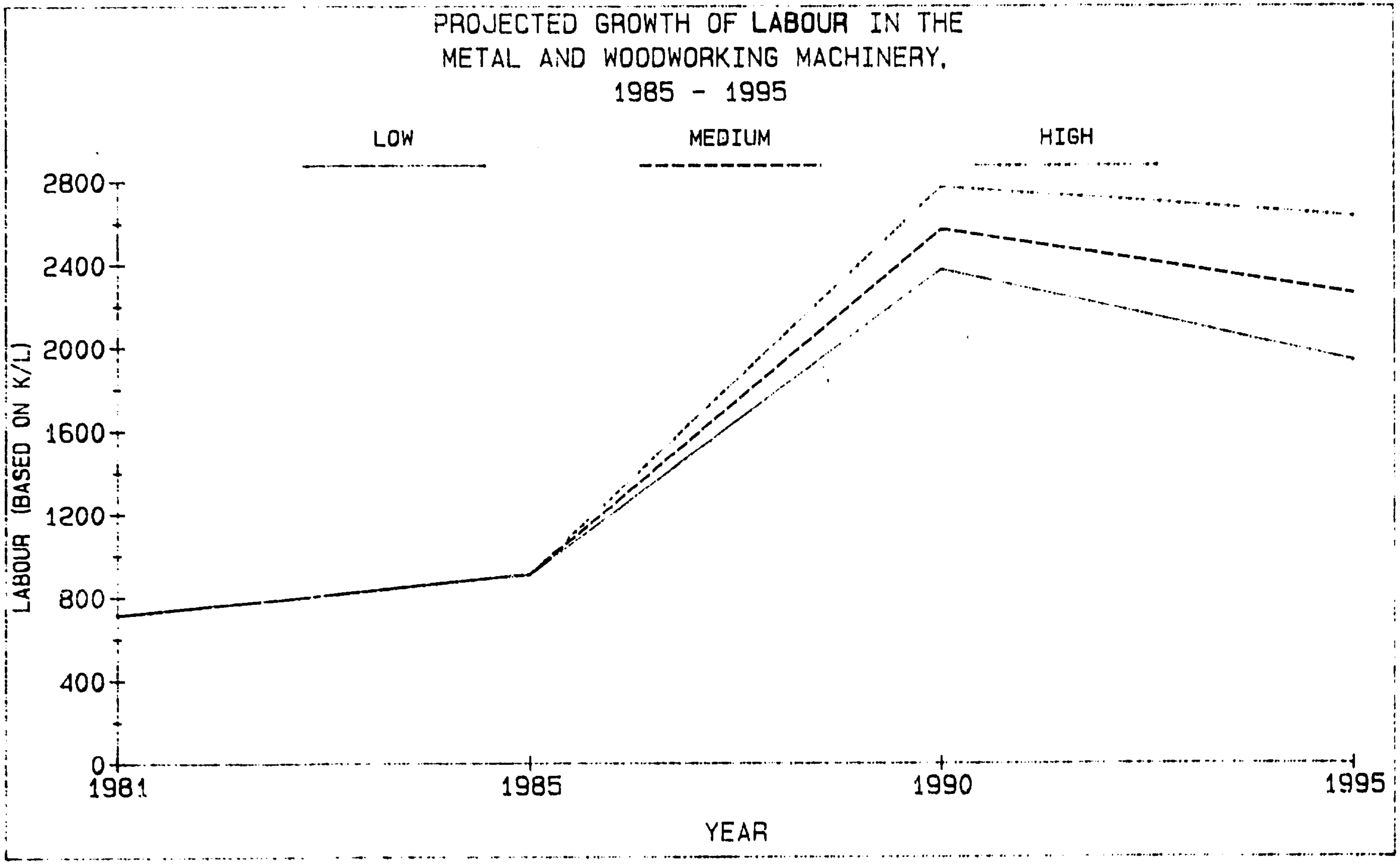

PROJECTED GROWTH OF CAPITAL IN THE
METAL AND WOODWORKING MACHINERY,
1985 - 1995
LOW
MEDIUM
HIGH
CAPITAL ($ MILLION)
0
100
200
300
400
500
600
1981
1985
1990
1995
YEAR

FIGURE 6.3.13


PROJECTED GROWTH OF LABOUR IN THE
METAL AND WOODWORKING MACHINERY,
1985 - 1995
LOW
MEDIUM
HIGH
LABOUR (BASED ON K/L)
2800
2400
2000
1600
1200
800
400
0
1981
1985
1990
1995
YEAR

D. Material handling machinery And Equipment Industry

Tables 6.3.12 and 6.3.13 illustrates the derivation of the projections for output, capital and employment for the material handling machinery industry. As usual, certain assumptions are made.

- Output-capital and capital-labour ratios are assumed to reflect those ratios found in the overall sector. This is because there is no data for material handling machinery industry.

- Export growth is based on past trend and there is 2% adjustment for high and low values.

- Targetted market shares of local products are 30% by 1990 and 50% by 1995. These targets are slightly lower than all the other industries. This is basically because of the fact that there is no existing manufacturing activity. Hence, less "ambitious" targets are set.

As can be observed, a total investment of about $71 million is required for 1985 - 1995 to build up the industry. About $34 million is required to be invested in first five years. The required manpower is projected at 3,256; slightly less than 2/3 of these manpower is required within the first 5 years. The projected production for 1985-1995 is about $0.37 billion.

TABLE 6.3.12

PROJECTED TOTAL DEMAND, PRODUCTION AND EXPORT/IMPORT OF MATERIAL HANDLING MACHINERY AND EQUIPMENT IN MALAYSIA, 1985 - 1995 ($ MILLION 1984 CONSTANT PRICE)

| | 1981 | 1985 | 1990 | | | 1995 | | |
|---|---|---|---|---|---|---|---|---|
| | | | LOW | MEDIUM | HIGH | LOW | MEDIUM | HIGH |
| 1) TOTAL DOMESTIC DEMAND | 178.90 | 256.30 | 396.20 | 426.00 | 449.70 | 612.30 | 708.20 | 788.80 |
| 2) TOTAL EXPORT | 7.99 * | 9.86 * | 11.65 | 12.83 | 14.09 | 13.77 | 16.68 | 20.13 |
| 3) TOTAL DEMAND | 178.90 | 256.30 | 407.85 | 438.83 | 463.79 | 626.07 | 724.88 | 808.93 |
| 4) IMPORT % OF DOMESTIC DEMAND | 100.00 | 100.00 | 70.00 | 70.00 | 70.00 | 50.00 | 50.00 | 50.00 |
| 5) TOTAL IMPORT | 178.90 | 256.30 | 277.34 | 298.20 | 314.79 | 306.15 | 306.15 | 394.40 |
| 6) TOTAL DOMESTIC PRODUCTION | 0.00 | 0.00 | 130.51 | 140.63 | 149.00 | 319.92 | 370.78 | 414.53 |

NOTE : EXPORT GROWTH 1973 - 1981 (IN 1984 CONSTANT PRICE) = 5.4% P.A.
FUTURE EXPORT GROWTH RATES ARE ASSUMED TO BE L=3.4%, M=5.4% AND H=7.4%

* RE-EXPORTS OF IMPORTS

FIGURE 6.3.14

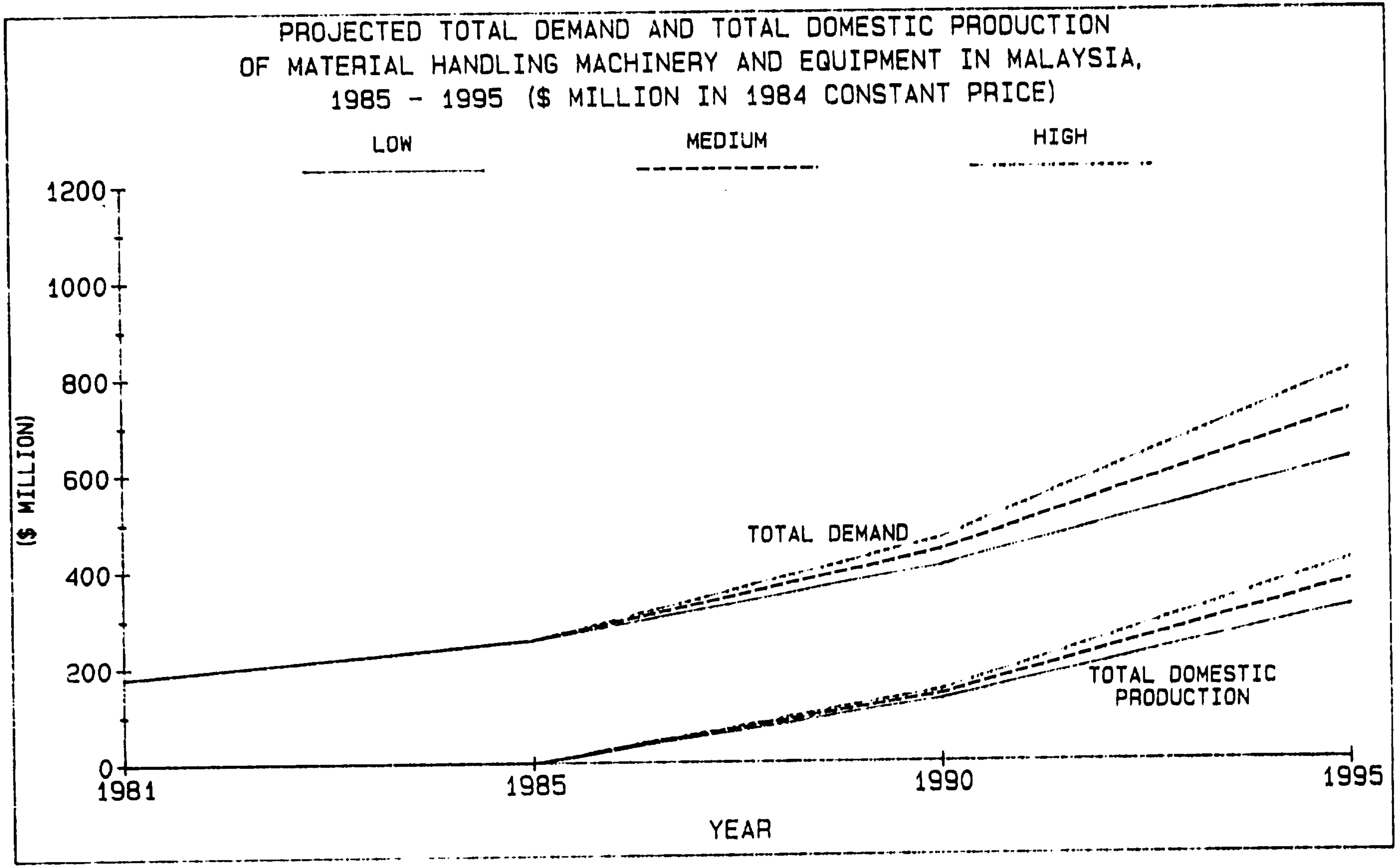

PROJECTED TOTAL DEMAND AND TOTAL DOMESTIC PRODUCTION
OF MATERIAL HANDLING MACHINERY AND EQUIPMENT IN MALAYSIA,
1985 - 1995 ($ MILLION IN 1984 CONSTANT PRICE)
LOW
MEDIUM
HIGH
1200
1000
800
600
400
200
0
($ MILLION)
TOTAL DEMAND
TOTAL DOMESTIC
PRODUCTION
1981
1985
1990
1995
YEAR

TABLE 6.3.13

PROJECTED GROWTH OF CAPITAL AND LABOUR IN THE MATERIAL HANDLING MACHINERY INDUSTRY, 1985 - 1995

| | 1981 | 1985 | | 1990 | 1995 | CHANGE 1985 - 1990 | IMPLIED GROWTH RATE P.A. | CHANGE 1990 - 1995 | IMPLIED GROWTH RATE P.A. |
|---|---|---|---|---|---|---|---|---|---|
| OUTPUT | 0 | 0 | LOW | 130.51 | 319.92 | 130.51 | - | 189.41 | 19.6 |
| ($ MILLION) | | | MEDIUM | 140.63 | 370.78 | 140.63 | - | 230.15 | 21.4 |
| | | | HIGH | 149.00 | 414.53 | 149.00 | - | 265.53 | 22.7 |
| CAPITAL | 0 | 0 | LOW | 31.83 | 61.52 | 31.83 | - | 29.69 | 14.1 |
| ($ MILLION) | | | MEDIUM | 34.30 | 71.30 | 34.30 | - | 37.00 | 15.8 |
| | | | HIGH | 36.34 | 79.72 | 36.34 | - | 43.38 | 17.0 |
| LABOUR | 0 | 0 | LOW | 1906 | 2509 | 1906 | - | 903 | 8.1 |
| (BASED ON K/L) | | | MEDIUM | 2054 | 3256 | 2054 | - | 1202 | 9.7 |
| | | | HIGH | 2176 | 3640 | 2176 | - | 1464 | 10.8 |

FIGURE 6.3.15

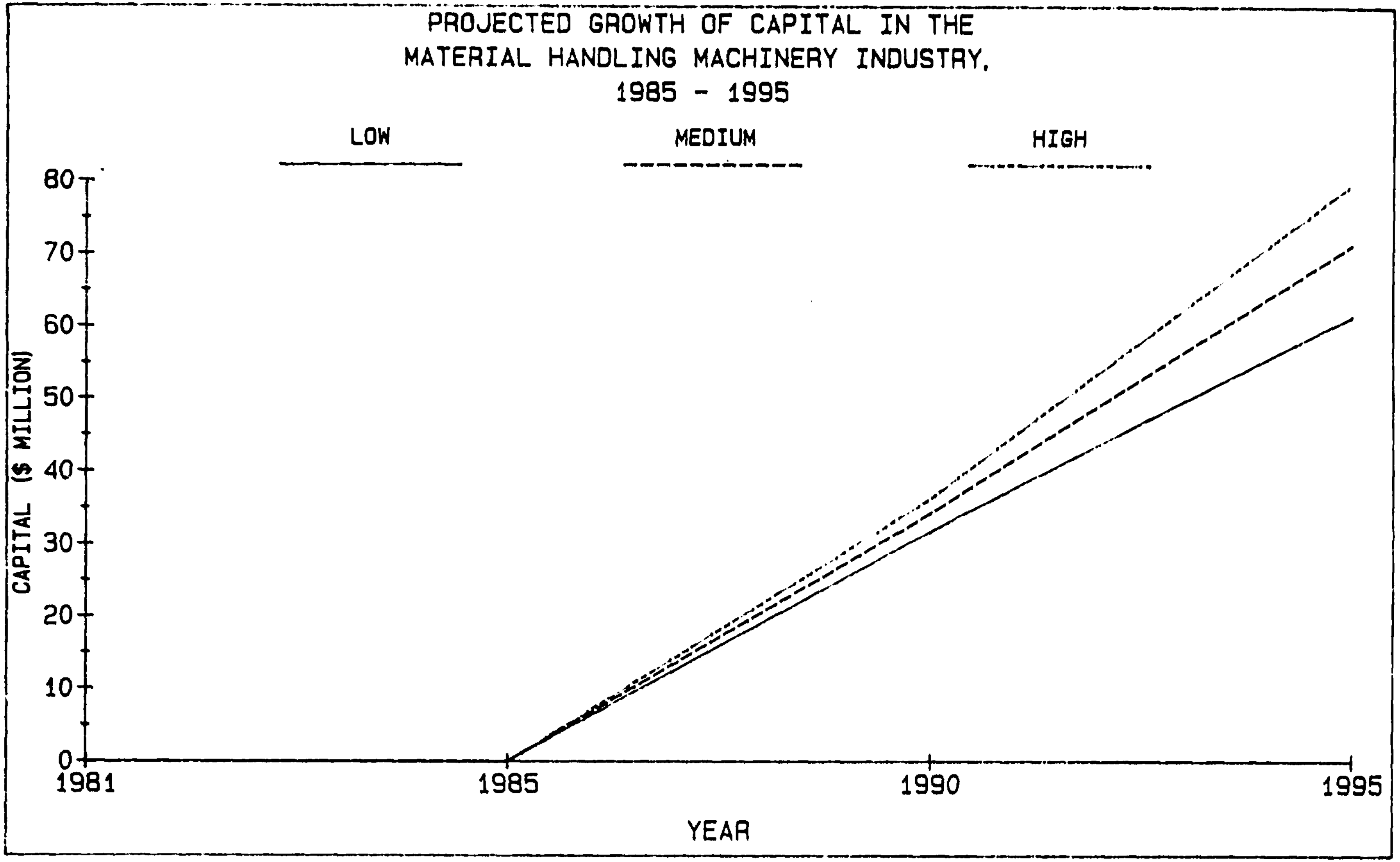
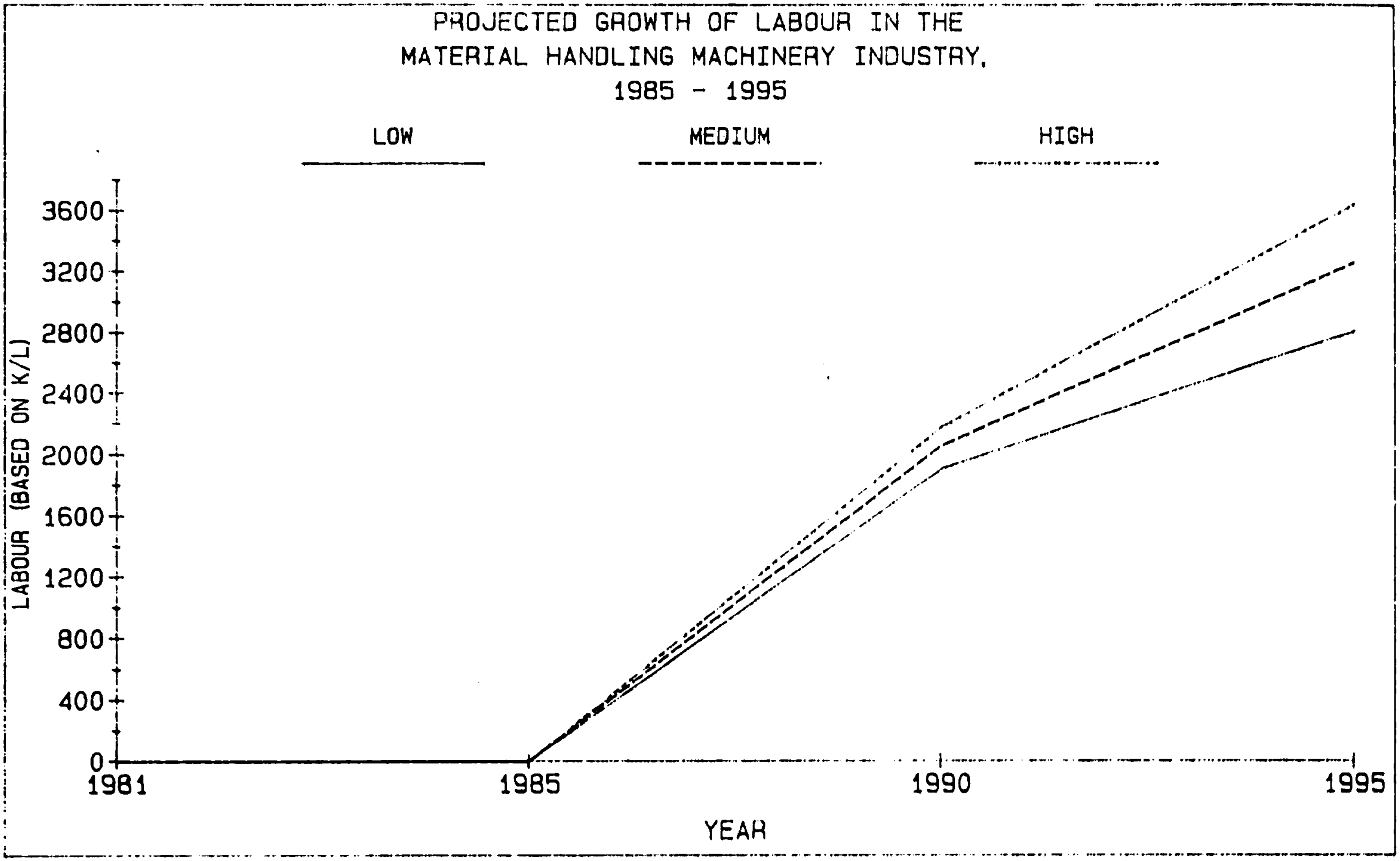

PROJECTED GROWTH OF CAPITAL IN THE
MATERIAL HANDLING MACHINERY INDUSTRY,
1985 - 1995
LOW
MEDIUM
HIGH
CAPITAL ($ MILLION)
80
70
60
50
40
30
20
10
0
1981
1985
1990
1995
YEAR

FIGURE 6.3.16


PROJECTED GROWTH OF LABOUR IN THE
MATERIAL HANDLING MACHINERY INDUSTRY,
1985 - 1995
LOW
MEDIUM
HIGH
LABOUR (BASED ON K/L)
3600
3200
2800
2400
2000
1600
1200
800
400
0
1981
1985
1990
1995
YEAR

## 6.4 Investments Planning Issues

### 6.4.1 Indicative Targets

The summary of projections given above merely serves as rough guides for the amount of investments required to ensure that the total supply of machinery will be able to meet the future domestic demand. These are not definitive targets. With the recent emphasis on privatisation in natural development, it is essential to strike a realistic combination of private and public investment programmes.

### 6.4.2 Restructuring Equity Participation

With the expected greater investments in the machinery sector, it also opened up more room for bumiputra and local participation. Moreover, given the low level of foreign participation, it is recommended that they should also supplement the investments requirements needed. However, while doing so, it should also be bore in mind that the increase in foreign participation should also be accompanied by more effective technology know-how transfer. This is particularly applicable to the transfer of more efficient production technology and research and development activities.

### 6.4.3 Infrastructure Investments

Effectively, when discussing about the location of machinery producing factories, it should be pointed out that it is essential for the companies to be located at developed areas. The developed urban centers are the most likely candidates as they are well served with the necessary infrastructure (e.g. telecommunication, commercial institution, educational centers providing skill labour, transport network etc.). In addition, to infrastructure economies, the urban centre is where skilled labour is found. Hence, the machinery companies should be treated as a particular exception to the general rule of industries relocation.

In addition, the technological infrastructure needs to be developed and expanded to provide the necessary backup for the further development of the machinery sector. Investments in this area is essential. For a discussion of the technological infrastructure of the machinery sector, please refer to Technology section. Detail policy recommendations in this area are found in the next section.

# PART VII POLICIES AND PROGRAMMES

## PART VII POLICIES AND PROGRAMMES

### 7.1 Introduction

The objective of this section is to translate the strategies and investment plans of Sections V and VI and the problems and issues identified in Section III into policies and programmes.

The policies and programmes are for the NEM sector in general and, where possible, specific policies and programmes are indentified for the machine tool industry.

To facilitate presentation, the policies are grouped under functional purposes like financial incentives, export promoting measures, etc. However, it should be noted that some of the recommentations and incentives have overlaping functions.

### 7.2 Specific Policy and Programme Recommendation

#### 7.2.1 Policies And Programmes For Skilled Manpower Development

A major problem indentified in Section 3.10 is the shortage of trained, skilled workmen. This is particularly true of machining, and tool and die making skill. This is a critical obstacle to the development of the machinery industry. In addition, the shortage of a pool of "entrepreneur engineers" in the tradition of the machine tool industry of developed economies has greatly hampered the capacity of the industry to raise quality standards.

In view of the pervasiveness of this problem in the manufacturing sector, we recommend the following programmes for adoption in the machinery industry as well as for national manpower development

a) <u>Skill Development Fund</u>

We recommend this fund be established on a national level for the development of machining skills. Owing to the machinery sector's inability to finance (or for that matter other manufacturing sectors) training of manpower on its own,a research cess should be introduced in the manufacturing sector. Grants from this Fund are to be used for training courses, skill enchancement courses, "teaching machinery" especially for "reverse" engineering and other training facilities.

We further recommend that tax exemptions be given to contributions from private sectors towards this fund.

b) Establishment Of Machine Tool Skill Training Eoard

Currently, there are 3 training institutes under the management of the Industrial Training Division, 32 vocational schools and 9 technological schools under the Ministry Of Education, and 9 more vocational training institutes managed by Mara. Another 5 institutes are proposed over the next 4 to 5 years.

There are two Boards supervising the development of the industrial sector; the National Industrial Training and Trade Certification Board (NITTCB) and the Central Apprenticeship Board (CAB). Presently, the functions and objectives of these two boards are too wide to meet the requirements of the machinery industry.

As the development of skilled labour is crucial to the machinery sector, we recommend a Machine Tool Skill Training Board which formulates comprehensive training programmes involving all the vocational institutes and the Metal Working Industrial Technology Centre.

c) <u>Expanding The Role Of The Metal Industrial Technology Centre (MITEC)</u>

The function of MITEC is the operating arm to the Machine Tool Skill Training Board. It is operated as an institution for industrial education, research, and design. The institute should also be instrumental in spearheading R & D projects, establishment of a metal working data bank and also assist to assist firms in product and design development. This institute can play a role similar to the Rubber Research Institute, Malaysia.

d) <u>Develop The Research Base In Engineering Faculty In The Universities.</u>

The three proposals above should be closely linked to the Mechanical Engineering Faculty of all the institutes of higher learning. At present, there is no engineering research base in these faculties. Unless this is rectified, the productiveness of the local mechanical engineer graduates vis-a-vis the development of the machine building capability in the country will remain zero. This will also entail the restructuring of the engineering curriculum which is oriented towards project management.

e) <u>Increasing Intake Of Mechanical Engineers</u>

Historically the outflow of British engineers during the post-independence period from JKR and Keretapi Tanah Melayu (KTM) was replaced by local graduates. Tin mining and later the oil palm industry also took in mechanical engineers produced by the local institutions which produced about 400 enginners from the 4 main enginnering disclipines. By mid-1970s, the boom in the construction sector further attracted a large number of mechanical enginners.

Since the immediate post-war period, the engineering sector has remained undeveloped. This is especially true for the machine tool industry.

A sufficient large number of mechanical enginners must be produced so that the spill-over from the traditional sectors can be absorbed into the machinery industry. Thus we reccommend increasing the output of mechanical engineers from training institutions. Moreover, mechanical engineers in the public sector should be directed to perform engineering reseach work. As mentioned above, the present educational orientation of mechanical engineers towards the management and administrative field is unhealthy.

f) Industrial Training

The output of skilled personnels can also be pursued by sending personnels for overseas training. This can be done via bilateral inter-govermental aid whereby local personnels can be sent abroad for a period of one or more years to acquire advance training in firms overseas. For subsidiaries of foreign company, a legislation should be introduced requiring the company to send local employees for overseas training.

At the local level, undergraduates in the engineering field should be given industrial training as part of the educational curriculum.

### 7.2.2 Policies For Rationalisation And Modernization Of The Machinery Sector

a) Estabilishmentof Minimum Standards by Legislature

Another crucial weakness of the machinery sector is the lack of uniform quality product standards. Quality control is not up to the high standards set by international organisations and multinational consumers. Generally, more sophisticated quality control equipment need to be employed.

To improve the international acceptance and competitiveness of the machinery sector we recommend the establishment of Minimum Standards by Legislature.

Current legislature as embodied in the Trade Description Act is too broad to be effective in quality control. Heavy penalties are recommended to be imposed an manufacturers not conforming to the specifications as printed in their catalogues. An example is the withdrawal of incentives for firms not complying to specifications.

The minimum standard requirements should minimally cover the ability of the manufactured machinery products to meet the specifications stipulated in the sales product brochures.

b) <u>Establishment Of A Machinery Leasing Institution</u>

Besides imposing minimum standards, another programme for modernization is by assisting firms in the industry to upgrade their plant and equipment. This world entail purchasing new and modern machinery. To assist the industry, we recommend the establishement of a joint-venture machinery leasing organisation comprising of banks, leasing companies, financial institutions as well as machinery manufacturing associations. This machinery leasing institution specialises in machinery equipment and other priority machinery products.

It will have the following objectives :-

i. To assist small and medium size manufacturing business to expand and modernize their production process and products.

ii. Provision of "soft loans" to enable small manufacturing business to upgrade their production, quality control machinery to higher technology, modern and safe machinery especially for products/industries where economies of scale are not important

iii. Formation of a pool of machinery consultancy experts who can provide management advice and financial consultation to the machinery sector.

c) <u>Encourage Joint-Venture And Mergers Among Small firms And Medium/Large firms for Priority Products Where Economies Of Scale Are important</u>

At present the industry is characterised by many firms which do not enjoy economies of scale. This stage of development was also experienced by Japan and Taiwan as discussed in Section V. One of the first measures adopted by these countries was the rationalisation of the industry. Adopting the same stragtegy we recommend the following programmes to encourage mergers and joint-ventures to bring about rationalisation.

i) Development Income Exemption

If as a result of the mergers, the restructured company meets government stipulations of economies of scale and other production criteria, a tax exemption of 20% of the total taxable income for 5 years(begining from the date of the merger) will be granted.

ii) Machinery Proceeds Exemption

All proceeds resulting from sale of machinery and equipment previously used by the restructured company shall be tax exempted provided the full proceeds are used to pay for modern machinery and equipment, provided the sale and acquisition of machinery and equipment are implemented within 1 1/2 years commencing from the date of the merger.

iii) Exemption On Expenses

Legal expenses, and other incidental expenditures incurred for the mergers are exempted from stamp duties and other taxes.

d) <u>Accelerated Depreciation On New Machinery</u>

All modern, particularly automated, machinery that are purchased by firms in this industry should be granted accelerated depreciation.

We further recommend accelerated depreciation to be granted at 3 levels :

i) For purchase of <u>locally made</u> machinery, accelerated depreciation is allowed over 2 years for machinery and equipment with service life of over 2 years.

ii) Purchase of <u>Imported Machinery</u> Which Are <u>Not made Locally</u>

Acelerated depreciation allowed 2 years for machinery and equipment with service life of over 2 years

iii) Purchase of <u>Imported Machinery</u> which are <u>Produced Locally</u>

Accelerated depreciation is allowed over 5 years for machinery and equipment with service life of over 2 years.

e) <u>Reserve For Purchase Of New Machinery</u>

To further enlarge the machinery sector's capacity for orderly rationalisation and modernization, we also recommend that a reserve be set aside from accelerated depreciation of machinery against future new purchase of modern machinery.

### 7.2.3 Policies And Programmes To Expand The Domestic Market

Domestic demand is dependant on imports. Thus loss of revenue from this sector provides a justification for its development. Other reasons which argue for development are the benefits accuring from the transfer of technology for the machinery sector.

The machinery industry should thus be developed to support the automotive industry as comparative experiences in Korea and Taiwan have shown the close links between the 2 industries. Even in developed economies like Germany, England and Japan, the machinery industry is traditionally dependent on the motor-car industry and the construction industry.

To develop this industry, we recommend that the local domestic market be expanded for local manufacturers and to achieve this policy we recommend the following programmes:-

a) Quota restrictions be imposed on imports of machinery which are locally manufactured. The specific quota restrictions are :-

| Industry | Target Share Of Local Products As % Of Domestic Market | | |
|---|---|---|---|
| | 1985-86 | 1987-90 | 1991-95 |
| Metal & Wood Working Machinery | 20 | 45 | 70 |
| Agri.Machinery and Equipment | 60 | 70 | 70 |
| Engines & Turbines | 20 | 45 | 70 |
| Material Handling Equipment | 10 | 30 | 50 |

### 7.2.4 Policies And Programmes for Export Promotion

This sector is very weak in the area of export promotion. There isno effective marketing programme. Few Malaysian firms are knowledgeable about the international market. Export promotion is a prime objective of our industrialization policy. To achieve this, we recommend the following programmes to promote export from the machinery industry.

a) <u>Accelerated Export Depreciation</u>

Accelerated export depreciation on capital investment which are used to generate exports. The degree of depreciation will depend on the plant and machinery devoted to exports. For instance, a firm venturing for exports is allowed accelerated export depreciation of 30% of its machinery if 30% of output is exported for the year.

b) <u>Export Income Deduction</u>

Income generated by exports are exempted from tax for a period of 3 years. Hence a firm exporting 30% of its output is encouraged to be more export competitive.

c) <u>Export Market Development Reserve</u>

A small proportion of the current income from exports which are tax exempted shall be set aside as reserve against export losses. This measure seeks to buffer the smaller firms against initial export losses and provides resilience to firms in the international market.

d) <u>Accelerated Depreciation On Capital Investment For Overseas Offices Of Exporting Firms</u>

This is similar to the export accelerated depreciation above but this measure is to encourage firms to establish new trading bases overseas. An initial 40% write-off is recommended for the 1st year while the rest is written off over the next 2 years.

e) Overseas Investment Loss Reserve

A small portion of the accelerated depreciation for overseas offices is recommended to be set aside as reserves against possible export losses. This reserve has the same objective as the Export Market Development Reserve recommended earlier.

f) Government/Mida Sponsored Export Promotion Missions

The government is recommended to organise and sponsor export missions for priority products. Export missions could also incorporate educational visits to technically advanced foreign plants. Efforts in terms of promotional activity need to be boosted and re-enforced. There should be stronger links and cooperation between the various relevant institutions like Industry and Trade Associations, Productivity Councils, Promotional Boards and the like to orientate their activities towards industrial promotion.

g) Establishment Of The Association Of Metal Working Industries

The enforcement and implementation of a minimium set of quality product standards for the industry or the manufacturing sector is a formidable task. The failure of SIRIM to solve this problem is indicative of its magnitude. Though legislature has been recommended as an enforcement method, it can be a cumbersome and time-consuming process. Nonetheless, it will be a definitive step towards greater product competitiveness in the world market.

What is required is a self-regulating system. To achieve this, we recommend the establishment of a Joint Private Government Quality Control Board to regulate quality control standards. The Board will also include, besides local repreentation, expert representatives from interntional organisations and multinational companies.

The functions of the Board are:

i) To establish an inspectorate which will evaluate all firms in the industry for dnustry for membership, based on an accreditation system to be set up. As establishment which meets the quality requirements of the association is registered as a fully acreditated member or as a partially accreditated member until such time the establishment raises its standards in line with that of the Board. All fully accrediated members are required to display their membership on the registered name and trademark. Renewal of membership is on a 5 yearly basis which is again based on the existing quality control standards of the member.

ii) To provide member firms of the Board with special loans for upgrading machinery and the provision of end-financing to end-users of locally manufactured products by the Machinery Leasing Association suggested earlier.

Thus it would be to the interest of a firm in the metal working industry to become an accreditated member of the Board.

iii) To disseminate information, new R&D, new designs and new technology techniques to the industry.

iv) To act as watchdog for quality production standards of its members and to apply pressure on errant members which maintain slip-shod standards of production.

v) To set up a data bank for the industry.

vi) To provide a forum for the government and the private sector.

vii) To lobby for the interest of the industry at the international level.

h) <u>At present, we recommend the targets for export growth be based upon previous trend</u> They are as follows:

| Industry | Export Growth Rate | Exports ($ millions) 1990 | 1995 |
|---|---|---|---|
| Engines and Turbines | 3.8% | 3.72 | 4.48 |
| Agricultural Machinery | 2.4% | 4.17 | 4.69 |
| Metal and Wood Working Machinery | 12.6% | 16.76 | 30.34 |
| Material Handling Machinery | 5.4% | 12.83 | 16.68 |

### 7.2.5 Policies And Programmes for R & D

Research, development and experimental expenses used for improving technology, developing new products shall be tax exempted. A major focus for innovations will involve the simplication of product designs of imported machinery which allows more extensive use of local equipment, materials and skills.

All machinery and equipment used for R&D, experimental and quality control inspection purposes with service life exceeding 2 years shall be allowed accelerated depreciation over 3 years. Other policies which may stimulate research activity are

- o a joint scientific research, design and technological work
- o documentation of samples of existing machinery
- o provision of inducement to encourage the employment of expatriates who are machinery experts.

7.2.6 <u>Policies And Programmes For The Transfer Of Technology</u>

The machinery sector cannot be competitive without the appropriate technology. However, indigenuous technology is rather outdated and the industry has not made any significant progress in product development over the last decade. To attract suitable foreign technology, we recommend :-

a) <u>Foreign Joint Ventures For Selected Priority Products</u>

Encouraging foreign joint-ventures provide opportunities for foreign firms to license their product or technology locally.

b) <u>Encourage Plants In Cost Escalating Developed Countries To Re-Si[illegible] To Malaysia</u>

To further pur[illegible] this [illegible] we recommend:

i) Such plants with vital technology and which produce priority products be exempted from the NEP equity participation requirement.

ii) Tax holidays be granted for 5 years.

c) <u>Purchase "Ready-Made" Plants for Priority Products</u>

Korea, Taiwan exports ready made plants. These plants represent immediate transfer of physical technology and hence shortens the technology transfer path discussed in Appendix Table 5.3.1)

d) <u>Employment of Expatriates</u>

There should also be inducement to encourage the employment of foreigners to work in the local machinery sector. Priority should be given to those who have long experience working in the machinery industry and are experts in machinery. They will be employed to help building up the machine buil capability in the country; helping to set up a research base, to spearhead innovations and to transfer technical know-how. In fact, this will prove to be a more effective means of technology transfer than via subsidiaries of foreign companies which imposed restrictive conditions.

7.2.7 Contribution to Reduction in Production Cost

There are other factors which although may appear minor can contributes towards the reduction in production cost.

These include:

- o Revisions in factory layout.
- o Machine Operators' Manuals
- o Specifications of Materials and Tools

7.2.8 Development of Ancillary Activities

Supporting and ancillary activities and industry that needs to be improved and upgraded are

- o Machining
- o Heat Treatment
- o Die Casting
- o Tool and Die Making
- o Promotional and Marketing

Supporting and ancillary activities that need to be expanded are

- o Machining
- o Surface Treatment
- o Materials Supply

Supporting and ancillary activities that need to be introduced for development are:

- o Forging
- o Research and Development

# LIST OF APPENDICES

APPENDIX 1.2.1

**MALAYSIA INDUSTRIAL CLASSIFICATRION FOR SELECTED INDUSTRY GROUPS OF NEM SECTOR**

| Revised Malaysia Industrial Classification | | | | Description | Preceding Code |
|---|---|---|---|---|---|
| Division | Major Group | Group | Industry | | |
| | 382 | | | Manufacture of Machinery except Electrical | |
| | | 3821 | 38210 | Manufacture of engines and turbines(1) | 4629)p<br>4630)p |
| | | 3822 | 38220 | Manufacture of agricultural machinery and equipment(2) | 4610)p<br>3630)p |
| | | 3823 | 38230 | Manufacture of metal and wood working machinery(3) | 4620)p<br>4630)p |
| | | 3829 | 38299 | Machinery and equipment, n.e.c.(4) | 4620)p<br>4630)p<br>4641)p<br>4649)p |

(1) The manufacture, re-building and repair of steam and gas engines and steam, gas and hydraulic turbines; and of petrol, diesel and other internal combustion engines. The manufacture of complete steam, gas and hydraulic turbine-generator sets, and of complete engine-generator sets, is classified in group 3831 (Manufacture of electrical industrial machinery and apparatus). The manufacture of turbines or engines by establishments primarily engaged in fabricating a given type of transport equipment and establishments primarily engaged in producing specialised turbines or engines for a given type of transport equipment, are classified in the appropriate group of major group 384 (Manufacture of transport equipment).

(2) The manufacture and repair of agricultural machinery and equipment for use in the preparation and maintenance of the soil, in planting and harvesting of the crop, in preparing crops for market on the farm, or in dairy farm operations and processes, such as planting, seeding, fertilizing, cultivating, harvesting; ploughs, harrows, stalk cutters, milking machines, farm tractors, etc. Excluded is the manufacture of agricultural hand tools, such as rakes, hoes, clippers, hand lawn mowers, which is classified in group 3811 (Manufacture of cutlery, hand tools and general hardware).

(3) The manufacture, alteration and repair of wood-working and metal-working machinery, such as machinery for sawmills, planing mills, furniture makers and veneer workers; lathes, boring, drilling, milling, grinding, shearing and shaping machines; power-saws and sanders; drop forges and other forging machines; rolling mills, presses and drawing machines; extruding, melting and non-electrical welding machines; and machine tools, dies and jigs. The manufacture of attachments and accessories for wood-working and metal-working machines is included. Excluded is the manufacture of electric welding equipment (classified in group 3831), and hand-tools for wood and metal working that are not power-driven (classified in group 3811)

(4) The manufacture, renovation and repair of machinery and equipment, except electrical machinery, not elsewhere classified, such as pumps, air and gas compressors; fire sprinklers;

mechanical power transmission equipment; lifting and hoisting machinery, cranes, elevators, moving stairways, industrial trucks, tractors, trailers, and stackers; sewing machines; small arms and accessories, heavy ordinance and artillery; industrial process furnances and ovens; automatic merchandising machines; washing, laundry, dry-cleaning and pressing machines; cooking ranges and ovens; and other service industry machines. Included are manufacture of general purpose parts of machinery, such as ball and roller bearings, piston rings, valves; and shops engaged in manufacturing, rebuilding or repairing various kinds of machinery and equipment and associated parts and accessories on a job or order basis for others.

## MACHINERY

Appendix 1.2.2

| MIC Code | | Measure-ment | Description |
|---|---|---|---|
| Industry | Commodity | | |
| 38210 | | | <u>Manufacture of Engines & Turbines</u> |
| | 01 | Unit | Diesel engine, except for motor vehicle and marine |
| | 02 | Unit | Petrol engine, except for marine and railroad |
| | 03 | Unit | Turbine except marine |
| | 04 | Unit | Internal combustion engine, other than petrol or diesel except for motor vehicle, aircraft, marine and railroad |
| | 05 | Unit | Steam engine exept locomotive and marine |
| | 06 | Unit | Stationary engine |
| 38220 | | | <u>Manufacture of Agricultural Machinery and Equipment</u> |
| | 01 | Nos. | Threshing machine |
| | 02 | Nos. | Feed grinder and crusher |
| | 03 | Nos. | Nut cracker |
| | 04 | Nos. | Fertilizer distributor machine |
| | 05 | Nos. | Agricultural tractor |
| | 06 | Nos. | Feed Mixer |
| | 07 | Nos. | Peanut sheller |
| | 08 | Nos. | Power tiller |
| | 09 | Nos. | Grain harvester |
| | 10 | Nos. | Sorting and grading machine |

| MIC | | Measure-ment | Description |
|---|---|---|---|
| Industry | Commodity | | |
| | 11 | Nos. | Tree dozer |
| | 12 | Nos. | Milking machine |
| | 13 | Nos. | Agricultural plough |
| | 14 | Nos. | Machine and equipment, n.e.c. |
| | 15 | Nos. | Dryer |
| | 16 | Nos. | Extruder |
| | 17 | Nos. | Press (included main shaft) |
| | 18 | Nos. | Conveyor |
| | 19 | Nos | Rubber coagulating tube |
| | 20 | Nos. | Depericarper and parts |
| | 21 | Nos. | Rubber bailing press |
| | 22 | Nos. | Granulators |
| | 23 | Nos. | Bunch hoppers |
| | 24 | Nos. | Nuts silo |
| | 25 | Nos. | Machinery, rubber industry |
| | 26 | Nos. | Corn sheller |
| | 27 | Nos. | Floating wheel |
| | 29 | Nos. | Vulcanisers and air receivers, etc |
| | 30 | Nos. | Auto rotary feeders |
| | 31 | Nos. | Cast bar for step goate |
| | 32 | Nos. | Werfley pump casing |
| | 33 | Nos. | Digester stirring shaft |
| | 34 | Nos. | Auto press skirt |
| | 35 | Nos. | Junk Ring |
| | 36 | Nos. | Hydro cyclone casing |

| MIC | | Measurement | Description |
|---|---|---|---|
| Industry | Commodity | | |
| | 37 | Nos. | Stainless steel sleave press cage |
| | 39 | Nos. | Machinery, palm oil industry |
| 38230 | | | Manufacture of Metal and Wood Working |
| | 01 | Nos. | Lathes, metal and wood work |
| | 02 | Nos. | Planers, metal and wood work |
| | 03 | Nos. | Shapers, metal and wood work |
| | 04 | Nos. | Grinders, metal and wood work |
| | 05 | Nos. | Polishers, metal and wood work |
| | 06 | Nos. | Drillers, metals and wood work |
| | 07 | Nos. | Boring machine, metal and wood work |
| | 08 | Nos. | Metal cuting machine tool, n.e.c |
| | 09 | Nos. | Hydraulic press, metal and wood work |
| | 10 | Nos. | Metal press e.g. rivet making maches |
| | 11 | Nos. | Jigs and fixtures, metl and wood work |
| | 12 | Nos. | Die and die sets, metal and wood work |
| | 13 | Nos. | Metal industrial moulds |
| | 14 | Nos. | Precision measuring tools e.g. micrometers, calipers, scales and dividers |
| | 15 | Nos. | Power driven hand tools, metal and woodwork |
| | 16 | Nos. | Gas welding machinery, metal work |
| | 17 | Nos. | Gas cuting machinery, metal work |
| | 18 | Nos. | Wood debarking machinery |
| | 19 | Nos. | Wood splitting machinery |

| MIC | | Measurement | Description |
|---|---|---|---|
| Industry | Commodity | | |
| | 20 | Nos. | Wood slicing machinery |
| | 21 | Nos. | Chain saws and other wood sawing machinery except sawmill saw |
| | 22 | Nos. | Sanding machines, metal and wood |
| | 23 | Nos. | Veneer mill mcahinery, n.e.c. |
| | 24 | Nos. | Sawmill machinery, n.e.c. |
| | 25 | - | Nil |
| | 26 | Nos. | Metal working machinery, n.e.c |
| | 27 | Nos. | Wood working machinery n.e.c. (eg. machinary used in pencil making industry , cooperage and machinery etc.) |
| | 28 | Nos. | Dust blower |
| 38229 | | | <u>Machinery and Equipment, n.e.c.</u> |
| | 01 | Nos. | Bearing ball & roller |
| | 02 | Nos. | Tractor, industrial |
| | 03 | Nos. | Sewing machine, household and industrial |
| | 04 | Nos. | Water pump |
| | 05 | Nos. | Piston and piston ring |
| | 06 | Nos. | Mechanical or hydraulic power transmission equipment (e.g. clutches of all types, shaft couplings etc) |
| | 08 | Nos. | Cranes, travelling, overhead and monorail |
| | 09 | Nos. | Conveyors |
| | 10 | Nos. | Elevators, including pneumatic, bucket lifts and platform elevators |
| | 11 | Nos. | Escalators |

| MIC | | Measure-ment | Description |
|---|---|---|---|
| Industry | Commodity | | |
| | 12 | - | Nil |
| | 13 | Nos. | Cooking ranges and ovens, commerical and household |
| | 14 | Nos. | Pumps, air and gas |
| | 15 | Nos. | Fans and blowers except electric fans for room ventilation |
| | 16 | Nos. | Fire sprinklers |
| | 17 | Nos. | Compressor, air and gas |
| | 18 | Nos. | Lifting and hoisting machinery, except cranes and forklifts |
| | 19. | - | Nil. |
| | 20 | Nos. | Stackers |
| | 21 | Nos. | Cranes, electric |
| | 22 | Nos. | Meter, water |
| | 23 | Nos. | Clorifien |
| | 24 | - | Nil |
| | 25 | - | Nil |
| | 26 | Nos. | Small arms (eg. pistols, revolvers, rifles, guns and machine guns) |
| | 27 | Nos. | Artillery weapons (eg. canons and machine tnks etc.) |
| | 28. | Nos. | Ammunition except small arms (e.g. bombs torpedoes, rockets grenades, land and sea mines etc. |
| | 29 | Nos. | Pump, petroleum |
| | 30 | Nos. | Slot machine |
| | 31 | - | Nil |
| | 32 | Nos. | Coin operated amusement machine |
| | 33 | - | Nil |

| MIC | | Measure-ment | Description |
|---|---|---|---|
| Industry | Commodity | | |
| | 34. | Nos. | Laundry, dry cleaning and pressing machines |
| | 35 | Nos. | Truck, forklift |
| | 36 | Nos. | Generator, gas |
| | 37. | Nos. | Lift passenger carrying |
| | 38. | Nos. | Furnaces and ovens industrial |
| | 39. | Nos. | Nil |
| | 40 | Nos | Machinery and equipment, n.e.c. |
| | 41 | Nos. | Spare parts |
| | 42 | - | Nil |
| | 43 | - | Nil |
| | 44 | - | Nil |
| | 45 | - | Nil |
| | 46 | - | Nil |
| | 47 | - | Nil |
| | 48 | Nos. | Vibratory Compaction Roller - Bomag |
| | 50 | Nos. | Liner, impeller and gear box |
| | 51 | - | Nil |
| | 52 | Nos. | Suction door and impeller |
| | 53 | - | Nil |
| | 54 | Nos. | M.S. Dump ferry |
| | 55 | Nos. | Other Otter board |
| | 56 | Nos. | Tunnel car |
| | 57 | - | Nil |
| | 58 | Nos. | Rolling machine |

| MIC | | Measure- ment | Description |
|---|---|---|---|
| Industry | Commodity | | |
| | 59 | Nos. | Sluice valves |
| | 60 | Nos. | Sealing machine |
| | 61 | - | Nil |
| | 62 | Nos. | Liner/casing |
| | 63 | Nos. | Exhaust pipes |
| | 64 | Nos. | magnetic separators |
| | 65 | Nos. | Vibrating tables |
| | 66 | Nos. | Wire-rope machine and equipment |
| | 67 | - | Nil |
| | 68 | - | Exhaust valves |
| | 69 | Nos. | Fire and fitting equipment |
| | 70 | Nos. | Baling machine |
| | 71. | Nos. | Heat exchange |
| | 72. | Nos. | Crane pumps |
| | 73 | Nos. | Vertical pump |
| | 74 | Nos. | Catering equipment |
| | 75 | Nos. | Pipe autochair truck |
| | 76 | Nos. | Tractor's attachments |
| | 77 | Nos. | $CO^2$ (carbon dioxide)System for NEB |

Source : Penyiasatan Perusahaan Perusahaan Perkilangan Cod Book for output commodities (Internal use only), Bahagian Perkilangan Tahunan

Weakness: These classifications are not necessarily used by private sectors and serve only as internal codes for easy classification by the statistics department.

Appendix 1.2.3

MIC and SITC classification for
Selected Industry Groups of the NEM Sector

| Description | MIC Code | SITC Code Pre 1978 | SITC Code Post 1978 |
|---|---|---|---|
| I **Manufacture of Engines & Turbines** | 38210 | | |
| Diesel engine, except for | 01 ) | 711 511 00 | 713 811 00/713 812 00 |
| motor vehicle & marine | ) | 711 512 00 | 713 813 00/713 814 00 |
| stationary engine | 06 ) | 711 513 00 | 713 815 00/713 819 00 |
| Petrol engine, except for marine & railroad | 02 | | 713 890 00 |
| Turbine except marine | 03 | 711 311 00 | 712 601 00 |
| Internal combustion engine, other than petrol or diesel except for motor vehicle air craft, marine and railroad | 04 | 711 810 00 | 713 890 00 |
| Steam engine except locomotive & marine | 05 | 711 329 00 | 712 602 00 |
| **Manufacture of Parts** | | | |
| Cylinder blocks & crank cases | - ) | | 713 910 00 |
| pistons and cylinder liners | - ) | | 713 920 00 |
| with external diameter between | ) | | |
| 50mm & 155mm | ) | 711 319 00 | |
| | ) | | |
| Other piston and cylinder ) | ) | 711 528 00 | 713 930 00 |
| liners ) | ) | | 713 990 00 |
| ) | - ) | | |
| Others ) | ) | | 712 900 00 |

| Description | MIC Code | | SITC Code Post 1978 |
|---|---|---|---|
| II **<u>Manufacture of Agricultural Machinery</u>** | | | |
| <u>Soil preparation, maintenance and cultivation machinery</u> | 388220 | | |
| Agricultural tractor | 05 | | 722 411 00 |
| Power tiller | 08 | 712 110 00 | 722 419 00 |
| Tree dozer | 11 | | |
| Agricultural plough | 13 | 712 110 | 721 110 00 |
| Fertiliser distributor machine | 04 | | |
| Seeders, planters & transplanters, fertiliser distributors & manure spreaders | | | 721 120 00 |
| Scarifiers, cultivators, weeders, hoes & harrows | | | |
| Other agricultural & horticultural machinery for soil preparation or cultivation | | | 721 180 00 |
| Parts for this group of machinery | | | 721 190 00 |

| Description | MIC Code | SITC Code Post 1978 | |
|---|---|---|---|
| **Harvesting & Threshing Machinery** | 38220 | | |
| Threshing machine | 01 | 712 209 00<br>712 208 00 | 721 220 00 |
| Grain harvester | 09 | | |
| Sorting & grinding machine | 10 | | |
| Combined harvester-threshers | | | 721 220 00 |
| Other harvesting or threshing machinery; mowers, other than lawn mowers; straw or foddder presses | | | 721 230 00 |
| Winnowing & similar cleaning machines for seed, grain or leguminous vegetables & egg-grading & other grading machines for agricultural produce | | | 72 240 00 |
| Parts | | | 721 290 00 |

| Description | MIC Code | | SITC Code Post 1978 | |
|---|---|---|---|---|
| Dairy Machinery | 38220 | | | |
| Milking machines | | 12 | 712 391 00 | 721 310 00 |
| Other dairy machinery | | | 712 398 00 | 721 380 00 |
| Parts | | | | 721 390 00 |
| Feed mixed | | 06 | | 721 380 00 |
| Other agricultural, horticultural, poultry-keeping & bee keeping machinery; germination plant fitted with mechanical or thermal equipment; poultry incubators & brooders: | 38220 | | | |
| Poultry incubators & brooders | | | 712 991 00 | 721 971 00 |
| Other | | | 712 992 00 | 721 979 00 |
| Parts | | | | 721 990 00 |

| | Description | MIC Code | SITC Code Post 1978 | |
|---|---|---|---|---|
| III | **Manufacture of Metal & Woodworking Machinery** | 38230 ) | | |
| | Lathes | 01 ) | 715 100 00 | 736 130 00 |
| | Planners | 02 ) | | 736 170 00 |
| | Shapers | 03 ) | | |
| | Grinders | 04 ) | | 730 190 00 |
| | Polishers | 05 ) | | |
| | Drills | 06 ) | | |
| | | ) | 715 100 00 | 736 150 00 |
| | Boring machine | 07 ) | | |
| | Metal cutting machine tool, nec | 08 | | 736 120 00 |
| | Hydraulic press | 09 ) | | 736 280 00 |
| | Metal press eg. Rivet making machines | 10 ) | 715 100 00 | 736 280 00 |

| Description | MIC Code | | SITC Code Post 1978 |
|---|---|---|---|
| Reaming or milling machines | 38230 | | 736 140 00 |
| Gas welding machinery | 16 | 715 231 00 | 737 311 00 |
| Gas cutting machinery | 17 | | 737 311 00 |
| Parts for gas operated welding, brazing, cutting and surface tempering appliances | | 715 239 00 | 737 319 00 |
| Jigs & fixtures, metal & woodwork | | | 736 800 00 & 736 900 00 |
| Die & die sets, metal & woodwork | | | |
| Metal industrial moulds | | | |
| Sawing machines (including fiction or abrasive cutting off) | | | 736 160 00 |
| Sanding machines | 22 | 715 100 00 | 736 190 00 |
| Bending, forming, folding or flattening machines | | | 736 220 00 |
| Shearing, punching or notching machines | | 715 100 00 | 736 230 00 |
| Other machines tools for working metal & metal carbides | | | 736 700 00 |
| Tapping or screw cutting machines | | | 736 180 00 |

| Description | MIC Code | | SITC Code Post 1978 |
|---|---|---|---|
| **Woodworking Machinery** | 38230 | | |
| Wood debarking machinery | 18 | | |
| Wood splitting machinery | 19 | | |
| Wood slicing machinery | 20 | 719 520 00 | 728 120 00 |
| Sawmill machinery nec | 24 | | |
| Woodworking machinery nec | 27 | | |
| Other accessories & parts for use in this section | | | 728 190 00 |
| IV **Machinery and Equipment N.E.C.** | 38299 | | |
| Cranes travelling, overhead and monorail | 08 | | 744 221/2/9 |
| Coveyors | 09 | | 744 230 00 |
| Elevators, including pheumatic bucket lifts and platform elevators | 10 | 719 311 00 | 744 230 00 |
| Escalators | 11 | | 744 250 00 |
| Cranes, electric | 21 | | 744 221/2/9 |
| Truck, forklift | 35 | | 744 211 00 |

| Description | MIC Code | SITC Code | Post 1978 |
| --- | --- | --- | --- |
| Lifing & hoisting machinery, except cranes & forklifts | 38299 08 | | 744 280 00 |
| Parts for lifting, handling, loading and unloading machinery | | 719 311 00 | 744 900 00 |
| Electric hoist | | 719 313 00 | 744 212 00 |
| Winches and capstans, etc | | 719 319 00 | 744 219 00 |
| Lifts and skip hoists | | | 744 240 00 |
| Stackers | 20 | | |
| Electric cranes | 21 | | 744 221 00 |
| Jack and pulley tackles | - | 719 312 00 | 744 211 00 |

Appendix 3.1.1

LEGENDS TO SITC CODES

ENGINES & TURBINES

| SITC Code Pre 1978 | Description |
|---|---|
| 711311 | Turbine |
| 713319 | Steam engine with boiler non turbine |
| 711321 | Steam engine without boiler turbine |
| 711329 | Steam engine without boiler non turbine |
| 711511 | Diesel engine under 10 hp stationary |
| 711511 01 | Diesel engine not exceeding 50 hp stationary |
| 711511 02 | Diesel engine exceeding 50 hp, stationary |
| 711512 | Diesel engine 10 hp to 50 hp, stationary |
| 711513 | Diesel engine exceeding 50 hp |
| 711528 | Parts for piston engine; non-aircraft |
| 711800 | Other engines including water turbines |
| 711810 | Hydraulic engines & motor (including water turbines) |
| 711511 03 | Diesel engine stationary exceeding 99 hp but not exceeding 800 hp |
| 711511 04 | Diesel engine stationary exceeding 800 hp |
| 711511 09 | Diesel engine stationary exceeding 1000 hp |

Appendix 3.1.1

LEGENDS TO SITC CODES

ENGINES & TURBINES

| SITC Code Post 1978 | Description |
|---|---|
| 712601 | Steam or other vapour power turbines |
| 712602 | Steam or other vapour power turbines, nec. |
| 712900 | Parts for steam or other vapour power units, nes. |
| 713811 | Diesel engine - stationary 40 kw. |
| 713811 10 | Diesel engine - stationary not exceeding 7.5 kw. |
| 713811 20 | Diesel engine - stationary exceeding 7.5 kw. |
| 713812 | Diesel engine exceeding 40 kw. but not exceeding 125 kw. |
| 713813 | Diesel engine exceeding 125 kw. but not exceeding 600 kw. |
| 713814 | Diesel engine - stationary exceeding 600 kw. not exceeding 750 kw. |
| 713815 | Diesel engine - stationary exceeding 750 kw. |
| 713819 | Other diesel engines |
| 713890 | Other engines nes. |
| 713910 | Cylinder blocks + crank cases |
| 713920 | Piston + cylinder liners for external diameters 50 mm + 155 mm for internal combustion piston engines |
| 713930 | Other piston & cylinder liners |
| 713990 | Other parts nes. |

Appendix 3.1.1

LEGENDS TO SITC CODES

AGRICULTURAL MACHINERY

| SITC Code Pre 1978 | Description |
|---|---|
| 712100 | Agricultural machinery for soil preparation |
| 712110 | Agricultural machinery for soil preparation |
| 712190 | Parts for Agricultural and horticultural machine for soil preparation or cultivation |
| 712208 | Parts for harvesting and threshing machine |
| 712209 | Threshing machine |
| 712390 | Parts for dairy machinery including milking machine |
| 712391 | Milking machine |
| 712398 | Other dairy machinery |
| 712501 | Agricultural tractor pedestrian controlled |
| 712509 | Agricultural tractor non-pedestrian controlled |
| 712900 | Agricultural machinery, nec. |
| 712991 | Poultry incubators and brooders |
| 712992 | Other agricultural, horticultural, poultry keeping and bee keeping machine |
| 712993 | Parts for other agricultural, horticultural, poultry keeping and bee keeping machine, germination plant, poultry incubators and brooders |

Appendix 3.1.1

LEGENDS TO SITC CODES

AGRICULTURAL MACHINERY

| SITC Code Post 1978 | Description |
|---|---|
| 721220 | Combined harvestor - threshers |
| 721290 | Parts for harvesting and threshing machinery |
| 721971 | Poultry incubators and brooders |
| 721130 | Scarifiers, cultivators, weeders, hoes and harrows |
| 721240 | Winnowing, cleaning machine for seeding, grading, etc. |
| 721180 | Other agricultural and horticultural machinery for soil preparation or cultivation, lawn and sports ground rollers |
| 721230 | Other harvesting or threshing machinery, mowers excl. lawn mowers, straw or fodder presses |
| 721110 | Ploughs |
| 721120 | Seeders, planters and transplanters, fertiliser distributors and manure spreaders |
| 721990 | Parts for other agricultural, horticultural, poultry keeping and bee keeping machinery, germination plant, etc. |
| 722411 | Agricultural tractor pedestrian controlled |
| 722419 | Agricultural tractor non pedestrian controlled |
| 721190 | Parts for agricultural and horticultural machine for soil preparation or cultivation |
| 721310 | Milking machine |
| 721380 | Other dairy machinery |
| 721390 | Parts for dairy machinery including milking |
| 721979 | Other agricultural, horticultural, machine poultry keeping and bee keeping |

Appendix 3.1.1

LEGENDS TO SITC CODES

METAL AND WOODWORKING MACHINERY

| SITC Code Pre 1978 | Description |
|---|---|
| 715100 | Machine tool for working metal |
| 715231 | Gas operated welding, brazing, cutting and surface-tempering appliances |
| 715239 | Parts for gas operated welding, brazing, cutting and surface-tempering appliances |
| 719520 | Machine tool for working wood |

Appendix 3.1.1

LEGENDS TO SITC CODES

METAL AND WOODWORKING MACHINERY

| SITC Code Post 1978 | Description |
|---|---|
| 736700 | Other machine tools for working metal or metal carbides |
| 736900 | Parts nes and accessories of machine tools for working metal and metal carbides |
| 736220 | Bending, forming, folding or flattening machines, metal working |
| 736130 | Lathes, metal working |
| 736190 | Machines for working metal or metal carbines operated by grinding wheels, abrasives or polishing products |
| 736280 | Other metal working presses |
| 736230 | Shearing, punching or notching machines, metal working |
| 736140 | Reaming or milling machines, metal working |
| 736150 | Drilling or boring machines, metal working |
| 736180 | Tapping or screw cutting machines |
| 736160 | Sawing machine, metal working |
| 736120 | Gear-cutting machines |
| 736170 | Planning machines, metal working |
| 737311 | Gas welding machinery |
| 736800 | Work-holders, self-opening dieheads and dividing heads for machine-tools, tool holders |
| 737319 | Parts for gas operated welding, brazing, cutting and surface tempering appliances |
| 728120 | Machine tools for working wood, cork, bane and ebonite (vulcanite), hard artificial plstic materials or other hand carving materials |
| 728190 | Other accessories and parts for 728120 and 728110 |

Appendix 3.1.1

LEGENDS TO SITC CODES

MATERIAL HANDLING EQUIPMENT

| SITC Code Pre 1978 | Description |
|---|---|
| 719313 | Other leading machinery |
| 719312 | Jacks pulley tackles including parts |
| 719319 | Parts for cutting, handling loading or unloading |
| 719311 | Hoisting machinery |
| 719311 10 | Other lifting machinery |
| 719311 30 | Other lifting machinery |
| 719311 70 | Other lifting machinery |

Appendix 3.1.1

LEGENDS TO SITC CODES

MATERIAL HANDLING EQUIPMENT

| SITC Code Post 1978 | Description |
|---|---|
| 744221 | Gantry and bridge cranes |
| 744230 | Conveyors and elevators, pneumatic |
| 744250 | Escalators and moving pavements |
| 744280 | Other machinery for loading, lifting etc. |
| 744900 | Parts for lifting, handling, loading and unloading machinery |
| 744212 | Electric Hoist |
| 744211 | Jacks and pulley tackles |
| 744219 | Winches and capstans etc. |
| 744240 | Lifts an skip hoists |
| 744222 | Ships derricks |
| 744229 | Other lifting handling, loading or unloading machinery |

## APPENDIX 3.1.2

## SELECTED MACHINERY PRODUCTS FOR INTRA TRADE COMPARISON

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A) Engines And Turbines

- Steam boiler and ancillary plant
- Steam engines, turbines
- Internal combustion piston engines
- Engines, turbines, motor

B) Agricultural Machinery

- Agricultural machinery excluding tractor

C) Metal Working Machinery

- Machine tools for metal working
- Metal working machinery n.e.s

D) Machinery And Equipment n.e.c

- Material handling equipment

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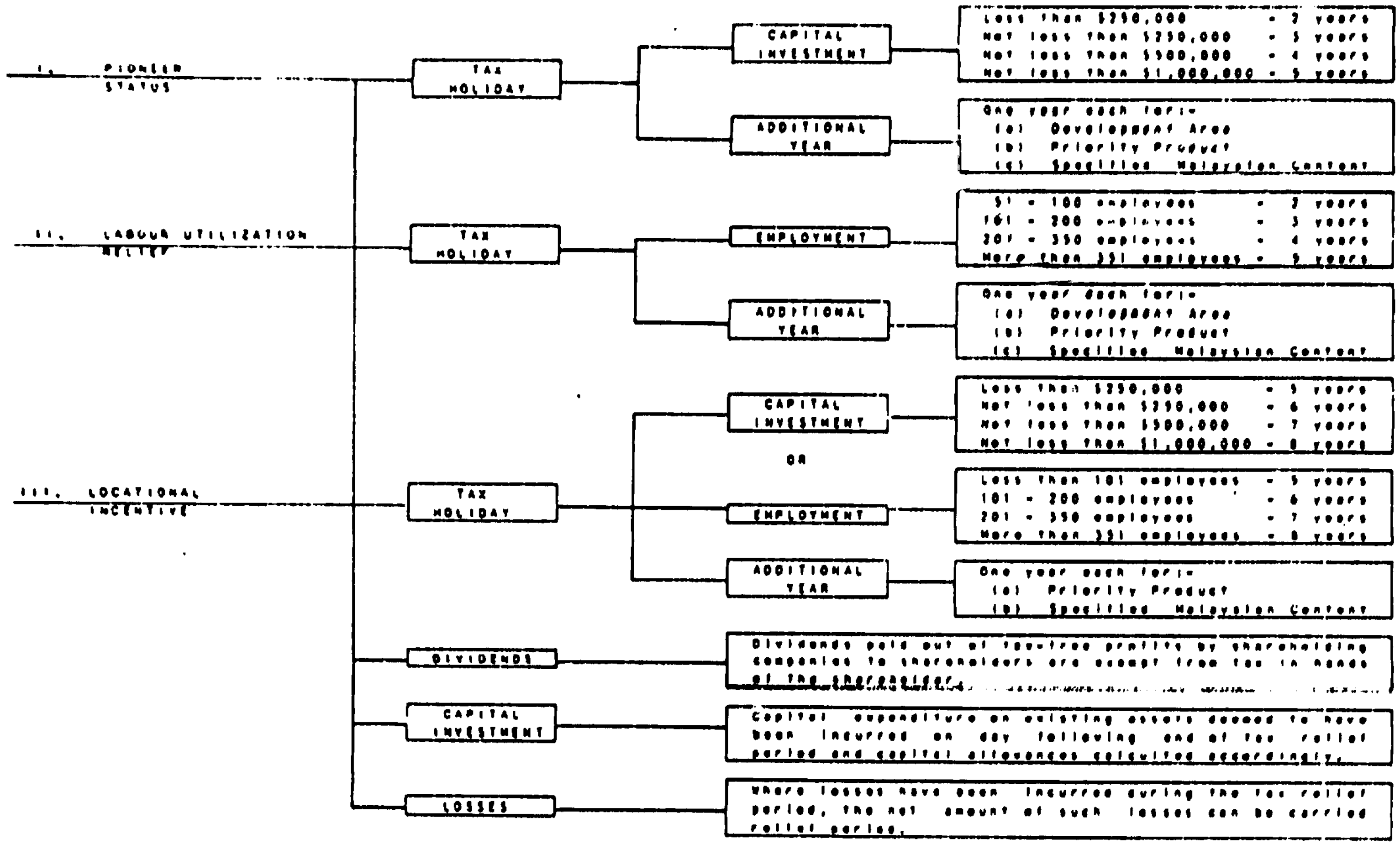
APPENDIX 3.8.1

Investment Incentives Act 1968



IV. INVESTMENT TAX CREDIT

- Amount not less than 25% of capital expenditure [illegible] of a factory, plant or machinery for approved project.
- ADDITIONAL 5%
  - (a) Development
  - (b) Priority Product
  - (c) Specified Malaysian content
- Tax relief equals amount of credit and credit [illegible] carried forward in case of loss or insufficiency of [illegible] until fully utilised against subsequent profits.
- Dividends paid out of tax free profits exempted from tax hands of shareholders.

V. EXPORT INCENTIVES

- DEDUCTIONS FOR PROMOTION OVERSEAS
  - Qualifying Expenses
  - (a) Overseas Advertising
  - (b) Supply of free samples overseas
  - (c) Export market research
  - (d) Preparation of overseas tenders
  - (e) Supply of technical information overseas
  - (f) Public relations work connected with export
  - (g) Expenses directly contributable to the exhibits and/or participation required in trade or industrial exhibitions approved by the Minister of Trade and Industry.
  - (h) Fares in respect of travel overseas by employees of companies of business.
  - (i) Accommodation and sustenances expense incurred by Malaysian businessmen going overseas for business subject to $200/- per day.
  - (j) Cost of maintaining sales offices overseas for the promotion of exports.
- ACCELERATED DEPRECIATION ALLOWANCE
  - Only resident companies qualify
  - Must export 20% by value of total production
  - Given only in respect of capital expenditure incurred on modernization
  - Rate - 40% per annum
- EXPORT ALLOWANCE
  - 5% of the f.o.b. value of export sales, given to all exporters, including traders effective from basis year 1983

VI. SPECIAL INCENTIVES FOR APPROVED AGRICULTURAL INDUSTRIES

- INVESTMENT TAX CREDIT AMOUNTING TO 50% OF QUALIFYING CAPITAL EXPENDITURE
  - Activities Eligible For This Incentive:
  - (a) Cultivation of food crops and fruits,
  - (b) Cultivation of vegetables
  - (c) Rearing of fresh water fish and prawns and marine culture,
  - (d) Rearing of livestock farmer and dairy products.

VII. HOTEL INCENTIVES

- Pioneer status; accelerated depreciation allowance; industrial building allowance (with the exception of K.L. District and Penang Island); abatement of Income Tax on a percentage of chargeable income (depending on hotel location) for a period of 12 years; hotel tax credit.

VIII. INCREASED CAPITAL ALLOWANCE

- CAPITAL ALLOWANCE
  - (a) For qualifying plant expenditure, the rate of annual allowance is 40%.
  - (b) For qualifying building expenditure [illegible] on the construction of a building, the annual allowance is 5% of that expenditure.
  - (c) For qualifying building expenditure incurred on the purchase of a building, the permitted fraction is multiplied by one and one [illegible]

APPENDIX 3.8.2

## Incentives for Industrial Development

Malaysia's investment incentives under the Investment Incentives Act 1968 are designed to provide total or partial relief from the payment of income tax (40%) and development tax (5%) to companies manufacturing new products or undertaking expansion and/or diversification. The relief is granted in various forms and investors may select the type of incentives most beneficial to them. Basically, Malaysia offers eight major forms of tax incentives, 7 of which apply to the manufacturing sector.

### Pioneer Status

Companies which intend to produce goods not already manufactured on a commercial scale suitable to the economic requirements of Malaysia, or whose establishment is vital to the public interest can apply for pioneer status. Companies which intend to manufacture their products wholly for export can also apply.

Pioneer status companies are allowed an initial tax relief period of two years beginning on production day. Extensions of tax relief will be granted according to the level of capital investment. Hence the tax holiday period is:

- 2 years for fixed capital expenditure less than $250,000

- 3 years for fixed capital expenditure not less than $250,000

- 4 years for fixed capital expenditure not less than $500,000

- 5 years for fixed capital expenditure more than $1,000,000

In addition to the above, an extension of a further year of the tax relief period is granted for each of the following conditions, thus bringing the total period to a maximum of eight years:

i. If the pioneer factory is sited in a development area

ii. If the product/industry is a priority product of industry*

iii. If the percentage of Malaysian content attained is more than 50%.

Where losses are incurred for the whole of the tax relief period, capital allowances are allowed to be notionally calculated and aggregated as deduction in the post tax relief period. Dividends from pioneer companies are also exempted from tax.

Labour Utilisation Relief (LUR)

The Labour Utilisation Relief provides for exemption of income tax in the same way as in pioneer status except that in this case, the granting of such exemption is based upon the number of full-time paid employees engaged in the project instead of on the amount of capital expenditure incurred.

Under the LUR the tax exemption period and the qualifying requirements are:

| Qualifying Full Time Employment | Tax Exemption Period |
|---|---|
| 51-100 employees | 2 years |
| 101-200 employees | 3 years |
| 201-350 employees | 4 years |
| 351 employees and above | 5 years |

In addition, an extension of a further year of the tax relief period is granted for each of the following conditions :

i. If the factory is sited in a development area

ii. If the product/industry is a priority product of industry

iii. If the percentage of Malaysian content is more than 50%

* A List of 'Priority Products' for which additional incentives are provided under the Investment Incentives Act, is available in the booklet,"All About Investment Incentives" obtainable from MIDA.

The above investment incentive is designed to encourage industrial ventures which will generate greater employment opportunities in the country.

Investment Tax Credit

The investment tax credit can be granted to approved companies not enjoying Pioneer Status. The amount of tax credit given is not less than 25% of the total capital expenditure incurred by the project. It is given for the year of assessment in the basis period in which the expenditure was incurred and for not more than 5 years from the beginning of the basis period in which the project is approved.

The credit will be increased by an additional 5% of the expenditure for each of the following :

i. If its factory is in a development area

ii. If it produces a priority product*

iii. If the percentage of Malaysian content exceeds 50%

The benefit amounts to an exemption of income tax on profits equal to the tax credit given. The credit may be carried forward in case of loss or insufficiency of income until fully utilised against subsequent profits.

The incentive is particularly beneficial to projects that have high investment level and a long gestation period before profits are made.

**Increased Capital Allowance**

In order to encourage existing factories to modernize their production techniques and to encourage the setting up of modernized factories, the Government has also designed a tax incentive called Increased Capital Allowance. It can be granted to projects which the Government deems to be desirable in the national interest but which cannot be granted tax exemption either under the Pioneer Status of Labour Utilisation Relief, or Investment Tax Credit. The increased capital allowance applies to qualifying building and plant expenditure incurred in the modernizing production techniques in an existing factory by a resident company. In the case of qualifying plant expenditure, initial allowance is 20% while annual allowance is 40%*. The initial allowance for qualifying expenditure incured on the construction of a building is 10% with annual allowance of 30%.

For qualifying expenditure, incurred on purchase of building, the permitted fraction is multplied by one and one-half.

Export Incentives

Three kinds of Export Incentives can be granted to companies which export their Malaysian manufactured products.

a) Export Allowance

The amount of allowance is 2% of the ex-factory value of all export sales of the year and additional 10% of the difference between the ex-factory value of export sales of the basis period which the company was last exporting and any such basis period being not earlier than the basis period for the year of assessment 1973.

For a company exporting for the first time, the total amount of allowance for that year is 12% of the ex-factory value of export sales of the year in question.

Under this Allowance, no distinction is made between exports incorporating more than 50% Malaysian materials and components and those incorporating less than 50% Malaysian materials and components.

b) Accelerated Depreciation Allowance

Resident companies, if they export 20% (by value) of their total production and if they incur qualifying plant expenditure for the purpose of modernizing the company's production techniques or to set up a modernised factory, are entitled to an Accelerated Depreciation Allowance of 40% per annum, in addition to an initial allowance of 20%*.

c) Deduction for Promotion Overseas

These are deductions for expenses incurred for the purpose of seeking opportunities for export of products manufactured in Malaysia. Pioneer companies have a special privilege. All qualifying expenses which would have been allowed under the schedule and which were incurred during a pioneer company's tax relief period can be carried forward and allowed as a deduction in the post pioneer period. the same position holds with respect to campanies enjoying LUR and Locational Incentive. The expenses that qualify for this deduction are :

- Overseas advertising

- Supply of free samples abroad

- Export market research

- Preparation of tenders for supply of goods overseas

- Supply of technical information abroad

- Public relations work connected with exports

- Expenses directly contributable to the exhibits and or/participation required in trade or industrial exhibitions approved by the Ministry of Trade and Industry

- Fares in respect of travel overseas by employees of companies for business

- Accommodation and sustenance expense incurred by Malaysian businessmen going overseas for business subject to $100-per day

- Cost of maintaining sales offices overseas for the promotion of exports

6) Locational Incentives

The Locational Incentives was introduced to encourage the dispersal of industries away from the existing industrial concentration in the urban areas. A company locating its factory in an area specified by the Government as a Locational Incentive Area may be considered for a maximum of up to 10 years tax relief. The qualifying criteria and the number of years of tax relief are as follows in the table below :

| Qualifying Fixed Capital Expenditure Employment | Period of Tax Holiday (Year) |
|---|---|
| For Fixed Capital expenditure less than M$250,000 or employment less than 101 | 5 |
| For Fixed Capital expenditure not less than M$250,000 or employment not less than 101 | 6 |
| For Fixed Capital expenditure not less than M$500,000 or employment not less than 201 | 7 |
| For Fixed Capital expenditure not less than M$1,000,000 or employment not less than 351 | 8 |
| Priority Product | 1 |
| Malaysian Content | 1 |
| Total number of years of tax relief | 10 |

7) Special Incentives for Approved Agricultural Industries

In order to encourage greater and better utilisation of agricultural land an investment tax credit amounting to 50% of qualifying capital expenditure on approved agricultural industries had been made available specially to companies and cooperatives. Activities eligible for this incentive include utilisation of food crops and fruits, the cultivation of vegetables, rearing of freshwater fish and prawns and marine culture, and rearing of livestock for meat and dairy products.

And Additional Incentives

Accelerated Depreciation Allowance (Under Income Tax Act)

In order to encourage the establishment, modernisation and expansion of industries or activities, an accelerated depreciation allowance in the form of an annual allowance of 80% of plant and machinery (instead of the normal annual allowance at rates prescribed for various industries) is accorded to all industries for expenditure incurred during the basis period for assessment years 1977, 1983. This means that the economic activities expanded in 1977, 1978, 1979, 1980, 1981 and 1982 would qualify for this concession. The annual allowance of 80% is granted in lieu of the normal allowance prescribed in the Income Tax (Qualifying Plant Annual Allowance) Rule

1968. the initial allowance of 20% however, remains unchanged. This means that 100% or the entire amount of the capital cost of plant and machinery is allowed to be written off for tax purposes in one year.

**Reinvestment Allowance (Under Income Tax Act)**

All existing companies engaged in manufacturing and processing which are not enjoying any form of incentives under the Investment Incentives Act including those which have ceased to benefit from such incentives for at least 3 years, are eligible for a Reinvestment Allowance amounting to 25% of the expenditure on plant, machinery and industrial buildings incurred for expansion during the basis period for assessment years 1980, 1981 and 1983.

The Reinvestment Allowance is administered directly by the Income Tax Department but before companies can avail themselves of this incentive, their expansion programmes must first be approved by the Ministry of Trade and Industry unless they are exempted under the Industrial Co-ordination Act.

**Tax incentives for Restructuring**

a) Equity Restructuring

Exemption of 5 percentage points of the company income tax of 40% is granted to any company conforming to the equity restructuring requirement of the NEP with at least 30%

equity ownership for Bumiputeras, 40% for non-Bumiputeras, and 30% for foreigners.

b) Employment and/or Marketing Network Restructuring

Any company conforming to the employment and/or marketing network restructuring will be exempted from the development tax of 5%.

The above restructuring incentives are offered on yearly basis for 3 assessment years from assessment year 1980 to assessment year 1982. In order to qualify for exemption, the company must either have paid-up capital of $1 million unimpaired by contingent liabilities or have a net asset (before revaluation) of not less than $1 million. Pioneer companies and companies enjoying tax incentives will not qualify for this incentive.

Source : Directory of Federation of Malaysian Manufacturers, 1982

## APPENDIX 3.8.3

**The Industrial Co-Ordination Act 1975**

The Industrial Co-ordination Act 1978 (ICA) requires person(s) engaged in any manufacturing activity, existing or new, to obtain a licence from the Secretary-General, Ministry of Trade and Industry, in respect of Trade and Industry, in respect of such manufacturing activity.

**Objectives of the Act**

The objectives of the Act are basically:-

- to ensure orderly development and growth in the manufacturing sector;
- to guide the private sector in the implementation of the Government's industrialisation policies; and
- to collect relevant data and information on the manufacturing sector

**Exemptions**

Under Section II of the Act, the following manufacturing activities are exempted from all provisions of the Act:-

a. with shareholders funds of less than two hundred and fifty ringgit; and with less than twenty-five full-time employees

b. milling of fresh palm oil fruits in-to crude palm oil;

c. producing and processing raw natural rubber of all types including latex, skim, sheets, crepes, scrap, technically specified rubbers, non-standard and modified rubbers or any other un-vulcanised form of natural rubber prepared by any patented or technically specified procedure.

## Coverage of the Act

Manufacturers, who, on commencement of the Act, are already engaged in manufacturing may continue to do so but shall not later than one year from the date of commencement of the Act, i.e., 1 st May, 1976, apply for a licence in the prescribed forms i.e., Forms ICA/1 or ICA/2.

Manufacturers who want to engage in new manufacturing activities by diversifying into additional products or by expanding production capacity or existing approved products are required to seek approval from the licensing officer (Ministry of Trade and Industry) after which the licence for the additional products will be given, and, in the case of expansion of production capacity, the approval letter will be given.

APPENDIX 3.8.4

List of Industries and Products Encouraged for Establishment In Malaysia

The list of products highlighted is by no means exhaustive and Malaysia is prepared to consider investment proposals in any investment group which can be profitably and viably established in Malaysia. Apart from the products that have been highlighted, other industries in which investment opportunities exist for joint-ventures, especially for export, include :

Manufacture of Food Products

Vegetable canning
Meat canning including meat, poultry game and preparation thereof excluding chicken and mutton curries
Palm oil food products

Cultivation and Processing of the Following Crops

| | |
|---|---|
| Maize | chillies |
| Cashew nuts | Spices and condiments |
| Cocoa | Stevia |
| Sorhgum | Vanilla |
| Soya Bean | Mushrooms |
| Coffee | Sago |
| Groundnut | Vegetables |
| Ginger | Patchouli, citroenella or lemon grass |
| Tomatoes | Fruits except pineapple |

Culture and Processing of

Fish, including prawns and eels Crustaceans, reptiles and amphibians

Cattle Farming, Meat processing and the Processing of by-products

Dairy farming and/or production of dairy products from locally produced materials

Apiculture and the Processing of Honey and other by-products

Silkworm Culture and the Production of Silk

Integrated Coconut Processing Producing a combination of the following products-

Coir products
Hardboard
Desiccated coconut
Coconut shell flour
Coconut cream
Activated carbon
Any other approved products

Processing of Hides

Processing of Agriculture Waste and by-products

**Manufacture of wood-products**

Chipboard (80% export)
Softboard (80% export)
Hardboard (80% export)
Knocked down furniture (80% export)
Wooden souvenirs and handicrafts
Wooden educational objects
Wooden sports equipment
Prefabricated timber houses

**Manufactured of Natural Rubber Products**

Rubberised fabrics
Conveyor belts
Transmission belts
Sporting goods of rubber Swimming accessories of rubber (80% export)
Dipped rubber products (80% export)
Inflatable rubber products (80% export)
Tyres all types (80% export)
Tubing and hoses (80% export)
Cot sheets (80% export)
Rubber mats and other moulded products (80% export)
Rubber floor tiles (80% export)
Medical and surgical rubber products (80% export)

**Manufacture of the following chemicals and chemical product**

Sorbitol
Yttrium dioxide and other rare earths
Tin chemical such as stannic oxide, inorganic tin catalysts and organotin components. Basic petrochemical products such as ethylene pronylene, butadiene, benzene, toluene, paraxylene and orthoxylene. Intermediate petrochemical products such as ethylene oxide, vinyl chloride monomer, acrylonitrile, styrene caprolactam, terephthalic acid and dimethyl terephthalate.
Derivatives from hydrochloric acid :

- chlorides/oxychlorides of tin ore by-product (e.g. stannous chloride, cerium chloride, xenotime oxychlorides, etc.)

- chlorides of inorganic salts e.g. ammonium chloride, calcium oxychloride, etc.

- palm oil chemical derivatives

**Manufacture of handtools**

Axe
Pliers
Screw Drivers
Wrenches
Hammers
Pincers
Riveting Tools

Manufacture of machinery and component parts of the following

Ball bearings
Machine tools
Tooling including dies and moulds machinery, all types including antipollution devices
Woodworking tools
Refrigerators (80% export)
Air-conditioners (80% export)
Typewriters (80% export)
Calculators (80% export)
Dictaphones (80% export)
Cash registers (80% export)
Accounting machines (80% export)
Power driven handtools (80% export)

Manufacture/Assembly of transport equipment parts and components thereof

Outboard motors (80% export)
Pleasure crafts (80% export)
Hovercrafts
Helicopters and other light aircrafts

Manufacture of components, accessories, spare parts, supplies, fittings for motor vehicles

Parts and fittings for the following :

Engine
Transmission system
Suspension system

Braking system excluding brake linings and clutch facings)
Pollution control devices
Other rubber parts and fittings

**Manufacture of professional scientific measuring and controlling equipment parts and components thereof (80% export)**

Surgical and dental instruments, Scientific instruments of all types
Scientific/medical equipment

**Manufacture of photographic and optical goods, parts and components thereof (80% export)**

Cameras, all types
projectors, all types
Lenses
Binoculars
Telescopes
Microscopes
Other photography devices

**Manufacture of watches and clocks, parts and components thereof (80% export)**

**Manufacture of musical instruments parts, and components thereof (80% export)**

**Manufacture of footwear (80% export)**

Footwear, all types

**Manufacture of non-metallic mineral products**

Manufacture of glass products e.g. technical/special glass products for use in the electronics, pharmaceutical and chemical industries; decorative glassware (80 export)
Manufacture of clay products e.g. ceramic artware (80% export), ceramic insulators and ceramic tableware.

**Manufacture of toys**

Toys - all types

Source : Directory of Federation of Malaysian Manufacturers. 1982

## APPENDIX 3.8.5

PRIORITY PRODUCTS

A list of 'priority products' have been approved by the Minister of Trade and Industry and the Minister of Finance, These includes :

Manufacture of wooden, metal, plastic, rubber and textile

Manufacture from padi husks and straw

(a) Gazetted in 1970

Manufacture of food products

Fruit canning excluding pineapple canning, vegetable canning

Meat canning including meat, poultry, game and preparation thereof but excluding chicken and mutton curries

Manufacture of animal feedstuffs

• Pineapple waste and bran

Manufacture of wood products

• Fibre board, Chip board, Soft board, Hardboard

**Manufacture of rubber products**

- Rubberised fabrics, Conveyor belts, transmission belts V-type belts

- Rubber insulated and braided cables

**Manufacture of chemicals and chemical products**

- Titanium dioxide

**Manufacture of hardware tools**

- Axes, Pilers
- Screw drivers
- Spanners
- Riveting tools
- Hammers, Pincers

**Manufacture of Industrial machinery and parts**

- Ball bearing
- Machine tools
- Industrial machinery, all types

**Manufacture of transport equipment**

- Outboard motors
- Pleasure craft

**Manufacture of components, accessories, spare parts, fitting for motor vehicles**

- Accessories, all type
- Bus and motor car seat frames

- Components, accessories, spare parts, supplies and fittings for tractors and other earth-moving plants
- Parts and fittings for the engine
- Parts and fittings for the suspension system
- Parts and fittings for the transmission system
- Parts and fittings for the steering system
- Parts and fittings for the braking system
- Parts and fittings for the exhaust system
- Parts and fittings for the cooling system
- Parts and fittings for the electrical system
- Parts and fittings for the window and wind-Screens
- Parts and fittings for trim, upholstery, dashboard and
- Parts and fittings for chassis and body
- Rubber parts and fittings

**Assembly/Manufacture of Electronic Components/ Equipments**

- Transformers and coils
- Loud speakers
- Printed circuit boards
- Electron tubes
- Transistors and diodes (semi-conductors)
- Fixed and variable resistors, all types
- Fixed and variable capacitors, all types
- Connectors
- Relays
- Switchers
- Ferrite cores and rods
- Electronic computer components
- Electronic calculating machine
- Components
- Radios, all types

- Amplifiers
- Tape recorders
- Telephone switching equipment

Manufacture of electrical appliances equipment/ components

- Tubular heating elements
- Electric hot plates
- Ventilating fans, food mixers, high rupturing capacity fuses/cartridges, electric motor starters/contractors battery separators, caps for incandescent and fluorescent lamps

(b) Gazetted in 1972

Manufacture of refrigerating exhaust, ventilating and in conditioning machinery

- Room air conditioners
- Compressors and parts and components of air-conditioners 90% of which is for export

(c) Gazetted in 1973

Primary Iron and steel-milling (by Integrated process)

- Cast pig iron
- Steel ingots or billets
- Mild steel round bars
- Mild steel angle bars
- Mild steel flat bars
- High tensile deformed bars
- Wire rods

(d) Gazetted in 1975

**Manufacture of Wood Products**

- Knock-down furniture
- Wooden souvenir and handicraft items
- Wooden educational objects
- Turned wood objects
- Rayon
- Pulp and paper

**Manufacture of Natural Rubber Products**

- Swimming accessories of rubber (90% for export)
- Sporting goods of rubber
- Dipped rubber products (90% for export)
- Inflatable rubber products (90% for export)
- Tyres - all types (90% for export)
- Rubber shoes and boots (90% for export)
- Rubber masterbatch (90% for export)
- Tubing /hoses (90% for export)
- Cot sheets (90% for export)
- Rubber mats and other moulded rubber products (90% for export)
- Rubber floor tiles (90% for export)
- Medical and surgical rubber products (90% for export)

**Manufacture of Chemicals and Chemical Products**

- Upgrading of ilmenite and rutile
- Palm oil derivatives in finished products

**Manufacture of Agricultural Implements**

- Cangkul
- Spade
- Rake
- Tajak
- Sickle
- Tuai
- Tapping knives

**Primary Iron and Steel Milling (By Integrated Process)**

- Sponge iron
- Steel blooms and slabs
- Hot rolled structural sections such as I-steel, channel steel, I-steel and H-steel
- Steel plates
- Hot rolled coils
- Cold rolled coils

**Steel Castings and Ferro Alloys**

- Alloyed steel castings
- Ferro-silicon
- Ferro-manganese
- Ferro-silico-manganese
- Ferro-chromium

**Manufacture of Electronic and Electrical Components and Products (90% for Export)**

- Television sets
- Electronic computers
- Weather communication equipment

- Hearing aids
- Walkie-Talkie sets
- Radiograms/stereograms
- Gramaphones/record players/record changers
- Fish finders
- Testing meters and instruments
- Telephone and telegraph line systems
- Telecommunication equipment including radio and T.V.
- Broadcasting equipment X-ray apparatus
- Integrated circuits
- Television picture tubes
- Valves
- Volume/tone controls
- Potentiometers
- Tuners for T.V.sets
- Antenna and oscillating coils
- Peaking coils
- Magnetic head coils/recording heads
- Input, output, vertical and horizontal transformers, and chokers for radios, TV sets and amplifiers
- Memory planes/units
- Earphone
- Modules
- Magnetic audio tape cassette reels
- Parts for hearing aids
- Speakers
- Microphones
- Circuit packers
- Telephone amplifiers
- Matrix planes
- Memory core arrays and its components
- Digital heads
- Magnetic advice for digital and other computer memory system

- Plastic moulded cabinets
- Plastic knobs
- Radio chassis
- Coil formers
- T.V. aerials
- Radiogram/stereogram chassis
- Electronic measuring equipment
- Electronic heaters
- Computing scales
- Timers
- Digital clocks
- Transducers
- Miniature (micro) motors
- Counter
- Card readers
- Automatic gate systems
- A-D, D-A converters
- Scanners
- Annuciators
- Shift registers
- Sequence programmers
- Automatic fare collection systems
- Automatic traffic control systems
- Automatic vending systems
- Automatic parking fee collection systems
- Automatic cytological analysers

The following products of Integrated manufacture:

- fans
- vacuum cleaners
- cooking and kitchen wares
- shavers
- hair dryers
- fractional horsepower motors

Leather cases and plastic and metal parts for transistor radios

- Tools and dies for electronic industries
- Hi-fi stereo and cassette players

**Manufacture of Machinery (90% for export)**

- Refrigerators
- Air-conditioners (package unit and automobile)
- Typewriters
- Calculators
- Dictaphones
- Cash registers
- Accounting machines
- Machine tools and mechanical precision measuring equipment
- Power driven hand tools

**Manufacture of Professional, Scientific, Measuring and Controlling Equipment (90% for export)**

- Surgical and dental instruments and equipments
- Hearing aids
- Scientific gauges of all types

Manufacture of Photographic and Optical Goods (90% for Export)

- Cameras - all types
- Projectors - all types
- Lenses
- Binoculars
- Telescope magnifying glass and microscopes

**Manufacture of Watches and Clocks (90% for export)**

Watches - all types
Clock - all types

**Manufacture of Musical Instruments (90% for Export)**

Musical instruments - all types

(e) Gazetted in 1979

**Manufacture of Electronics and Electrical Components and Products (90% for Export)**

TV deflection yoke
Flyback transformer
Electric automatic pencil sharpener
Vacuum cleaner for motorcars
Electric home water pumps

## APPENDIX 3.8.6

## PRICES OF INDUSTRIAL LAND IN PENINSULAR MALAYSIA

### A) PULAU PINANG

1) THE INDUSTRIAL ZONE OF BAYAN LEPAS, NEW SELLING PRICES FOR INDUSTRIAL LAND ARE AS FOLLOWS :-

| LOCATION | PRICE (P.S.M.) | | INCREASE | REMARKS |
|---|---|---|---|---|
| | 1-1-1981 | 1-1-1983 | (%) | |
| a) FREE TRADE ZONE | $32 | $48 | 22.5 | - |
| b) NON-FREE TRADE ZONE | $31 | $37 | 9.2 | FOR MANUFACTURING INDUSTRIES |

2) SEBERANG PERAI UTARA

| LOCATION | LAND AREA (S.M.) | BUILD-UP AREA (S.M.) | SELLING PRICE ($) | PRICE P.S.M ($) | REMARKS |
|---|---|---|---|---|---|
| 1) MAK MANDIN INDUSTRIAL ESTATE | 2,374 | 478 | 450,000 | 54 | ALL THE INDUSTRIAL PROPERTIES SITUATED HERE ARE AS PURPOSE BUILT AND OWNER OCCUPIED EXCEPT FOR THE FEW UNITS BUILT BY THE MIEL |
| 2) JALAN PERMATANG PAUH AND JALAN SUNGAI NYIOR | 270 - 400 | 166 - 225 | 240,000 - 290,000 | | 2-STOREY LIGHT INDUSTRIAL BUILDINGS |
| IN 1982 | 195 | | 250,000 | | STANDARD LOTS |
| | | | 260,000 - 350,000 | | CORNER LOTS WITH EXTRA LAND 223 - 450 S.M. |

APPENDIX 3.8.6 (CONT)

A) PULAU PINANG (CONT)

3) SEBERANG PERAI TENGAH
PERAI INDUSTRIAL ESTATE

| LOCATION | RENTAL PRICE (P.S.M.) |
|---|---|
| 1) NON-FREE TRADE ZONE | |
| PHASE 1 | 30.15 |
| PHASE 2 | 27.45 |
| BULK CARGO TERMINAL AREA | 43.00 |
| RAILWAY SIDING AREA | 43.00 |
| 2) FREE TRADE ZONE | |
| PHASE 1 | 33.90 |
| PHASE 2 | 30.15 |

## APPENDIX 3.8.6 (CONT)

### B) PERAK

| TOWN | LOCALITY | PRICE (P.S.M.) 1982 ($) | 1983 ($) | INCREASE (%) | REMARKS |
|---|---|---|---|---|---|
| 1) IPOH | TASEK INDUSTRIAL ESTATE | 48 | 65.75 | 46 | 94 YEARS UNEXPIRED DEVELOPED & BUILT UPON |
| | TAMAN MERU INDUSTRIAL ESTATE | 38 | 38 | - | 60 YEARS LEASE PR. FIXED BY STATE DEVELOPEMENT CORPORATION |
| | SILIBIN INDUSTRIAL ESTATE | 34 ( BUMIPUTERA ) | 34 | - | 60 YEARS LEASE PR. FIXED BY STATE DEVELOPEMENT CORPORATION |
| | | 38 ( NON-BUMIPUTERA ) | 38 | - | |
| | JALAN AERODROME INDUSTRIAL ESTATE AREA | 64 (*) | 64 (*) | - | 60 YEARS LEASE PR. FIXED BY STATE DEVELOPEMENT CORPORATION * DOES NOT INCLUDE INFRASTRUCTURE. INFRASTRUCTURE COSTS ANOTHER $12 P.S.M. |
| 2) SITIAWAN | KAMPUNG ACHEH INDUSTRIAL AREA | 10 | 16 (*) | 60 | 60 YEARS LEASE PR. FIXED BY STATE DEVELOPEMENT CORPORATION * HIGHER PRICE FIXED TO INCLUDE ESTIMATED PARTIAL INFRASTRUCTURE COST LIKE THE PROVISION OF WATER AND ELECTRICITY WHICH ARE EXPECTED TO BE INCURRED IN THE FUTURE. (NO INFRASTRUCTURE AT THE MOMENT) 557 h.a. STILL AVAILABLE |
| | SERI MANJUNG INDUSTRIAL ESTATE | - | 40.43 | - | 60 YEARS LEASE PR. FIXED BY STATE DEVELOPEMENT CORPORATION NEW PROJECT OPEN FOR BOOKING IN 1983. (TOTAL AREA = 26.58 h.a.) |

APPENDIX 5.8.6 (CONT)

B) PERAK (CONT)

| TOWN | LOCALITY | PRICE (P.S.M.) 1982 ($) | PRICE (P.S.M.) 1983 ($) | INCREASE (%) | REMARKS |
|---|---|---|---|---|---|
| 3) TAIPING | KAMUNTING INDUSTRIAL ESTATE TAMBAHAN | 11 | 16 (*) | 45 | 60 YEARS LEASE<br>PR. FIXED BY STATE DEVELOPEMENT CORPORATION<br>PREMIUM ON LAND TO BE PAID BY BUYER<br>* HIGHER PRICE FIXED IN VIEW OF ADITIONAL DEVELOPEMENT COST INCURRED IN 1983.<br>2.43 h.a. STILL AVAILABLE. |
| | TUPAI INDUSTRIAL AREA PHASE III (LIGHT INDUSTRIAL USE) | | 38 (*) | - | NEW PROJECT STARTED IN 1983<br>TOTAL AREA 12.83 h.a.<br>60 YEARS LEASE<br>PR. FIXED BY STATE DEVELOPEMENT CORPORATION<br>PREMIUM ON LAND TO BE PAID BY BUYER<br>* HIGHER PRICE FIXED BECAUSE OF HIGH DEVELOPEMENT COST |
| 4) PARIT BUNTAR | PARIT BUNTAR INDUSTRIAL AREA | 11 | 16 (*) | 45 | 60 YEARS LEASE<br>PR. FIXED BY STATE DEVELOPEMENT CORPORATION<br>* HIGHER PRICE FIXED IN VIEW OF ADDITIONAL DEVELOPMENT COST INCURRED IN 1983<br>31.7 h.a. STILL AVAILABLE |
| 5) KUALA KANGSAR | KUALA KANGSAR INDUSTRIAL AREA | 11 | 16 (*) | 45 | 60 YEARS LEASE<br>PR. FIXED BY STATE DEVELOPEMENT CORPORATION<br>* HIGHER PRICE FIXED IN VIEW OF ADDITIONAL DEVELOPMENT COST INCURRED IN 1983<br>7.52 h.a. STILL AVAILABLE |

APPENDIX 3.8.6 (CONT)

C) SELANGOR

| LOCATION | LAND AREA (S.M.) | PRICE (P.S.M.) 1982 ($) | PRICE (P.S.M.) 1983 ($) | REMARKS |
|---|---|---|---|---|
| 1) SHAH ALAM | | | | |
| LORONG BEREMBAN I | 2,388 | 215 | — | WITH FACTORY |
| LOT 37 | | | | |
| LORONG BEREMBAN I | 2,555 | 215 | — | WITH FACTORY |
| LOT 36 L.O. 7/65 | 1,979 | — | 300 | WITH FACTORY |
| L.O. 7/65 | 2,309 | — | 300 | WITH FACTORY |
| H.S. (D.) 66 | 20,234 | — | 300 | - |
| JALAN PERBANDARAN 3/5 | 24,281 | — | 270 | WITH FACTORY |
| 2) PETALING JAYA | | | | |
| JALAN S51A/227 L.O.7 | 1,486 | 320 | — | WITH FACTORY |
| LORONG S51A/227 C.L.011 | 1,538 | 480 | — | WITH FACTORY |
| LORONG S51A/223 LL.0.34 | 5,932 | 410 | — | - |
| JALAN S51A/222 PJ 294/66 | 5,932 | 430 | — | WITH FACTORY |
| SEC. 13 LOTS 62 & 63 | 12,550 | 380 | — | WITH FACTORY |
| JALAN S51A/222 L.O.3 | 4,047 | 430 | — | WITH FACTORY |
| LOT 27 SEC. 13/5, JLN. KEMAJUAN | 8,336 | | 400 | WITH FACTORY |
| LOT 29 SEC.13 | 6,237.14 | | 505 | - |
| LOT 16 JALAN 241 | 4,806.7 | | 430 | WITH FACTORY |
| LOT 22 JALAN 19/1 | 8,357 | | 490 | - |
| LOT 14 LG. 51A/227C | 1,486 | | 500 | - |

APPENDIX 3.8.6 (CONT)

D) WILAYAH PERSEKUTUAN

| LOCATION | SELLING PRICE ($) | AREA (S.M.) | PRICE P.S.M. | REMARKS |
|---|---|---|---|---|
| TEH WAN SANG INDUSTRIAL AREA, JALAN SEGAMBUT | 1,400,000 - 1,700,000 | | | SELLING PRICE DEPENDS ON SIZE, SHAPE, FINISHES & DESIGN |
| KEPONG AREA | 980,000 - 2,050,000 | 1,394 - 2,323 | INCREASED BY 13% AS COMPARED TO 1982 PRICE | PRICES DEPEND ON LOCATION, SIZE, DESIGN & INTERNAL FINISHES |
| TAMAN WAHYU | | 334 (BUILT-UP AREA = 263) | | |

APPENDIX 3.8.6 (CONT)

E) NEGERI SEMBILAN

| INDUSTRIAL AREA | LOCATION | TYPE OF INDUSTRY | TOTAL AREA (h.a.) | AREA OF LOT (h.a.) | YEAR OF COMPLETION | DEVELOPER | LEASEHOLD (NO. OF YEARS) | DEVELOPER'S SELLING PRICE (P.S.M.) ($) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 1) SENAWANG | 6 1/2 KM TO THE SOUTHEAST OF SEREMBAN TOWN | MIXED | 142 | 0.81 (8,093.72) | 1975 | PKNNS | 99 | LAND @ 64.58<br>BUILDING @ 269.00 | ALL LOTS HAVE BEEN SOLD |
| 2) NILAI | 3 KM OUTSIDE NILAI TOWN, DISTRICT OF SEREMBAN | HEAVY | 121 | 1.61 - 20.2 | 1983 | PKNNS | 60 | 22.00 | ALL LOTS HAVE BEEN SOLD |
| 3) DIOH | NEAR KUALA PILAH TOWN | LIGHT | 23 | 0.4 - 1.61 | 1975 | PKNNS | 99 | 5.50 | VACANT LOT STILL AVAILABLE AT $5.50 P.S.M. |
| 4) CHEMBONG | 5 KM FROM REMBAU TOWN | LIGHT | 44.5 | 0.4 - 1.2 | 1981 | PKNNS | 60 | 13.00 (BUMIPUTRA)<br>20.50 (NON-BUMIPUTRA) | 709 SOLD OUT THERE ARE 3 FACTORIES IN OPERATION |
| 5) SUNGAI GADUT | 11 KM TO THE SOUTH-EAST OF SEREMBAN TOWN IN THE MUKIM OF REMBAU | LIGHT | 48.6 | 1.68 - 12.1 | 1981 | PKNNS | 66 | 5.50 (BUMIPUTRA)<br>12.50 (NON-BUMIPUTRA) | |
| 6) SIMPANG PENTANG | OUTSIDE THE VILLAGE OF SIMPANG PENTANG, DISTRICT OF JELEBU | LIGHT | 30.4 | 0.4 - 1.2 | 1981 | PKNNS | 60 | 11.00 | MANY LOTS STILL VACANT. ONLY 2 LOTS WERE SOLD. |

## APPENDIX 5.8.6 (CONT)

### f) JOHOR

| DISTRICT/LOCATION | SITE AREA (h.a.) | PRICE (P.S.M.) 1982 ($) | 1983 ($) | INCREASE (%) | REMARKS |
|---|---|---|---|---|---|
| 1) JOHOR BAHRU | | | | | |
| JALAN SKUDAI (7.5 KM) | 0.1 - 0.2 | 110 - 130 | 130 - 178 | 28 | FREEHOLD |
| TAMPOI/LARKIN | 0.2 - 0.4 | - | 90 - 110 | - | LEASEHOLD |
| | 0.4 - 2.0 | 48 - 75 | 48 - 75 | - | LEASEHOLD |
| | 0.2 - 0.8 | - | 65 - 75 | - | FREEHOLD |
| PASIR GUDANG INDUSTRIAL ESTATE (980 h.a.) | ABOVE 0.4 | 43 - 54 | 48 - 65 | 16 | LEASEHOLD PREMIUM |
| SENAI INDUSTRIAL ESTATE | 0.2 - 1.62 | 32 - 38 | 36 - 43 | 16 | LEASEHOLD PREMIUM |
| 2) KOTA TINGGI | | | | | |
| KOTA TINGGI INDUSTRIAL ESTATE | 1 - 2 | 43.0 | 43.0 | - | LEASEHOLD PREMIUM |
| BANDAR TENGGARA (116.1 h.a.) | 0.4 - 1.2 | 8.5 | 8.5 | - | LEASEHOLD PREMIUM |
| BANDAR PENAWAR (28.7 h.a.) | 1.6 - 4.04 | 7.5 | 7.5 | - | (DEVELOPED AREAS) |
| INDUSTRIAL ESTATES | ABOVE 4.04 | 5.5 | 5.5 | - | 72.4 h.a. & 2.02 h.a. |
| 3) BATU PAHAT | | | | | |
| TONGKANG PECAH INDUSTRIAL ESTATE (15.4 h.a.) | - | - | - | - | - |
| PARIT RAJA INDUSTRIAL ESTATE (37.7 h.a.) | - | 27 - 32 | 32 - 38 | 19 | LEASEHOLD PREMIUM |
| SERI GADING INDUSTRIAL ESTATE (121.5 h.a.) | - | 38 | 38 | - | LEASEHOLD PREMIUM |
| 4) MUAR | | | | | |
| TANJUNG AGAS INDUSTRIAL ESTATE (78.5 h.a.) | 0.4 - 0.6 | 27 - 38 | 32 - 38 | 8 | LEASEHOLD PREMIUM |
| 5) SEGAMAT | | | | | |
| SEGAMAT INDUSTRIAL ESTATE | - | 38 - 43 | 38 - 43 | - | LEASEHOLD PREMIUM |
| 6) KELUANG | | | | | |
| KELUANG INDUSTRIAL ESTATE (52.2 h.a.) | - | 38 | 38 | - | LEASEHOLD PREMIUM |
| JALAN MERSING | 4 | 6.20 - 8.50 | 7.40 - 12.30 | 34 | FREEHOLD |
| JALAN HAJI MANAN | 0.1 - 0.2 | 59 | 59 | - | 60 YRS. UNEXPIRED TERM |
| JALAN YAP TAN SOH | 0.1 - 0.2 | 70 - 75 | 70 - 75 | - | 90 YRS. UNEXPIRED TERM |

APPENDIX 3.8.6 (CONT)

G) PAHANG

| SCHEME | PRICE (P.S.M.) 1982 ($) | PRICE (P.S.M.) 1983 ($) | INCREASE (%) | NO. OF LOTS SOLD IN 1983 | AREA OF LOTS SOLD IN 1983 (h.a.) | LAND SOLD TILL 1983 (%) |
|---|---|---|---|---|---|---|
| 1) EAST PAHANG | | | | | | |
| SEMAMBU (KUANTAN) | 48 | 97 | 102 | - | - | 90 |
| PERAMU (PEKAN) | 11 | 13 | 18 | 1 | 8.26 | 78 |
| MARAN | 15 | 22 | 47 | 1 | 0.61 | 77 |
| GEBENG (PORT AREA) | 38 | 43 | 13 | 1 | 0.27 | 24 |
| 2) WEST PAHANG | | | | | | |
| SONGSANG (TEMERLOH) | 14 | 24 | 71 | 1 | 1.21 | 86 |
| JERANTUT | 18 | 26 | 44 | 2 | 0.91 | 44 |
| BENTONG | 43 | 65 | 51 | 2 | 3.70 | 38 |

APPENDIX 3.8.6 (CONT)

H )TERENGGANU

| DISTRICT | INCREASE (%) | PRICE (P.S.M.) 1982 ($) | 1983 ($) | INCREASE (%) | PRICE (P.S.M.) 1982 (h.a.) | 1983 (h.a.) |
|---|---|---|---|---|---|---|
| 1) KUALA TERENGGANU | GONG BADAK | 20 | 20 | - | 15.0 | 0.6 |
| | KUALA IBAI | 27 | 30 | 11 | 0.8 | 0.8 |
| 2) KEMAMAN | JAKAR (PHASE 1) | 27 | 30 | 11 | 5.2 | 1.9 |
| | JAKAR (PHASE 2) | 27 | 38 | 41 | 1.3 | 0.8 |
| 3) DUNGUN | DUNGUN | 30 | 33.5 | 12 | 5.5 | 3.0 |

SOURCE: MINISTRY OF FINANCE, MALAYSIA, PROPERTY MARKET REPORT 1983

APPENDIX 4.2.1

## INCOME AND SIZE ELASTICITIES BY INDUSTRIAL BRANCH, 1970-1978

| *Branch (ISIC)* | *Large countries* | | *Small countries* | | | | | | *Centrally planned economies* | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | *With modest resources* | | *With ample resources and* | | | | | |
| | | | | | *Primary orientation* | | *Industrial orientation* | | | |
| | *Income* | *Size* | *Income* | *Size* | *Income* | *Size* | *Income* | *Size* | *Income* | *Size* |
| Food products (311/2) | 1.09 | −0.18 | 1.09* | 0.10† | 0.22 | −0.18 | 0.77 | 0.21 | 0.66* | −0.10* |
| Beverages (313) | 1.17 | −0.65 | 0.88† | 0.27 | 0.46 | −0.20 | 0.74 | −0.29 | 0.74 | −0.16 |
| Tobacco (314) | 0.61 | −0.22 | 0.74 | 0.14† | 1.22 | 0.19 | 0.55 | −0.32 | −0.62 | −0.39 |
| Textiles (321) | 0.93 | −0.08† | 1.18 | 0.86 | 0.09 | 0.57 | 0.74 | 0.40 | 0.60 | −0.08† |
| Wearing apparel (322) | 1.49 | −0.33 | 1.41 | −0.16* | 0.72† | −0.33 | 0.81 | −0.11 | 0.11 | 0.12 |
| Leather and fur products (323) | 1.23 | −0.23 | 1.10* | 0.06* | 0.36 | 0.09* | 0.56 | 0.04* | 0.70 | −0.16 |
| Footwear (324) | 1.26 | −0.22 | 0.88* | 0.04* | 0.80* | −0.05* | 0.66 | 0.01* | 0.70 | 0.03* |
| Wood and cork products (331) | 1.21 | −0.06* | 1.23 | −0.12* | 0.72† | −0.46 | 1.14 | 0.38 | 0.40 | −0.11 |
| Furniture and fixtures excluding metal (332) | 1.57 | −0.07* | 1.47 | −0.28 | 0.75† | −0.29 | 1.20 | −0.08† | 0.53 | −0.11 |
| Paper (341) | 1.61 | 0.06* | 1.10* | 0.43 | 0.71 | 0.11* | 1.38 | 0.17 | 1.03* | −0.17 |
| Printing and publishing (342) | 1.58 | 0.03* | 1.41 | 0.36 | 0.65 | −0.54 | 1.41 | −0.01* | 1.74 | −0.04* |
| Industrial chemicals (351) | 1.63 | 0.15† | 1.45 | 0.53 | 1.82 | 0.05* | 1.08† | 0.54 | 1.28 | −0.00* |
| Other chemicals (352) | 1.26 | 0.16 | 1.58 | 0.89 | 1.71 | 0.22 | 0.84 | 0.39 | 1.36* | −0.38 |
| Petroleum refineries (353) | 1.13 | −0.35 | 1.30 | −0.29 | 1.62 | 0.03* | 0.53 | 0.32 | 0.97* | −0.57 |
| Miscellaneous products of petroleum and coal (354) | 0.61 | −0.15† | 2.08 | −1.65 | 1.04* | 0.25 | 1.59 | −0.03* | 0.20 | 0.47 |
| Rubber products (355) | 1.39 | −0.03 | 1.94 | 1.24 | 0.68 | 0.13† | 0.73 | −0.52 | 1.86 | −0.25 |
| Plastic products (356) | 1.65 | −0.11† | 1.87 | 0.72 | 0.72 | 0.19 | 1.21 | −0.10 | 1.49 | −0.19 |
| Pottery, china and earthenware (361) | 1.23 | 0.15 | 0.56 | −0.78 | 1.15 | −0.20 | 1.12† | 0.12† | 1.38 | 0.18 |
| Glass (362) | 1.35 | −0.26 | 1.87 | 0.20* | 1.65 | 0.41 | 1.25 | −0.15 | 1.52 | −0.08* |
| Other non-metallic mineral products (369) | 1.31 | −0.15 | 1.09* | 0.24 | 0.61 | −0.12 | 1.06† | 0.08 | 0.39 | 0.14 |
| Iron and steel (371) | 1.60 | 0.14 | 1.58 | 0.65 | 0.70 | 0.43 | 1.58 | −0.31 | 1.09* | [illegible] |
| Non-ferrous metals (372) | 1.34 | −0.17 | 1.66 | 0.80 | −0.20 | −0.03* | 1.42 | 0.27 | 0.53 | 0.07 |
| Metal products, excluding machinery (381) | 1.54 | −0.07 | 1.49 | 0.57 | 0.94* | −0.12 | 1.17 | 0.10 | 0.83 | −0.05* |
| Non-electrical machinery (382) | 1.92 | 0.35 | 1.82 | 0.49 | 1.58 | −0.10* | 1.77 | 0.11 | 1.24 | −0.41 |
| Electrical machinery (383) | 1.85 | 0.31 | 2.38 | 0.98 | 0.51 | −0.02* | 1.36 | 0.22 | 1.28 | −0.02* |
| Transport equipment (384) | 1.84 | 0.07* | 2.18 | 0.75 | 1.34* | 0.18 | 1.28 | 0.23 | 1.23 | 0.49 |
| Professional and scientific equipment, photographic and optical goods (385) | 2.08 | 0.42 | 1.97 | −0.16* | 0.66 | −0.63 | 2.01 | −0.49 | 1.68 | −1.11 |
| Other manufactures (390) | 1.22 | 0.17 | 1.03* | 0.20 | 0.84* | −0.32 | 1.48 | −0.58 | −1.14 | −0.07 |

*Source:* UNIDO data base with data supplied by the Statistical Office of the United Nations Secretariat.

*Note.* Elasticities of per capita value added in 1975 dollars with respect to income (per capita GDP in 1975 dollars) and size (population) were derived from regressions on the basis of pooled annual cross-country samples. The regression coefficients which represent the income (size) elasticities described above were, in general, significantly different from 1 (0) at the 5 per cent level. Exceptions are marked by † (*). If the corresponding significance level was less than (greater than) 10 per cent. For a description of the econometric techniques used, see J. Johnston, *Econometric Methods* (New York, McGraw Hill, 1960), pp. 106-144.

APPENDIX 4.2.2

PROJECTED PER CAPITA GDP GROWTH BASED ON EPU PROJECTIONS

| YEAR | POPULATION (MILLION) | GDP PER CAPITA ($) 1970 CONSTANT PRICE LOW | MEDIUM | HIGH |
|---|---|---|---|---|
| 1985 | 15.55 | 2,299.61 | 2,299.61 | 2,291.61 |
| 1986 | 15.91 | 2,382.40 | 2,404.90 | 2,427.40 |
| 1987 | 16.28 | 2,467.94 | 2,514.74 | 2,562.04 |
| 1988 | 16.65 | 2,557.84 | 2,630.99 | 2,705.53 |
| 1989 | 17.03 | 2,650.79 | 2,752.32 | 2,856.78 |
| 1990 | 17.46 | 2,740.61 | 2,872.45 | 3,009.34 |
| 1991 | 17.88 | 2,836.80 | 3,001.34 | 3,173.71 |
| 1992 | 18.31 | 2,936.37 | 3,135.99 | 3,347.13 |
| 1993 | 18.75 | 3,039.52 | 3,276.75 | 3,530.08 |
| 1994 | 19.20 | 3,145.35 | 3,423.96 | 3,723.13 |
| 1995 | 19.66 | 3,257.12 | 3,577.92 | 3,926.91 |

SOURCE : PROVIDED BY EPU

APPENDIX 4.2.3

GDP & GDCF TIME SERIES, 1970 - 1983

| YEAR | (1970 CONSTANT PRICE $ MILLION) | |
|---|---|---|
| | GDP | GDCF |
| 1970 | 12,308 | 2,169 |
| 1971 | 13,016 | 2,609 |
| 1972 | 14,238 | 2,995 |
| 1973 | 15,904 | 3,489 |
| 1974 | 17,227 | 4,252 |
| 1975 | 17,365 | 3,936 |
| 1976 | 19,373 | 4,133 |
| 1977 | 20,875 | 4,736 |
| 1978 | 22,264 | 5,119 |
| 1979 | 24,324 | 5,851 |
| 1980 | 26,228 | 7,186 |
| 1981 | 28,092 | 8,837 |
| 1982 | 29,677 | 9,800 |
| 1983 | 31,387 | 9,984 |

SOURCE : PROVIDED BY EPU

APPENDIX 5.2.1

SOURCES OF GROWTH OF MACHINERY AND EQUIPMENT SECTOR

| YEAR | OUTPUT (Y) | IMPORTS (M) | EXPORTS (X) | DOMESTIC DEMAND | v = Y/D | m = M/D | x = X/D | YEAR | DOMESTIC DEMAND EXPANSION | IMPORT SUBSTITUTION | EXPORT EXPANSION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1968 | 34,939,000 | 60,132,490 | 4,582,920 | 90,488,570 | 0.386115 | 0.664531 | 0.050646 | | | | |
| 1973 | 131,552,000 | 115,275,369 | 6,349,188 | 240,478,181 | 0.547043 | 0.479359 | 0.026402 | 1968-1973 | 0.5994 | 0.4609 | (0.0603) |
| 1978 | 198,854,000 | 386,541,981 | 16,279,928 | 569,116,053 | 0.349409 | 0.679197 | 0.028606 | 1973-1978 | 2.6712 | (1.6899) | 0.0186 |
| 1981 | 491,210,000 | 617,630,663 | 17,486,646 | 1,091,352,017 | 0.450093 | 0.565932 | 0.016023 | 1978-1981 | 0.6241 | 0.4228 | (0.0470) |
| | | | | | | | | 1973-1981 | 1.2942 | (0.2627) | (0.0315) |

SOURCE: DERIVED FROM SECTION III AND APENDICES 5.2.6 & 5.2.7

APPENDIX 5.2.2

SOURCES OF GROWTH OF ENGINES AND TURBINES SECTOR

| YEAR | OUTPUT (Y) | IMPORTS (M) | EXPORTS (X) | DOMESTIC DEMAND | v = Y/D | m = M/D | x = X/D | YEAR | DOMESTIC DEMAND EXPANSION | IMPORT SUBSTITUTION | EXPORT EXPANSION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1968 | N.A. | 17,523,036 | 1,368,757 | 16,154,279 | 0.000000 | 1.084730 | 0.084730 | | | | |
| 1973 | 8,830,000 | 17,973,661 | 1,026,296 | 25,777,365 | 0.342549 | 0.697265 | 0.039814 | | | | |
| 1978 | 18,044,000 | 195,128,819 | 3,343,277 | 209,829,542 | 0.085994 | 0.929940 | 0.015933 | 1973-1978 | 6.8425 | (5.2987) | (0.5438) |
| 1981 | 9,561,000 | 200,087,852 | 2,350,985 | 207,297,867 | 0.046122 | 0.965219 | 0.011341 | 1978-1981 | 0.0257 | 0.8621 | 0.1122 |
| | | | | | | | | 1973-1981 | 85.0610 | (75.9867) | (8.0743) |

SOURCE: DERIVED FROM SECTION III

APPENDIX 5.2.3

SOURCES OF GROWTH OF AGRICULTURAL MACHINERY SECTOR

| YEAR | OUTPUT (Y) | IMPORTS (M) | EXPORTS (X) | DOMESTIC DEMAND | v = Y/D | m = M/D | x = X/D | YEAR | DOMESTIC DEMAND EXPANSION | IMPORT SUBSTITUTION | EXPORT EXPANSION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1968 | N.A. | 17,991,286 | 1,207,571 | 16,783,715 | 0.000000 | 1.071949 | 0.071949 | | | | |
| 1973 | 6,725,000 | 18,903,297 | 1,447,682 | 24,180,615 | 0.278115 | 0.781754 | 0.059870 | | | | |
| 1978 | 32,818,000 | 46,544,610 | 1,614,841 | 77,747,769 | 0.422109 | 0.598662 | 0.020770 | 1973-1978 | 0.5710 | 0.5455 | (0.1165) |
| 1981 | 70,522,000 | 78,184,627 | 2,985,298 | 145,721,325 | 0.483951 | 0.536535 | 0.020486 | 1978-1981 | 0.7610 | 0.2401 | (0.0011) |
| | | | | | | | | 1973-1981 | 0.5298 | 0.5601 | (0.0899) |

SOURCE: DERIVED FROM SECTION III

APPENDIX 5.2.4

SOURCES OF GROWTH OF METAL AND WOODWORKING MACHINERY SECTOR

| YEAR | OUTPUT (Y) | IMPORTS (M) | EXPORTS (X) | DOMESTIC DEMAND | v = Y/D | m = M/D | x = X/D | YEAR | DOMESTIC DEMAND EXPANSION | IMPORT SUBSTITUTION | EXPORT EXPANSION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1968 | N.A. | 13,673,887 | 1,352,620 | 12,321,267 | 0.000000 | 1.109779 | 0.109779 | | | | |
| 1973 | 4,269,000 | 37,940,111 | 1,153,026 | 41,056,085 | 0.103980 | 0.924104 | 0.028084 | | | | |
| 1978 | 7,729,000 | 74,764,104 | 3,444,740 | 79,048,364 | 0.097776 | 0.945802 | 0.043578 | 1973-1978 | 1.1417 | (0.4957) | 0.3540 |
| 1981 | 17,911,000 | 174,018,273 | 5,089,029 | 186,840,244 | 0.095863 | 0.931375 | 0.027237 | 1978-1981 | 1.0351 | 0.2647 | (0.2998) |
| | | | | | | | | 1973-1981 | 1.1112 | (0.0996) | (0.0116) |

SOURCE: DERIVED FROM SECTION III

APPENDIX 5.2.5

SOURCES OF GROWTH OF MACHINERY A[illegible]QUIPMENT N.E.C. SECTOR

| YEAR | OUTPUT (Y) | IMPORTS (M) | EXPORTS (X) | DOMESTIC DEMAND | v = Y/D | m = M/D | x = X/D | YEAR | DOMESTIC DEMAND EXPANSION | IMPORT SUBSTITUTION | EXPORT EXPANSION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1968 | N.A. | 10,944,281 | 653,972 | 10,290,309 | 0.000000 | 1.063552 | 0.063552 | | | | |
| 1973 | 111,728,000 | 40,458,300 | 2,722,184 | 149,464,116 | 0.747524 | 0.270689 | 0.018213 | | | | |
| 1978 | 140,263,000 | 70,104,448 | 7,877,070 | 202,490,378 | 0.692690 | 0.346211 | 0.038901 | 1973-1978 | 1.3891 | (0.5359) | 0.1468 |
| 1981 | 393,216,000 | 165,339,911 | 7,063,334 | 551,492,577 | 0.713003 | 0.299804 | 0.012808 | 1978-1981 | 0.9557 | 0.1012 | (0.0569) |
| | | | | | | | | 1973-1981 | 1.0676 | (0.0570) | (0.0106) |

SOURCE: DERIVED FROM SECTION III

Appendix 5.2.6

IMPORTS AND EXPORTS FOR ENGINES & TURBINES, MALAYSIA, 1968 & 1973

| SITC CODE POST 1978 | 1968 IMPORTS $ c.i.f. | 1968 EXPORTS f.o.b. | 1973 IMPORTS $ c.i.f. | 1973 EXPORTS f.o.b. |
|---|---|---|---|---|
| 711-311-00 | NIL | 1,500 | 2,051,986 | 600 |
| 711-319-00 | NIL | 1,200 | 546,125 | 4,615 |
| 711-321-00 | 4,213,833 | NIL | 293,462 | NIL |
| 711-329-00 | NIL | 21,911 | 1,854,542 | 196,279 |
| 711-511-00 | 1,279,173 | 213,600 | 135,090 | NIL |
| 711-511-01 | NIL | NIL | 3,061,052 | 335,321 |
| 711-511-02 | NIL | NIL | 2,455,348 | 80,813 |
| 711-512-00 | 2,137,354 | 432,643 | 47,121 | NIL |
| 711-513-00 | 6.111,758 | 553,843 | 1,854,542 | NIL |
| 711-528-00 | 790,213 | 144,060 | 691,933 | NIL |
| 711-800-00 | 1,928,663 | NIL | NIL | NIL |
| 711-810-00 | NIL | NIL | 96,077 | NIL |
| 711-511-03 | 1,062,042 | NIL | 2,655,697 | 362,668 |
| 711-511-04 | NIL | NIL | 195,962 | 46,000 |
| 711-511-09 | NIL | NIL | 2,034,124 | NIL |
| | 17,523,036 | 1,368,757 | 17,973,061 | 1,026,296 |

EXPORTS AND IMPORTS FOR AGRICULTURAL MACHINERY, MALAYSIA, 1968 & 1973

| SITC CODE POST 1978 | 1968 IMPORTS $ c.i.f. | 1968 EXPORTS f.o.b. | 1973 IMPORTS $ c.i.f. | 1973 EXPORTS f.o.b. |
|---|---|---|---|---|
| 712-100-00 | 5,804,088 | 30,182 | NIL | NIL |
| 712-110-00 | NIL | NIL | 2,481,568 | 96,579 |
| 712-190-00 | NIL | NIL | 688,341 | 72,027 |
| 712-208-00 | NIL | 33,656 | 671,307 | 19,704 |
| 712-209-00 | 874,275 | NIL | 1,121,458 | 46,015 |
| 712-390-00 | NIL | NIL | 123,831 | 6,440 |
| 712-391-00 | NIL | NIL | 220 | NIL |
| 712-398-00 | NIL | NIL | 102,985 | 4,900 |
| 712-501-00 | 1,035,259 | 143,866 | 1,573,080 | 25,600 |
| 712-509-00 | 6,064,001 | 480,179 | 11,624,232 | 1,134,555 |
| 712-900-00 | 4,213,663 | 519,688 | NIL | NIL |
| 712-991-00 | NIL | NIL | 172,827 | 120 |
| 712-992-00 | NIL | NIL | 286,010 | 16,440 |
| 712-998-00 | NIL | NIL | 57,438 | 25,302 |
| | 17,991,286 | 1,207,571 | 18,903,297 | 1,447,682 |

NOTE : 1983 DATA IS FOR PENINSULAR MALAYSIA

SOURCE : D'. ASSET, v.y.

## Appendix 5.2.7

EXPORTS AND IMPORTS FOR METAL & WOODWORKING MACHINERY, MALAYSIA, 1968 & 1973

| SITC CODE POST 1978 | 1968 IMPORTS $ c.i.f. | 1968 EXPORTS f.o.b. | 1973 IMPORTS $ c.i.f. | 1973 EXPORTS f.o.b. |
|---|---|---|---|---|
| 715-100-00 | 5,865,909 | 1,114,414 | 23,810,956 | 344,621 |
| 715-231-00 | 360,922 | 31,193 | 393,323 | 79,442 |
| 712-239-00 | NIL | NIL | 593,561 | 11,617 |
| 719-520-00 | 7,447,056 | 207,013 | 13,142,271 | 717,346 |
| | 13,673,887 | 1,352,620 | 37,940,111 | 1,153,026 |

NOTE : 1983 DATA IS FOR PENINSULAR MALAYSIA

SOURCE : DS. ASSET, v.y.

EXPORTS AND IMPORTS FOR MATERIAL HANDLING EQUIPMENT, MALAYSIA, 1968 & 1973

| SITC CODE POST 1978 | 1968 IMPORTS $ c.i.f. | 1968 EXPORTS f.o.b. | 1973 IMPORTS $ c.i.f. | 1973 EXPORTS f.o.b. |
|---|---|---|---|---|
| 719-373-00 | 2,504,361 | 77,028 | 13,734,573 | 716,906 |
| 719-312-00 | 1,847,549 | 75,910 | 1,615,437 | 33,875 |
| 719-319-00 | NIL | NIL | 8,935,672 | 610,580 |
| 719-311-00 | 6,592,371 | 501,034 | NIL | 8,000 |
| 719-311-10 | NIL | NIL | 480,631 | 255,014 |
| 719-311-30 | NIL | NIL | 3,836,704 | 819,187 |
| 719-311-70 | NIL | NIL | 11,855,283 | 278,622 |
| | 10,944,281 | 653,972 | 40,458,300 | 2,722,184 |

NOTE : 1983 DATA IS FOR PENINSULAR MALAYSIA
SEE APPENDIX 3.1.1

SOURCE : DS. ASSET, v.y.

Appendix 5.3.1

## The Case For Small Firms In The Organizational Structures Of The Machinery Industry

A machine product is made up of common machine elements with universal functions. These functions are differentiated into forging, heat treatment, welding, machining and other processes. These characteristics give rise to a network of ancillary primary firms which are vertically disintegrated.

Ancillary firms normally supply the machine components to the primary firms. Normally the ancillary firms operate as medium and small scale enterprises while the latter are more commonly large firms. The smaller firms normally produce made-to order goods in small lot sizes while the large firms are involved in mass production of standardised items.

Discussions on small and medium scale firms in the industry have often centred on the "superiority" of the larger firms. However it cannot be accepted that small firms are synonymous with poor economic performance while large firms are symbols of economic efficiency. Comparative experience in Japan and the NICS have shown that the small organisations have contributed significantly to the development of the machinery industry.

The survival of any firm is its ability to compete efficiently and effectively for scarce resources. Otherwise it would be phased out of the market. The very fact that the larger firms find it profitable to sub-contract or buy from them is an admission of the comparative advantage of the smaller firms. Thus the economic significance of the smaller firms are not confined to providing component parts only but also as agents to precipitate the diffusion of knowledge and skill.

The following points are raised to support the rationale for the existence of small firms in the organisational structure of the machinery industry. Two very important constraints determine the structure; demand and supply.

The supply constraint may be analysed from the viewpoint of optimum scale of production. Certain production processes require heavy capital investment. It may however not be profitable for the firm to invest because its requirements do not justify the scale of operation. It would however be economical if a new firm make the initial capital investment and reap the economies of scale by sub-contracting from the few large firms.

There are also certain production processes which do not enjoy economies of scale and for such cases it is equally profitable and much easier for small and medium size firms to enter the market and compete alongside large set-ups. This is especially so when the factor markets are differentiated by economic dualism. In such cases the smaller firms can take advantage of the cheaper labour and/or capital resources.

Furthermore, the optimum scale of production is also determined by the type of equipment utilised by the industry. Highly sophisticated equipment raises the productivity as well as the optimum scale of production. For instance, a general purpose lathe has a lower level of production compared with specific purpose lathes.

On the demand side, the division of labour is limited by the extent of the market. This is true for production processes which can only be undertaken by large firms either due to heavy capital outlay or necessitated by large economies of scale. As the industry expands, so does the market and this gives rise to specialisation of labour which leads to greater efficiency. Experiences in developed and NICS econcmies have shown that as the industry grows, the network of ancillary firms also grow. This view is proposed by Stigler who agrees that the reverse occurs when a declining industry will not farm out its function so as to maintain its existing rate of return.

## APPENDIX 5.3.2

<u>Patterns Of Growth For The Machinery Industry In Contemporary Developing Countries.</u>

3 patterns of growth adopted by contemporary developing countries in South East Asia for the machinery industry are identified.

<u>Pattern I</u>

Most of the small and medium-sized firms are involved in maintenance and repairing services of imported machinery installed in other non-machinery industries or consumer durables like electric appliances and passenger cars. These firms utilised relatively "old-fashion" machinery.

The growth of the machinery industry normally take the following sequence :

1. Initially, the firms maintain and repair machinery in other industries. Normally this task is carried out by foreign experts and as the level of mechanical knowledge increase, the local technicians assumed this task.

2. Then, the industry manufactures replacement parts on an ad hoc basis, inside or outside the factory.

3 Over time, as the industry grows, producers specialise into 3 areas; manufacture of replacement goods, manufacture of general machines and providing processing services (eg. forging and casting) which support the activities of the former.

4 As a result, a marketing network for replacement machine products and used machines is formed. This growth in replacement markets results in the rise of new machinery industries with relatively unsophisticated technologies.

5. Finally, import-substitution takes place when local firms are established to manufacture domestic production of imported machinery.

Pattern II

Here the government deliberately establishes a definite machinery industry through private or state ownership. Such an industry is characterised by the following :-

1. Vertically integrated, all inclusive production processes where all the parts and components are supplied internally.

2. Manufactured products are for immediate import substitution.

This pattern is commonly found in China and India and is not encouraged due to the inefficiencies of the vertically integrated processes.

Pattern III

Foreign producers of machinery establish a completely new branch of the machinery industry. This is often through a joint-venture and is a short cut to the process postulated in Pattern I.

1. This model is characterised by higher technology knowledge. However it is more difficult to diffuse the technologies effectively as it may not be easy to train locals to manage its operations.

Related to this pattern are two hypothetical models of technological diffusion which are based on the experiences of some countries outside South East Asia.

Model A

The imported modern technology is later transferred to a large and growing number of local small scale firms. These firms then specialise and subcontract parts and services to the foreign venture enterprises which act as major assemblers. Many of these local sub-contractors grow to become independant modern enterprises, specialising either in the production of parts and components or in the provision of services.

Model B

"Packaged" foreign technology is first bought in by foreign related enterprises which assemble imported parts and components. In the second stage, trained local technicians and managers of the foreign enterprises transfer the design and production technologies to new firms by establishing or joining new firms. The domestic production of parts and components also expands. Next, the indigenous firms venture into research and development and engineering activities resulting in improvement of the foreign technology.

SOURCE: Odaka, K., The Motor Vehicle Industry In Asia, A Study of Ancillary Firm Development, 1983, Singapore University Press

# APPENDIX 5.3.3

## Korea's Industrial Structure

At the beginning of the 1960s, light industrial products dominated the sector's output, but with the rapid accumulation of capital stock, heavy and chemical industry products have gained increasing importance, especially since the late 1960s, and by 1980, accounted for more than half of all manufacturing output. The ratio of fixed capital formation to GNP rose from around 24 % during 1972-1976 to an average of more than 30% during the 1977-1980 period reflecting the growth in real investment.

## Development Of The Industrial Machinery Industry

The machinery industry in Korea has seen remarkable growth in recent years but the development of the Korean industrial machinery industry was delayed until the 1960s. Formerly most machinery products needed in the process of industrialisation had to be imported from abroad. There was hardly any local machinery industry worth mentioning except for plants producing small-size motors, farming implements and electrical products such as light bulbs and transformers. All these products were produced using primitive technology and obsolete facilities.

Prior to the 1960s, local industries were obliged to rely on imports. Under these circumstances, the government initiated a series of measures to boost local industries, and to improve the balance of payments by substituting home-made products for imported ones. The Act for promotion of machinery industries was put into force in 1967 and loans designed to promote the development of the industries began to be released in accordance with the basic promotion programs adopted by the government in 1968.

Machinery industry promotion loans are extended not only to manufacturers producing designated machinery but also to those who use home-made equipment. A total of 69 billion won of loans was supplied during the period 1968 to July 1974 on a long-term basis and at preferentially low interest rates. The magnitude and terms of the loans are expected to improve substantially as the National Investment Fund is added to the existing sources from 1974.

Moreover, to encourage the use of home-made products, in 1968 the government began to restrict the importation of machinery competitive with domestic products after plants have been introduced by the government or government owned enterprises. In addition, those who use home-made machinery were given the privilege of a 10% tax deduction on their investments.

## Industrial Development Strategy

Korea has implemented several Five Year Economic and Social Development Plan. Presently, the fifth Five Year Plan (1982-1986) is in progress. The following is a discussion of the import liberalisation objectives of this plan.

The import liberalisation programme initiated in 1978 is further extended during the plan period raising the import liberalisation ratio from the current 75% level to more than 90% by 1986. As practised by most small developed countries, a policy of low protection which foregoes the use of quantitative import restriction will be essential for effective investment allocation and for promoting efficiency through the inducement of foreign competition.

The elimination of quantitative restrictions is of particular importance for the machinery industry. This is because they have not ensured adequate specialisation in the production of either machinery or its components and at the same time allowed low quality to persist. For a more efficient scale and a higher quality of operation in the machinery industry, absolute protection will be replaced by stronger promotional measures such as tax benefits, technical assistance, government financed training and support for research and development. To minimise the shock to domestic producers and to give them time to adjust, import liberalisation will be carried out according to a gradual and pre-announced schedule. Any great disturbances or excessive increases in imports resulting from the liberalisation will be corrected by adjusting tariff rates. The Plan also calls for Korea to be more active in the import of advanced technology. Strong support will be given to the import, assimilation and improvement of foreign technology and efforts will be made to diversify the supplies of that technology. Foreign investments will be of special importance in the machinery industry because it is characterised by rapid technology change.

Problems And Prospects

The government's active support for the industry has been an important factor in its growth. This has taken the form of aid and encouragement to induce high quality technology from advanced countries, either in the form of direct investment or joint ventures. The establishment of the Pohang Iron and Steel Co Ltd, (POSCO) in the early 1970s also made it much easier to secure raw materials for the industry's growth.

Despite the steady growth of the industrial machinery industry, it remains a relatively underdeveloped sector of the economy, especially as regards to the production of plants. Some of the major problems which must be tackled in the near future to stimulate the continuing development of the industry may be summarised as follows :

1. The products of the industrial machinery industry must be improved in terms of both durability and precision and to ensure these characteristics, high quality raw materials must be used. A stable supply of such raw materials is therefore, a pre-requisite for

the development of the industry.

2. Demand for the industry's products remains unsatisfactory not only abroad, but also in the home market and a major effort must be made to raise the levels of sales and marketing expertise within the industry.

3 Greater emphasis should be directed towards the domestic supply of plants to level up the self-sufficiency ratio of these items.

4. Small and medium sized firms specialising in the production of industrial machinery and employing high-quality skills must be developed.

5. The level of technology must be enhanced through more effective training so as to ensure a supply of well qualified technical labour.

The government is expected to play a less prominent role in promoting the industrial machinery sector in Korea. Investment decisions will no longer be on "blind self-sufficiency" but more towards a voluntary and rational intra-industry specialisation.

The next decade will see Korea limiting its direct incentives. Greater emphasis will be expanded for such investments as in energy saving, technology development, productivity improvement and quali[illegible] enhance[illegible].

During the next Five Year Plan, the industry will move towards even greater automation, and trade liberalisation. Foreign investment will be further encouraged. This is necessary not only to enhance level of domestic technology and products but also to promote exports of skill-intensive product in the future. In this respect, joint-ventures by small medium firms will be encouraged to facilitate industry specialisation and to promote rational specialisation between big and small firms. This is reminiscent of the "merge and joint-venture" strategy of Japan in the 1960s.

Establishment of joint-ventures by Korean firms in countries rich in natural resources will be of greater emphasis. Hence, the "developed and import" strategy will be actively pursued by Korea in its next 5 year plan.

Note: Adapted from various sources.

## APPENDIX 5.3.4

The Taiwanese Model

In the first decade, from 1951 - 1960, emphasis was placed primarily on development of agriculture and the establishment of import-substituting light industries. From 1961 to ' stress was laid on industrialisation along diversification of agricultural production and promotion of agricultural and industrial exports. From 1971 to the present, attention has been devoted to expansion of foreign trade, promotion of agricultural modernisation and industrial sophistication.

The development strategies adopted by Taiwan are summarised below;

Phase I

Import-Substitution,(1950s) :

This phase was characterised by increasing allocation of foreign exchange to capital investment goods and away from consumer goods imports. During this period, an internal oriented economy stressed a four-pronged policy approach, which consisted of a strengthening of the agricultural base, development of a physical and social infrastructure, achievement of price stability, and emphasis on import-substitution industries.

In import substitution, priority was assigned to industries such as cotton, textile, clothing, shoes and leather products to alleviate the pressure caused by scarce foreign exchange. Except for agriculture products, food processing was the only major export industry.

Phase 2

Export-Substitution(1960s).

This phase was characterised by intense industrialisation, improvement of investment, and the promotion of exports. It turned to a more outward or export oriented growth which can be clearly seen in major changes in the policy mix. It included more tax incentives for investment (Statute to Encourage Investment, 1960), realistic and fixed exchange rates (the New Taiwan Dollar was pegged at 40:1 with the U.S. Dollar in 1963), tariffs instead of quota restriction (relieving the quota restriction and institutionalising "bonded warehouses and factories in 1962), and higher interest rate instead of credit rationing.

After 1963, there was an absolute as well as a relative decline in the agricultural population. Owing to relatively high levels of entrepreneurial maturity and combined with a large surplus of unskilled labour (with low wage rates), Taiwan's industrial goods were able to penetrate international markets on a competitive basis. The consequence was a radical change from land to labour-intensive exports, of which processing industries provided the main base for growth.

## Phase 3

### Second Import-Substitution (1970s) :

Owing to the rapid expansion of exports in 1960s, the ratio of exports/GNP was very high as Taiwan entered the present decade, 29.6% in 1970 and 49.1% in 1973. This means Taiwan has a highly dependent export economy. Along with continuing increase with wages, the re-export industries were threatened also by competition from the other developing countries and/or by import restrictions (protectionism) in the international markets. For example, raw materials or intermediate components needed by major industries such as textiles, plastics, machinery and electronics are mainly dependent on imports and cannot be produced domestically.

Realising the shortcomings of this type of economy, the government decided to develop capital-intensive industries in the 1970s, mainly in the heavy and petro-chemical industries. This new orientation was designed to produce the necessary intermediate materials for the existing and newly-created domestic industries. Thus, the "second import-substitution" was emphasised as a new strategy for economic development in the 1970s.

This phase is characterised by very large government investments in economic infrastructure and heavy industries. This leadership role is necessitated by the huge amount of capital required by heavy industries, their low returns, high risk, and long gestation period. Beginning in 1973, the government has embarked on Ten Major Construction Projects deploying investment of over US$ 6 billion. Among them, nuclear power, steel, petro-chemical and shipbuilding plants are concrete evidence of this "second import-substitution" strategy.

Industrial Structure of the Machinery Industry

Mechanical engineering is one of the sectors which has enjoyed particularly rapid growth since 1970. With its low capitalisation level, but high requirements for qualified workers and technical know-how, low energy consumption, high value added, and a practically unlimited market potential, this sector could be said to symbolise Taiwan's industrial ambitions.

Until only a few years ago, the mechanical engineering industry consisted of a large number of very small units manufacturing numerous low-value products. Although there are still many small firms, the structure of this industry has changed to the extent that the established medium-sized businesses are backed by more capital and the number of really large firms has substantially increased.

The state's share -largely represented by the Taiwan Machinery Manufacturing Company - was a modest 9% in 1963 and was only 5% by 1978; it is, however, doubtful whether this statistic fully takes into account the value of the arms industry, with its emphasis on small arms and light to medium artillery. After textiles and electronics, mechanical engineering is now Taiwan's third largest foreign exchange earner. Its labour force is expected to increase from 75,000 (1978) to almost 200,000 (1984), a clear pointer to the hoped for expansion.

Main Products

The main production lines at present are still lathes, turning, milling, drilling and grinding machines, typewriters and sewing machines ((0% for export); but a newer development is the increasing construction (using foreign parts) and export of whole manufacturing plants. The 38 complete factories exported in 1976 (mainly cement, soap, sugar, and paper factories) were followed by 80 in 1977, and 1978 saw a further substantial increase.

The main market for machine tools has so far been the USA, but Taiwan-made products are beginning to make themselves felt in this sector in Western Europe, too. The developing countries are the main purchasers of complete factories. As early as 1976, 64% of this sector's products were exported.

The degree to which this type of export is being promoted is reflected in the seven permanent machine display centres in Indonesia, the Philippines, the Netherlands, Singapore, Saudi Arabia, Thailand and Australia. Additional centres of this type are planned for the near future in Europe, the USA, Malaysia, and Argentina.

Prospects

In addition to the groups of products already mentioned, the industry is hoping for new pro-duction and export openings in spinning, weaving and knitting machines, plywood and veneering machines, fertiliser and petro-chemical manufacturing equipment, shoe factories, grain mills and oil presses, conveyor belts, deep-freezing and refuse incineration systems; further points of emphasis in the future will be ball bearings, precision measuring instruments and precision machine tools, diesel engines (including heavy duty ship engines), high-pressure boilers, gas, steam, and water turbines, loading cranes, and chassis for trucks and buses, etc. In cooperation with the domestic electronics industry, special stress is being placed on the development of numerically controlled machines. Another special area for the future is medical diagnostic apparatus, laboratory implements, and biological research, including oceanograph.

On the other hand, experience in the last few years has shown that there are likely to be a number of obstacles to be overcome on the way to achieving these objectives: bottlenecks in supplies from abroad, inadequate quality of some of the domestic intermediate products as well as a shortage of technically specialised manpower. Nevertheless, official estimates suggest a growth rate in this sector of 20% p.a. until 1980, increasing to 25% p.a. between 1980 and 1985.

Note: Adapted from various sources.
by James C., Hsiung and others

2) Taiwan: Economic Facts & Trends, Anton Galli

**APPENDIX 5.3.5**

The Japanese Model

The Japanese have long regarded the machinery industry as crucial to the country's development. A knowledge intensive industry employing highly skilled labour, has a high growth potential and is shielded from competition from developing countries. Japan currently accounts for less than 11% of all OECD industrial machinery exports, behind Germany, the USA and the UK and only slightly ahead of France.

In the 1950s and 1960s, the machinery industry consisted of 2 basic types of business. The first was the production of mechanical components such as gears, bearings, valves, heat exchangers, springs etc. Production of mechanical components usually consists of pressing, machining and some type of finishing operation.

The second type of business was machine assembly, in which mechanical components and structural metals and castings are assembled into paper machines, steel rolling mills, or metalworking machine tools, etc. This type of business has traditionally required coupling prime mover technology and metallurgical engineering to produce faster, more accurate, more powerful machines.

Two broad industry trends have a significant effect on industrial machinery businesses in 1970s.

The development of so-called "system businesses" or the sale of whole plants where various machines are assembled with construction materials into whole plants and are sold and installed as a package by one producer (though he may subcontract parts of it).

One reason for the growth of system businesses has been the increasing importance of developing countries as markets for machines. As industrialisation proceeds in OPEC and advanced developing countries, non-OECD countries have come to account for roughly one half of all OECD machinery purchases. These countries are less able to design their own plants, whether for ethylene production or food processing, and prefer to buy them ready made.

The growth of systems businesses has also been accelerated by progress in process control. Co-ordinated systems now allow the computer centralised control of a whole factory, increasing the effectiveness of industrial machines. Maximum efficiency in the overall process is achieved by designing an entire plant for a given application, rather than by assembling well designed individual machines.

The other major development in the machinery industry in the 1970s has been the introduction of new technologies to be integrated into machinery design. As a result, machinery makers have had to undertake massive research and development in unfamiliar fields in order to remain competitive in the industry.

## Japan's Place In The World Industry

Japan was far behind major European and US companies in production and design capability in 1950s and early 1960s partly because of war damage, but by the mid-1970s had virtually closed the gap. As its producers have become more successful, the Japanese government has shifted its policy from massive aid and very close direction to a looser form of assistance and cooperation. Japanese government policy has recognised the complexity of the machinery industry, which is made up of both small and large companies with very different cost structures. Because of this heterogeneity, Japanese policy towards industrial machinery consisted of almost 100 programmes over the past 25 years.

Active policy in the industry began in 1956 with the Extraordinary Measures Law for the Rehabilitation of the Machinery Industry, aimed at rationalising the industry's production and creating initial demand for its products. The law focused on basic components and some simple machinery. 21 industry areas were eventually designated under the law, including bearings, springs, gears, simple presses, castings and machine tools.

Between 1956 and 1960, the Japan Development Bank provided funds for the modernisation of equipment. The Ministry of International Trade and Industry, Japan authorised rationalisation cartels for purchasing parts and importing materials, standard were set for the industry and guidelines were established for production technology improvement. During this period, 25% of the total loans went to machine tools industry. The main goal at this stage was to impose basic standards on an industry made up of thousands of small producers. To the extent that these standards could not be met by weaker companies and they left the industry, the industry as a whole was rationalised.

In 1961, the Extraordinary Measures Law was extended and aimed at further rationalisation; this time through merger and joint investment rather than within a company. The government made available Japan Development Bank loans and preferential tax rates to encourage joint investments and mergers and the Small Business Finance Corporation (established in the late 1950s) began to make loans to firms in the industry to assist rationalisation.

Throughout the period 1961-1965, there was a two-fold policy approach appropriate to the machinery industry. Of this, in areas like making of special springs, or castings or certain parts of the machine tool industry, where scale of production is less important, modernisation was encouraged within the small companies. Industry associations were formed to facilitate the flow of information and rationalisation cartels were authorised.

By the mid-1960s, these measures had succeeded in rationalising the simple machine industry. When the law was extended again, emphasis shifted to making the companies internationally competitive. Major overseas enterprises were carefully examined as to size, capacity and level of technology.

In general, the industrial policy of the late 1950s was aimed at improving individual company efficiency, in the early 1960s, basic mergers to consolidate the industry were encouraged, and in the late 1960s, emphasis shifted to the encouragement of greater specialisation.

Protection and Stimulation of the Home Market

Throughout the 1950s and early 60s, only machinery which could not be made in Japan was allowed to be imported. This guaran a market for Japanese producers and encouraged foreign producers to license their technology or to form joint ventures in Japan, since outright exports to Japan were impossible.

In addition, a series of loan programmes helped domestic machinery suppliers become more competitive in the home market. In addition to these loan programmes, a series of special depreciation laws were enacted both to promote mechanisation and to encourage the purchase of Japanese made machinery. These programmes served 2 purposes -they encouraged the modernisation of all Japanese industry and at the same time aided the Japanese machinery industry.

Policy in the 1970s and 1980s

By 1970, the process of industry rationalisation had essentially been completed. World scale component producers co-existed in Japan with a number of efficient producers of machines. The Japanese industry enjoyed a predominance in its home market and had made inroads into world markets for some products, particularly simple machine tools and textile machinery.

In the early 1970s, government policy turned away from rationalisation, home market protection and stimulation and export assistance measures, and towards research and development assistance to companies for whole plant sales abroad. The goals are to propel Japan into the forefront of machinery technology, to build world market share by attaching the new growth markets in developing countries, and to build upon strong Japanese process industries to emphasis whole plant sales. These efforts to guide industry development have achieved considerable success. Japan has only a small export share in ordinary machine tools, compared to Germany and USA, but a high share in numerically controlled machine tools.

Note: Adapted from various sources.

APPENDIX 5.3.6

## Malaysia's Policy On Foreign Investment

The Malaysian Government does not practise any form of discrimination when considering projects and treats all foreign investors equally, irrespective of their country of origin. All investors, both foreign and local have to apply for a manufacturing licence under the Industrial Coordination Act. Projects are appraised according to their merits. Listed on the following pages are certain aspects of Government policy which are of interest to foreign investors.

### Equity Participation

The Malaysian Government prefers that all manufacturing proposals are on joint-venture basis between Malaysians and foreigners. The extent of foreign capital ownership allowed will depend on the nature of the project. If a project is dependent to a very large extent on the Malaysian market of non-renewable Malaysian resources, then the government would require that such projects have a substantial Malaysian majority ownership.

However, for projects which are substantially export-orientated then consideration can be given to foreign majority ownership and the extent of such foreign majority will depend on the merits of individual projects. Factors such as the size of the project, its location, the nature of the product manufactured, the level of technology involved and the number of similar projects already established in the country will influence consideration of equity. In the past the Government has even allowed 100% foreign ownership for wholly export-orientated projects. However, 100% foreign ownership is not encouraging as it is the government's view that joint-ventures are the best means of serving the long-term interests of both the foreign investors and Malaysians. It must be emphasised that the Ministry of Trade and Industry is prepared to be flexible in the stipulation of foreign equity participation to ensure that the project is mutually beneficial to Malaysia and the foreign partner.

Expatriate Employment

With regard to employment, it would be appreciated that every country desires to encourage maximum employment of its local nationals. This is also true for Malaysia. Our policy is to see that Malaysians are eventually trained and employed at all levels of employment. Not withstanding this, Malaysia allows foreign companies to bring in the required personnels in areas where there is shortage of Malaysians to do the job. In addition to this, foreign companies are also allowed certain 'key-posts' to be permanently filled by foreigners to safeguard their interests.

Exchange Control

One of the more attractive features of the Malaysian government's policy is the liberal exchange control regulations that exist in this country. Foreign investors can bring in their required capital from abroad for approved projects and equally able to remit oversea. capital and profit with minimal Government control. There are, of course, the normal foreign exchange formalities but these are no hinderances to the free flow of currencies. Malaysia, in fact, as acceded to Article VIII of the International Monetary Fund's Articles of Association whereby we assure a free transfer to funds for international transactions and that no discrimination currency arrangements or multiple exchange rates will be adopted.

## Royalties

An appropriate royalty of technical assistance fee rate will be considered according to the level of technology involved. However, the amount of the fee will depend on the merits of the applications, based among other things, on the following factors:

a: the level of technology to be transferred to the local manufacturing company.

b: the nature of the project to be undertaken by the local company and,

c. whether the technology to be transferred is conducive to Malaysia's industrial needs.

(a witholding tax of 15% is levied on royalty payment. Where there is a double taxation agreement between Malaysia and a foreign country the rate would depend on the agreement).

## Down Payments

Malaysia does not encourage payment for the transfer of technical know-how means of 'down-payments', since such payments will commit the local companies even at the initial stages without any guarantee of successful commercial production. Payments for the transfer of technical know-how must be related to production performances.

## Other Terms in Licensing Agreements

a. Malaysia will approve licensing agreements on condition that the licensor shall not restrict the marketing territory of the licensee.

b. The terms of the licensing agreement approved is 5 years and any renewal thereafter is subject to prior approval.

c. The applicable law of any licensing agreement approved should be the Laws of Malaysia and any differences and disputes relating to the agreements which cannot be settled amicably should be settled by arbitration in Malaysia.

d. Malaysia also requires that the know-how transferred through the licensing agreements must also include information on improvement/developments made by the licensor during the period of agreement.

e. Another requirement imposed is that any taxes or duties imposed on the payment or any of the fees should be borne by the local manufacturing company/companies.

f. If there are any training programmes to be provided and conducted by the licensors for local personnel, Malaysia shall preferably require that the direct costs of such programmes be borne by the licensors.

Source : Directory of Federation of Malaysian Manufacturers, 1982

APPENDIX 7.1.1

GNP & GDP Deflator

| YEAR | GNP CONST/CURRENT | GDP CONST/CURRENT |
|---|---|---|
| 1960 | 1.1896 | |
| 1961 | 0.7626 | |
| 1962 | 1.0190 | |
| 1963 | 0.9866 | |
| 1964 | 0.9954 | |
| 1965 | 1.0360 | |
| 1966 | 1.0156 | |
| 1967 | 1.0208 | |
| 1968 | 1.0348 | |
| 1969 | 1.0261 | |
| 1970 | 1.0000 | 1.0000 |
| 1971 | 1.0060 | 1.0047 |
| 1972 | 1.0044 | 1.0013 |
| 1973 | 0.8554 | 0.8540 |
| 1974 | 0.7568 | 0.7537 |
| 1975 | 0.7829 | 0.7776 |
| 1976 | 0.6940 | 0.6898 |
| 1977 | 0.6485 | 0.6455 |
| 1978 | 0.5898 | 0.5877 |
| 1979 | 0.5409 | 0.5395 |
| 1980 | 0.5060 | 0.5060 |
| 1981 | 0.5011 | 0.5011 |
| 1982 | 0.4866 | 0.4849 |
| 1983 | 0.4660 | 0.4651 |
| 1984 | 0.4433 | 0.4429 |
| 1985 | 0.4256 | 0.4393 |

SOURCE : EPU

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