UNIVERSITI PUTRA MALAYSIA

THE OPTIMUM LOCATION, NUMBER AND SIZE OF RICE MILLS IN TANJUNG KARANG, WEST MALAYSIA

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THE OPTIMUM LOCATION, NUMBER AND SIZE OF RICE MILLS IN TANJUNG KARANG, WEST MALAYSIA

By

SIOW KIAT FOO

Thesis Submitted in Partial Fulfilment of the
Requirements for the Degree of Master of Science
in the Faculty of Economics and Management
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DEDICATION

To my daughters

HENNA SIOW

and

LILY SIOW

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LIST OF ABBREVIATIONS

c.i.f.	Cost, insurance, freight
LP	Linear programming
LPN	Lembaga Padi dan Beras Negara
NF	Network flow
QP	Quadratic programming
TC	Total cost
TPC	Total plant Cost
ha	Hectare
kg	kilogram
mt	metric ton

ABSTRACT

Abstract of thesis submitted to the Senate of Universiti Pertanian Malaysia in partial fulfilment of the requirements for the degree of Master of Science.

THE OPTIMUM LOCATION, NUMBER AND SIZE OF RICE MILLS IN TANJUNG KARANG, WEST MALAYSIA.

By

SIOW KIAT FOO

April, 1990

Supervisor : Assoc. Prof. Dr. Mohd Ghazali Mohayidin
Co-supervisor : Dr Eddie Chiew Fook Chong
Faculty : Faculty of Economics and Management

Non-linear programming is used in analysing the spatial equilibrium model to determine the optimum configuration of number, location and size of rice mills in Tanjung Karang, West Malaysia. The model simultaneously considered the costs of raw materials, handling, assembly, drying and milling and revenue from output to determine the optimum net industry revenue. In the model, the transportation cost, drying cost and milling cost were represented by 3 non-linear functions. The region covered in the study consists of 4 mills and 43 supply areas. A total of 16 configurations reflecting all possible combinations of mills and supply areas under existing conditions were constructed and analysed to yield 16 optimum solutions, one for each configuration. Configuration 15 had the highest net loss of $5,439,087 for 4 mills located at Sungai Besar, Sekinchan, Ulu Tiram Buruk and Batu Dua with the

respective mill sizes of 22,722 mt, 22,722 mt, 22,722 mt and 8,115 mt of paddy. The results of the analysis indicate the importance of assembly and processing costs in determining the optimum number, location and size of rice mills.

ABSTRAK

Abstrak tesis yang dikemukakan kepada Senat Universiti Pertanian Malaysia sebagai memenuhi sebahagian daripada keperluan bagi penganugerahan ijazah Master Sains.

BILANGAN, LOKASI DAN SAIZ KILANG-KILANG PADI YANG OPTIMUM DI TANJUNG KARANG, MALAYSIA BARAT.

Oleh

SIOW KIAT FOO

April 1990

Penyelia : Assoc. Prof. Dr. Mohd Ghazali Mohayidin
Penyelia Bersama : Dr Eddie Chiew Fook Chong
Fakulti : Fakulti Ekonomi dan Pengurusan

Pemprograman tidak linear digunakan di dalam menganalisis model keseimbangan ruang untuk menentukan bilangan, lokasi dan saiz kilang-kilang padi yang optimum di Tanjung Karang, Malaysia Barat. Model ini mengambil kira secara serentak kos bahan mentah, pemegangan, pengumpulan, pengeringan dan pengilangan serta hasil dari output untuk menentukan hasil industri bersih yang optimum. Di dalam model ini, kos pengangkutan, kos pengeringan dan kos pengilangan diwakili oleh tiga fungsi tidak linear. Kawasan kajian mengandungi 4 buah kilang dan 43 kawasan bekalan. Sejumlah 16 jenis konfigurasi yang mencerminkan kesemua kemungkinan kombinasi kilang dan kawasan bekalan di bawah keadaan yang sedia ada dibentuk. Analisis ini menghasilkan 16 penyelesaian optimum. Konfigurasi dengan penyelesaian terbaik optimum mempunyai hasil bersih negatif $5,439,087 bagi 4 buah kilang yang terletak di Sungai Besar, Sekinchan, Ulu Tiram Buruk dan Batu Dua dengan saiz kilang masing-masing 22,722 mt, 22,722 mt,

22,722mt dan 8,115 mt padi. Hasil kajian ini menunjukkan kepentingan kos pengumpulan dan kos pemprosesan di dalam menentukan bilangan, lokasi dan saiz kilang yang optimum.

CHAPTER I

INTRODUCTION

Importance of Paddy in Malaysia

Physical Paddy Area

Malaysia has 465,800 hectares of physical paddy land (Embi Yusoff, 1986), of which 6.9 percent is found in Sabah, 12.2 percent in Sarawak and 80.9 percent in Peninsular Malaysia (Table 1). In terms of planted area, paddy ranks as the country's third major crop after oil palm and rubber. Of the total physical paddy area in Peninsular Malaysia, 78.5 percent or 295.8 thousand hectares are fully irrigated and double-cropped. Table 2 shows the area of the major irrigated schemes. The remaining 21.5 percent of the paddy area is either rainfed or partially irrigated.

Planted Paddy Area

The planted paddy area in Peninsular Malaysia shows a rising trend between 1967 to 1974 but it declined from 1975 onwards (Figure 1). The decline is due to increasing area being left idle (Tan, 1986). Over the same period, the planted area in Sabah remained constant, while that in Sarawak increased slightly.

Table 1

Physical Paddy Areas in Malaysia

Region	Area ('000 ha)	Percent
Sabah	32.0	6.9
Sarawak	57.0	12.2
P. Malaysia	376.8	80.9
Total	465.8	100.0

Source : Embi Yusoff (1986) Rice Production in West Malaysia - Technology Needs in the Next Decade. Paper presented at the National Paddy Conference, Malaysian Agricultural Research and Development Institute, 20-22 January, 1986.

Table 2

Physical Paddy Area in Peninsular Malaysia
by Irrigation and Scheme

Scheme	Area ('000 ha)	Percentage of Total
Fully Irrigated Paddy:		
Muda	95.0	25.2
Kemubu	31.5	8.4
Barat Laut Selangor	19.0	5.0
Kerian/Sg. Manik	30.1	8.0
Seberang Perai	13.1	3.5
Seberang Perak	9.5	2.5
Kemasin Semerak	7.3	1.9
Endau Rompin	11.3	3.0
Besut	5.1	1.4
Other Minor Schemes	73.9	19.6
Rainfed, Partially Irrigated and Hill Paddy	81.0	21.5
Total 376.8	100.0	

Source : Embi Yusoff (1986) Rice Production in West Malaysia - Technology Needs in the Next Decade. Paper presented at the National Paddy Conference, Malaysian Agricultural Research and Development Institute, 20-22 January, 1986.

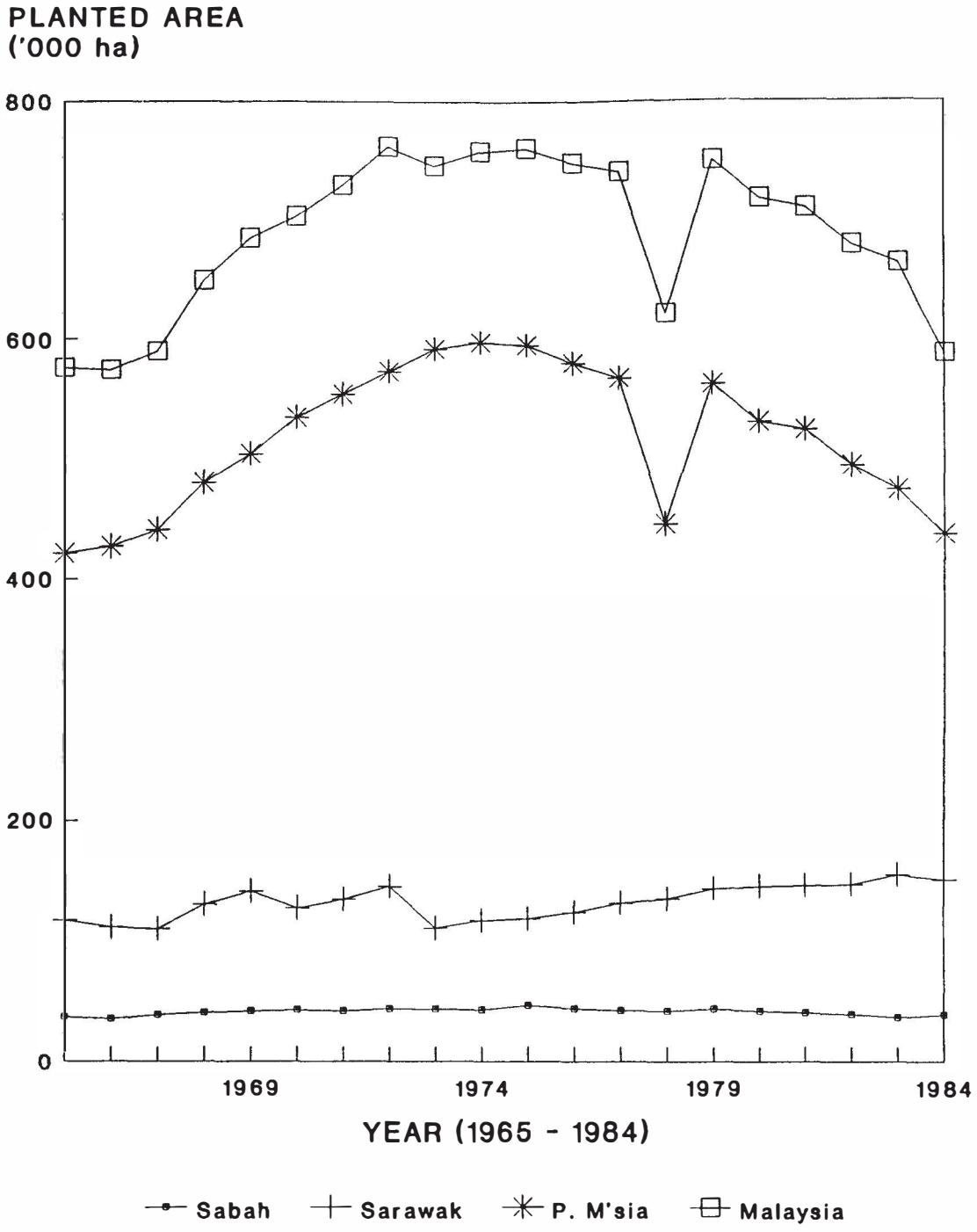

Figure 1. Paddy Planted Area

The average planted area for the whole country in the period 1965 to 1969 was 615.5 thousand hectares per annum. It increased to 739.3 thousand hectares in the period 1970 to 1974 but subsequently decreased to 724.2 thousand hectares and 670.3 thousand hectares in the period 1975 to 1979 and 1980 to 1984, respectively (Table 3).

The average growth rate for planted area in the period 1965 to 1969 was 4.6 percent per annum. It declined to 1.9 percent and 0.5 percent in the periods 1970 to 1974 and 1975 to 1979, respectively. It subsequently became negative in the period 1980 to 1984 (Table 3).

Table 3

Planted Paddy Area in Malaysia

Year	Area ('000 ha)	Average per Annum Growth (%)
1965 to 1969	615.5	4.6
1970 to 1974	739.3	1.9
1975 to 1979	724.2	0.5
1980 to 1984	670.3	-4.8

Sources: 1) Department of Statistics, Malaysia. Sabah Annual Bulletin of Statistics, various issues.
2) Department of Statistics, Malaysia. Sarawak Annual Bulletin of Statistics, various issues.
3) Department of Statistics, Malaysia Annual Bulletin of Statistics, various issues.

Paddy Production

Paddy production for the whole of Malaysia showed an increasing trend from 1967 to 1979 but declined from 1980 to 1984 (Figure 2).

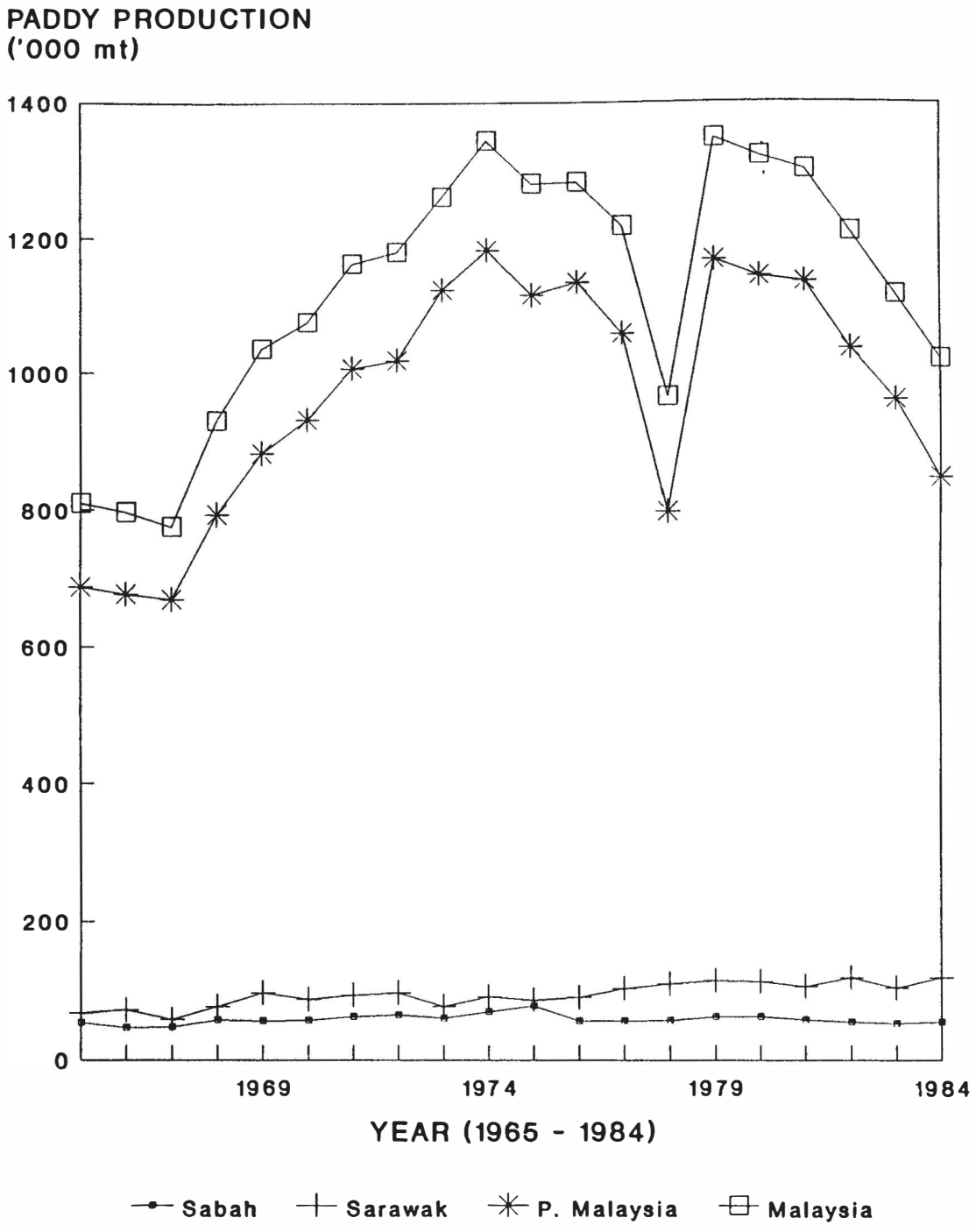

Figure 2. Paddy Production

The paddy production in Sabah remained constant over the years while that of Sarawak showed a very slight increase.

The average paddy production for the whole of Malaysia in the period 1965 to 1969 was 1.348 million metric tons per annum. It increased to 1.866 million metric tons and 1.891 million metric tons in the periods 1970 to 1974 and 1975 to 1979, respectively. It subsequently declined to 1.854 million metric tons in the period 1980 to 1984 (Table 4).

The growth rate for the period 1965 to 1969 was 6.7 percent per annum. It decreased to 5.8 percent and 3.5 percent in the periods 1970 to 1974 and 1975 to 1979, respectively. It finally became negative at 6.1 percent in the period 1980 to 1984.

Table 4

Paddy Production In Malaysia

Year	Production (10^6 mt)	Growth Rate (%)
1965 to 1969	1.348	6.7
1970 to 1974	1.866	5.8
1975 to 1979	1.891	3.5
1980 to 1984	1.854	- 6.1

Sources: 1) Department of Statistics, Malaysia. Sabah Annual Bulletin of Statistics, various issues.
2) Department of Statistics, Malaysia. Sarawak Annual Bulletin of Statistics, various issues.
3) Department of Statistics, Malaysia. Peninsular Malaysia Annual Bulletin of Statistics, various issues.

Rice Consumption

In this study, total rice consumption over a specified period was defined as the sum of total domestic rice production and net imports of rice and it was assumed that the rice stock remains constant at the beginning and end of the period.

Rice smuggled into the country was not included because the data for such rice were not available.

The total rice consumption in Malaysia remained stable in the period 1969 to 1984, with the quantity of net import smoothing out the fluctuations in domestic production (Figure 3). The average rice consumption in the period 1965 to 1969 was 1.201 million metric tons per annum. It increased to 1.492 million metric tons in the period 1970 to 1974 and then decreased slightly to 1.479 million metric tons in the period 1975 to 1979. It went up slightly again to 1.525 million metric tons in the period 1980 to 1984 (Table 5).

The average growth rate for rice consumption in the period 1965 to 1969 was 3.9 percent per annum. It then increased to 4.2 percent in the period 1970 to 1974 and then decreased to 3.2 percent in the period 1975 to 1979. It subsequently became negative at 0.3 percent in the period 1980 to 1984. The decrease was due to a shift in the consumption of rice to other forms of cereals. In 1972, the per capita daily intake of rice was 326.3 grams (Mohd. Ghazali Mohayidin and Siti Khairon Shariff, 1986). By 1984,

capita daily consumption of other cereals on the other hand increased from 88.7 grams in 1972 to 112.9 grams in 1984.

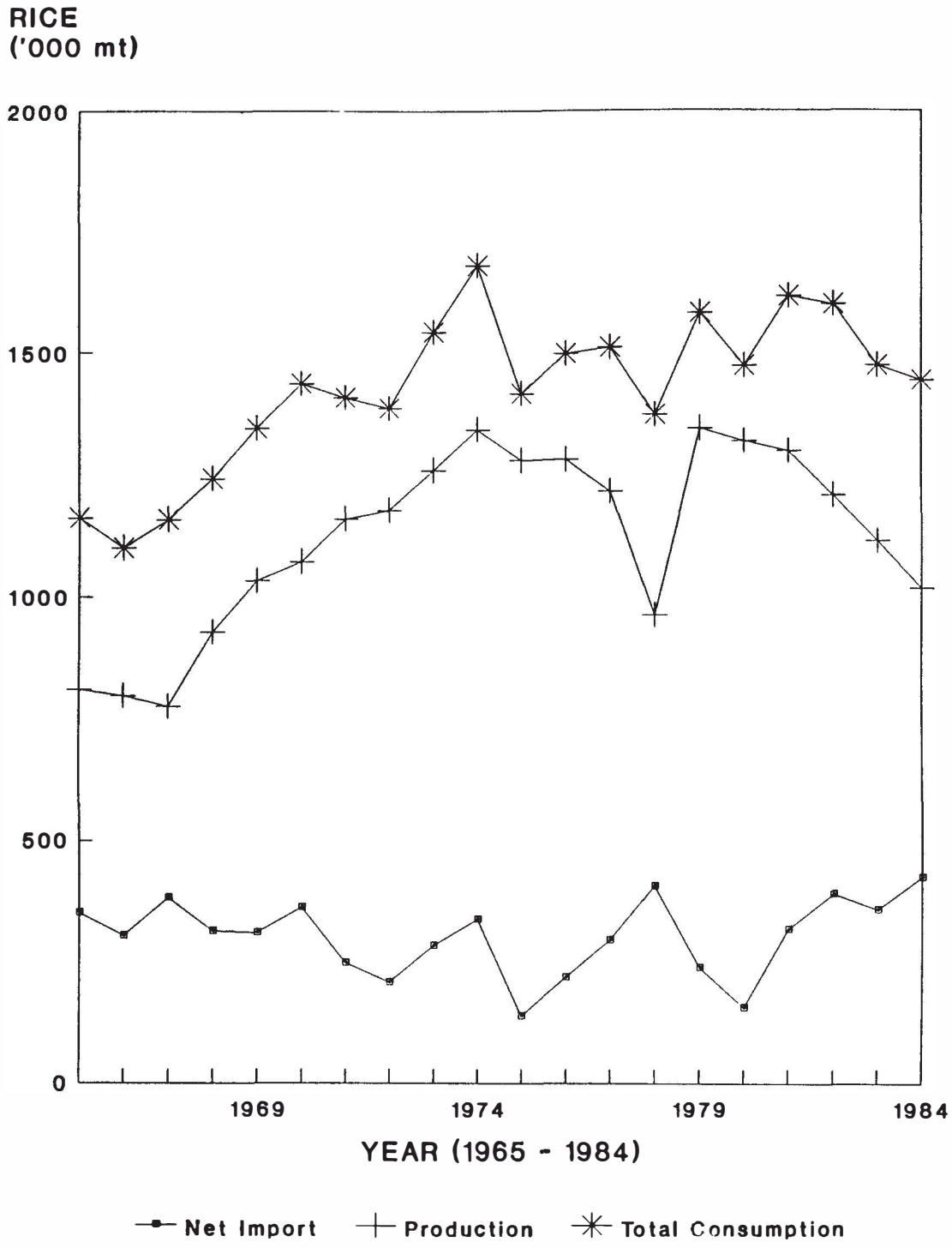

Figure 3. Rice Consumption in Malaysia