AN ANALYSIS OF THE CHANGING SPATIAL LOCATION OF AGRICULTURAL ENTERPRISES IN SELANGOR STATE, MALAYSIA

By

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DECLARATION

Except where otherwise indicated
this thesis is my own work.

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ABSTRACT

This paper examines the changing land use of agricultural areas in Selangor State generally and specifically near urban areas of Kuala Lumpur between 1966 and 1982. Using two contrasting models designed to explain the spatial location of agricultural enterprises, the study found that von Thunen's model has become less relevent due to the modernization of transportation system with consequent significant reduction in transport costs. However, in the late 60's, early 70's, there is some empirical evidence, that market gardening and mixed horticulture areas were found in close proximity to the urban built-up areas and along the major roads. This was in keeping with von Thunen's hypothesis.

Between the land use surveys of 1974 and 1982 rapid economic development and concentrated industrialization in the study area, resulted in a marked increase in population growth and urbanization. This had a significant impact on agricultural areas in a manner in keeping with Sinclair's 'urban sprawl' or 'urban threat' hypothesis. The effect was particularly marked in the peri-urban districts immediately surrounding the Federal Territory of Kuala Lumpur. Agricultural land use in the Federal Territory, which is mainly under rubber, declined by 33 per cent. In addition about 32 per cent of the rubber trees were senile in 1974. The problem of senile rubber trees has increased and extends to the peri-urban areas. However, the reduction of rubber areas in the intermediate districts is correlated with an expansion of oil palm areas. In other words, the lack of interest by rubber estates and smallholders in replanting with oil palm in the peri-urban districts was probably due to uncertainty associated with the urban expansion. Beside this aspect of the urban threat, agricultural land prices have increased substantially in recent years in both the peri-urban areas and also in the intermediate districts. The limited evidence that was available from the Landuse Surveys

suggests that the problem of agricultural production in the study area is now directly and strongly influenced by rapid urban expansion, as suggested by Sinclair. The nature of this influence needs to be the subject of more detailed research so that more realistic agricultural development policies can be designed.

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CHAPTER 1

INTRODUCTION

1.1 Background of Malaysian Agriculture

Malaysian agriculture is at an important crossroad: the recent (1981-83) agriculture growth rate in Malaysia has been estimated to be 4.4 per cent per year (Malaysia, EPU, 1984, p.2).[1] However, this growth rate would be marginal (only 1.9 per cent per year) if oil palm were excluded. In comparision, the average annual growth rates were about 5.6 per cent in the 60's (Gill, 1982, p.34) and about 4.3 per cent in the 70's (Malaysia, 1981, p. 12). The agricultural growth rate of 5.4 per cent over the whole period 1960-1976 would have been lower if not for the phenomenal 17 per cent growth rate of the oil palm industry. (Table 1.1). The growth of the oil palm industry has persisted at the same rate up to 1983 (Malaysia, 1984, p. 229). The rate of growth of the rest of the agricultural sector has been slowing down.

The relative contribution of the agricultural sector to the overall economy has also been declining over the years. Such a declining relative contribution is well expected in the course of a country's structural transformation as economic development proceeds. However, the slower and declining trend of agricultural production, particularly in food production, has given rise to concern in the government (EPU, 1984, p.20). The general stagnation and reduction in output of certain agricultural food products resulted in the government formulating the National Agricultural Policy (NAP) which was released in early 1984 (EPU,1984). The general strategy of the NAP was briefly spelt out in the Mid-term Review (MTR) of the Fourth Malaysia Plan,

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[1]All government publications used in this study come from Malaysia.

Table 1-1: Peninsular Malaysia: Gross Domestic Products by Selected Economic Activity in Producers' Values

(Constant 1970 Prices)

Selected Industry	Average Annual Growth Rates			
	1960-65	1965-70	1970-76	1960-76
1.Agriculture, Forestry and Fishing	5.5	5.7	5.0	5.4
a. Rubber	4.2	4.6	1.5	3.3
b. Oil palm	17.1	17.5	21.6	17.0
c. Coconuts and tea	-6.1	3.2	1.2	-0.4
d Livestock & other	9.4	2.8	4.8	5.5
d. Forestry	4.8	9.0	3.4	5.5
f. Fishing	7.2	11.5	-1.3	5.2
2.Mining and quarrying	3.6	1.3	-4.0	-
3.Manufacturing	16.7	16.0	13.0	15.1
Gross Domestic Product in purchasers'values	6.6	6.9	7.2	6.9

Source: Gill, M.S., 1982, Determinants of Economic Growth in Peninsular Malaysia, 1960-76, Phd. Thesis, Uni. Int. Microfilms, Ann Arbor, Michigan.

1981-85. The NAP identified several important structural constraints in agricultural production such as increasing idle alienated agricultural land, the shortage of farm labour and the ageing of the rural labour force. According to Shand (1984), agricultural real wages have risen in response to this labour shortage.

1.2 National Agricultural Policy

The main purpose of the NAP was to maintain and sustain the agriculture's rate of growth and agricultural's contribution to the overall economic development of the country (p. 3). In addition, the NAP requires the agricultural sector to play a more active role, both supportive and complementary, to the government's industrialization programme (p.2-3). The objective of the NAP is to maximize farm income by raising the productivity through the judicious selection of economically renumerative crops and employing the most efficient technology (p.6). It is envisaged that this objective will inevitably lead to the growth of the agricultural sector and consequently

contribute to overall economic growth with equitable income distribution. According to the NAP (p.6), the process of maximising farm income is to be achieved through the expanded production of traditional export crops, and the development and expanded production of food and industrial crops. The current approach of development will be continued but new strategies of co-operative and organized group farming with centralized management involving the consolidation of farm holdings into large scale will also be promoted. The NAP (p.9) also emphasized that with the exception of padi cultivation (which is linked to national food security), the production expansion of all crops would be based on economic, technical and agro-climatic considerations.

For the development of traditional export crops for industrial use, the NAP stresses the production of crops which have bright economic prospects and in which Malaysia can be an efficient producer. In this respect, efforts to expand the production of oil palm will continue through the development of organized smallholder and well-managed estates with emphasis on improved technology. Unorganized smallholder cultivation will be discouraged. The NAP has also identified cocoa as a potential export earner and its cultivation on a large scale will be encouraged. Cocoa is mainly cultivated by smallholders as an intercrop under coconuts in the states of Selangor, Perak and Johore. The cultivation of coconuts will be purely as shade crop and for meeting domestic consumption.

In terms of food production, the NAP stress that the country will remain largely dependent on imports except rice, fish and poultry products. For rice the country's target is to achieve a level of domestic production of between 80-85% of the domestic requirement (Malaysia, 1984, p. 245). There will be limited production of beef and dairy products which had been generally encouraged during the last two decades in order to achieve about 60-85% self-sufficiency (Malaysia, 1976). The production of poultry and fish, particularly the former in which Malaysia is self-sufficient, will be given further encouragement as a potential export earner (NAP, p.14).

According to the NAP (p.15), production of fresh vegetables will be intensified and produced in selected areas particularly near urban centres as well as in specific highland zones. This is because there

is a continuing demand of fresh vegetables despite advances in the preservation of food. The NAP also emphasized that the production of fresh vegetables will be encouraged on an organized large scale basis using both conventional as well as modern technologies. For the production of fresh fruits, the NAP (p.15) projected that the local demand is expected to double by the year 2,000. But the production of fresh fruits is characterized by low productivity, old and senile stands and poor cultural and management practices (NAP, p. 15) and coupled with unorganized cultivation often on a part-time basis (Mohayidin, 1981, p. 8).

1.3 The Problem

Historically, agricultural development and enterprise choice in Malaysia was primarily based on economic returns and the availability of suitable land. As such, the cultivation of profitable export crops such as rubber and oil palm are almost universally planted throughout the country and sometimes within the periphery of most urban centres. On the other hand, the cultivation of food crops for the urban market, particularly fresh vegetables and fresh fruits, is generally haphazard and unorganized and is often a marketable surplus generated by farmers whose main concern is subsistence. The importance of relative distance from urban consumers for the production of food crops is almost entirely neglected in policy statements. In the Kuala Lumpur area this resulted in the cultivation of fresh vegetables in marginal areas and worked-out land (Wong, 1971, p. 34), with the farmers usually holding only temporary tenure.

With the exception of fresh vegetables, this pattern of development seems to continue under the new National Agricultural Policy. For fresh vegetables, the government has realized the importance of enterprise choice with respect to relative distance and location, that is, vegetable cultivation will be intensified to meet the growing demand within the country particularly from large urban areas such as Kuala Lumpur and for exports. Besides fresh vegetables, the production of most food crops and fresh fruits also depend on the relationship between relative distance from the production areas and major consumption market. Recent development expenditures and

strategies released by the Selangor's Department of Agriculture does not indicate any changes in keeping with the NAP's objective to increase production of foods, particularly fresh vegetables.

Given the above scenario, the position of Selangor State is unique in terms of agricultural production, particularly for the cultivation of fresh vegetables, fresh fruits, and most food crops where the demand is projected to increase rapidly. In terms of fresh vegetables consumption, Selangor has been importing her needs from Perak and Pahang (Cameron Highlands) since the fifties (Wong, 1958, p. 20). Relative high income elasticities of demand for fresh vegetables and fresh fruits and the rapid urbanisation of Selangor has resulted in a major expansion of this market. Selangor is now the most industrial state in Malaysia, with a per capita income of about M$2,979 in 1983, second after the Federal Territory. (See Table 3.2 in Chapter III). The population of Selangor in 1980 was about 1.515 million, which was the third highest in Malaysia. The Federal Territory, which is surrounded by the State, adds about another million people (Department of Statistics, 1983a, p.1) It is projected that the population of Selangor and Federal Territory will increase rapidly due to high natural increase and inter-state migration (See Table 1 in Appendix A). Historically, Selangor and its former capital Kuala Lumpur (now located within the Federal Territory) was the centre of national administration, financial, industrial and commercial activity in Malaysia. This has resulted in Selangor having the best communication and transportation systems in the country. The largest port and the international airport are also located within the State.

Because of its location, Selangor has a unique position in terms of agricultural production potential. In other words, the development of agriculture in Selangor may require a different policy emphasis than that is conveyed by the National Agricultural Policy. Other major urban states or areas such as Penang and particularly Johore Bahru, which is located near Singapore may have a similar potential. This suggests that in terms of opportunity costs, it may not make sense for Selangor to continue to concentrate on the expansion of traditional export crops such as oil palm, rubber and cocoa and also simply continue producing traditional crops of paddy and coconuts. Thus, any

future expansion and intensification of agriculture in Selangor may be best devoted to enterprises for which location and relative distance from markets is critical. It is envisaged that intensive development for market gardening, horticulture, orchards, and flowers will become more attractive in Selangor with its advantages in transportation and communication costs to the major markets of Kuala Lumpur and the Kelang Valley Region.

1.4 Objective of the Study

The objective of the study is to examine the changing spatial pattern of land use and agricultural production generally in the State of Selangor and specifically in the growing of intensive and perishable products such as fresh vegetables, fresh fruits and certain food crops near the urban centre of Kuala Lumpur and Kelang Valley region. The study is important because of the influence of rapid urbanization and industrialization in the Kelang Valley and its impact on agricultural practices and the problems faced in their adjustment.

1.5 Hypothesis of the Study

On the basis of spatial theories of agricultural location it is hypothesized that the rapid growth of urban centres in the State during the last decade has caused a fundamental shift in the source of the greatest land rent in the agricultural sector. In other words, this study postulates that because of urban growth and better accessibility due to extensive road development, the form of land use which provides the greatest land rent has radically changed. The result has been that the relative distance between production areas and town centres has become less rather than more significant. If this proposition is true, it will need explicit recognition in future planning for the agricultural sector of the State.

1.6 Structure of the Study

Fundamental to this study are theories explaining the spatial location of agricultural enterprises. Consequently, the next chapter presents a review of the literature and some models of agricultural location theory. This is followed by a Chapter (III) giving an overview of the study area, the State of Selangor. This chapter discusses the changes in population, administrative structure and socio-economic status of the State as well as aspects of its agricultural development. Chapter four discusses methodology and the sources of data which are then analysed in Chapter five. The final chapter (VI), presents the conclusions of the study, together with some discussions of policy implications.

CHAPTER 2

SOME THEORETICAL MODELS ON AGRICULTURAL LOCATION THEORY

2.1 Introduction

The concepts of location and accessibility have attracted much interest for people from numerous disciplines: sociologists, planners, geographers, economists and others. In other words, the problem of relative distance is identified as one of the major factors affecting settlement patterns, location of manufacturing activity and the value of economic sites. Economists, particularly agricultural economists, have long been concerned and recognised the fundamental relationships between the problem of location and the economics of land use. That is, location and relative distance is often recognised as one of the important determinants of enterprise choice. As emphasized by Chisholm (1968, p.12), the central problem in the economics of land use can be stated simply as the problem of location, of the competition between relative users and uses each particular site.

In agricultural production, the problem of relative distance can create numerous problems. For example, in fragmented land holding there is the loss of time travelling to the different plots, the extra cost of fencing, and the inability to use machinery and obtain economies of scale. In such situations, each plot of land will be characterized by a different type of farming, such that on the furthest plots the amount of labour used is the least. According to Chisholm (1968, p. 13), this will result in a consequential ordering of crops and method of cultivation in relation to distance from the farmstead. On a regional level, the problem of relative distance and location from a market centre will result in a spatial pattern of agricultural land use, with varying intensity of production level.

According to Barlowe (1958, p.32), the concept of economic location refers to some areas which enjoy locational advantages over

others. This is because man's locational choice involves two economic relationships, namely neighborhood effects and transportation costs. Due to these factors, man's choice of one area rather than another is usually associated with natural or man-made advantages such as soil fertility; location near a harbour, water-way or along a railroad or road; or near a good market. Barlowe (1958, p.33) further argued that these advantages involve savings in transportation costs and time, and result in higher productivity and lower production costs. These advantages result in competition for the use of sites which gives them economic value or economic location.

2.2 The Beginnings of Location Theory

The general locational theory with explicit consideration of the spatial dimension was initially developed by Johann Heinrich von Thunen, who published his major work Der Isolierte Staat, in 1826[1]. The main idea of von Thunen's model was that situational factors, that is relative distance and accessibility of the site, are more important than other factors that determine land rent and land use. Later writers who followed von Thunen's concern of spatial dimension include Alfred Weber (1957), Isard (1956), August Losch (1954), Dunn (1954) and Found (1971). According to Hurst (1974, p. 106), only the above writers have considered explicitly the spatial dimension of the economy in expounding their location models. On the other hand, the general theories of location have been largely grounded in the equilibrium theory of economics, and in fact in their early development dealt with site locations as point locations, neglecting or underplaying the spatial dimension.

Hurst identified two basic approaches to location theory within the equilibrium approach, a partial equilibrium approach and a general equilibrium approach. The partial equilibrium approach, with primary emphasis on minimising cost factors, was largely developed by Alfred Weber. While the general equilibrium approach was developed by Isard's

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[1]According to Johnson (1974, p.117), this book was finally translated into English by Carla M Wartenburg and published as von Thunen's Isolated State, edited by Peter Hall, Oxford in 1966.

attempts on the spatial regional economy in its virtual entirety, emphasising the links and interdependencies between all sectors. Von Thunen's approach falls within the partial equilibrium category of location theory.

2.3 Von Thunen's Model

Von Thunen's model begins with a set of simplifying assumptions which are summarized by Hurst (p. 108) into seven categories:

a. There is an 'isolated state', consisting of one market city and its agricultural hinterland;

b. This city is the market for surplus products from the hinterland and receives goods from no other areas;

c. The hinterland ships its surpluses to no other market except the city;

d. There is a homogeneous physical and uniform fertile plain around the city;

e. The hinterland is inhabited by farmers who wish to maximize their profits and also adjust automatically to the market's demand;

f. There is only one mode of transport-the horse and wagon; and

g. Transportation costs are directly proportional to distance, and are borne entirely by the farmers.

Based on these assumptions, von Thunen sought and postulated what form of agricultural production would occur around a city and market centre. As the cost of transportation is the only major variable, the price received for any product after transportation costs are covered, declines with increasing distance from the market. If one assumes that transportation costs increase linearly as distance to the market increases, then the price received declines linearly with distance. This functional relationship led von Thunen to postulate that land rent declines linearly with distance if it was assumed that land use intensity remained constant everywhere.

Von Thunen also considered the intensity of production of a single product. This would, ceteris paribus, depend on the price the farmer gets for his crop. If that price is dependent solely on transportation

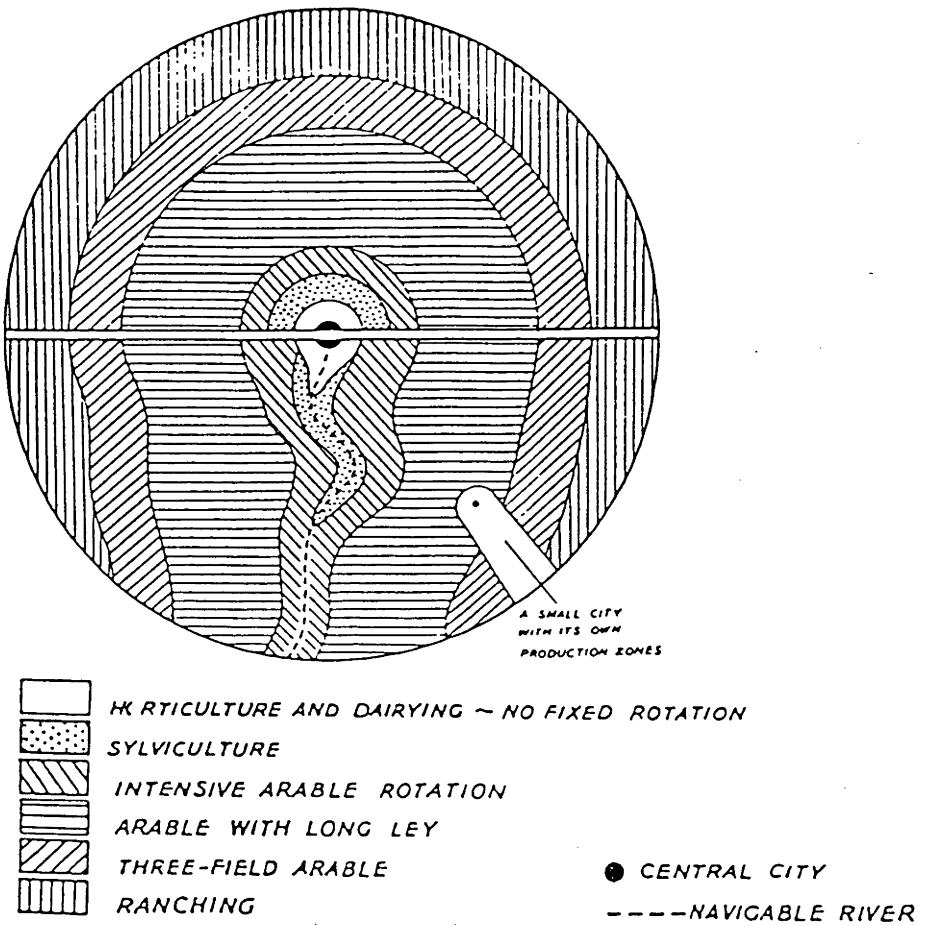
costs, the intensity of production will decrease with distance from the market. This is called the von Thunen's intensity theory. As observed by Hurst, this intensity theory is based on the realization that a given crop can be cultivated under different farming systems, some more intensive than others.

Building on this, von Thunen also decided that when several products are produced, each would have different profits according to their distance from the market and nature of product output. This is because the impact of transportation costs would vary according to the bulk and perishability of the commodity. He thus postulated that commodities which are heavy or bulky in relation to their value should be produced near the town since it would be more expensive for the remote districts to deliver them. Perishable goods such as fresh fruit and vegetables and milk should be produced near the town to minimise any losses by spoilage or dehydration. Conversely, he postulated that more distant agricultural land ought to be devoted to products that are lighter in relation to their value. This proposition is known as von Thunen's crop theory.

With these relationships in mind, von Thunen conceived a land use pattern of concentric functional belts as shown in Figure 2.1 below. This shows that the land use pattern around the town would comprise the following belts: horticulture (market gardening) and dairying, sylviculture, intensive arable rotation, two zones of increasing extensive field crops, and extensive farming. These functional relationships have one dominant locational force : transportation costs. That is why, in von Thunen's time (early 1800's) forestry had to be carried out quite near the town, whereas light industrial crops such as flax could be grown profitability in the outer ring. But it must be emphasized that the transport costs which concerned von Thunen were the transport costs per unit area, not the usual transport costs per unit of product (Chisholm, 1968,p.31).

With this general thesis, von Thunen calculated the Economic Rent accruing to each type of land use at various distances from the city. He defined Economic Rent as that land use providing the greatest return or making the highest bid for that land and, in so doing, displacing other land uses. According to Chisholm (1968,p.21), the concept of

Figure 2-1: Von Thunen's Land Utilization Belt



Source: Chisholm, M. 1968

Economic Rent was introduced by von Thunen independently of Ricardo [2] because he was unaware of Ricardo's work when preparing his first draft. However, when the first edition of Der Isolierte Staat was completed he had read Ricardo's concept of Economic Rent which viewed site factors, such as fertility, as prime determinants of land rent and land use.

It is very surprising to find that Ricardian concepts have had very wide application and influence in the development of economic theory. For von Thunen's ideas, as emphasized by Katzman (1974, p. 683)

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[2] Ricardian Economic Rent The concept of economic rent of Ricardo was based on land with a range of fertility. As land becomes less fertile, the economic rent fell to a point until it was zero. Ricardo's concept is equivalent to the surplus production that can be obtained from the use of the better soil above the return which would be obtained by applying the same resources of labour etc. to poorer land.

have had surprisingly little impact on even those facets of agricultural development where they would seem most applicable. This fact is further stressed by Thiele (1984, p. 257) who argues von Thunen's model has been generally ignored by agricultural economists in their empirical studies. Besides, the theory and vast literature of economic development are composed of numerous concepts of spatial variations such as regional dualism, the core vs periphery, growth-poles, etc. Yet, these concepts have totally ignored or have had little impact so far on location theory (Beckmamn, 1968, p.7)

Ironically, as noted by Katzman (1974, p. 683), von Thunen's model has found its greatest impact in urban economics where the theory has been elaborated. In fact, the theory of urban location initially began with von Thunen's model and developed via Weberian location theory into the central place theory of Christaller and Losch (Encyclopedia of Urban Planning, 1974, p.999). At the same time, the theory of urban structure such as the concentric theory etc. are generally based on an application to urban land use of von Thunen's model.

Nevertheless, it remains true that von Thunen's model originally formulated the principles relating distance to rural land use. Recent empirical evidence has shown that the role and importance of transportation costs in agricultural development is now much more than in most other sectors of the economy. Bishay (1974, p.27), has argued this point based on two major reasons:

a. the complete immobility of the land fixes in advance the location of farms, irrespective of the distance from the consuming units and/or the centres supplying inputs (e.g. fertilizer factories);

b. the special nature of most agricultural products raises transportation costs of these products rather high in relation to their farm prices. For example, perishable and fragile agricultural products may require some costly transportation devices (special cold room trucks, trains and ships with refrigerators, packages etc.) to prevent rapid deterioration.

According to Chisholm (1968,p.21) and Found (1971, p. 57) the other significant contribution of von Thunen was in regard to the method of analysis - the technique of postulating a simpler-than-reality model based on specific assumptions and deduced relationships to clarify some aspects of a real life situation. Besides these

contributions, there are a number of consequences noted by von Thunen which have policy implications (Chisholm, 1968,p.31). First, anyone managing a farm or an estate should look at the costs and the return of each field and try to arrange a pattern of cropping so that the net returns obtained from each field is maximised. Second, for any particular type of farming system there is an optimum areal extent of holding: farm size is therefore closely related to location. Third, the distance from the city at which a particular crop ceases to be grown is also affected by the distance within the farm. Finally, the benefit of farm consolidation can be based on location principles. Fragmented farms generally yield low or even negative economic rent.

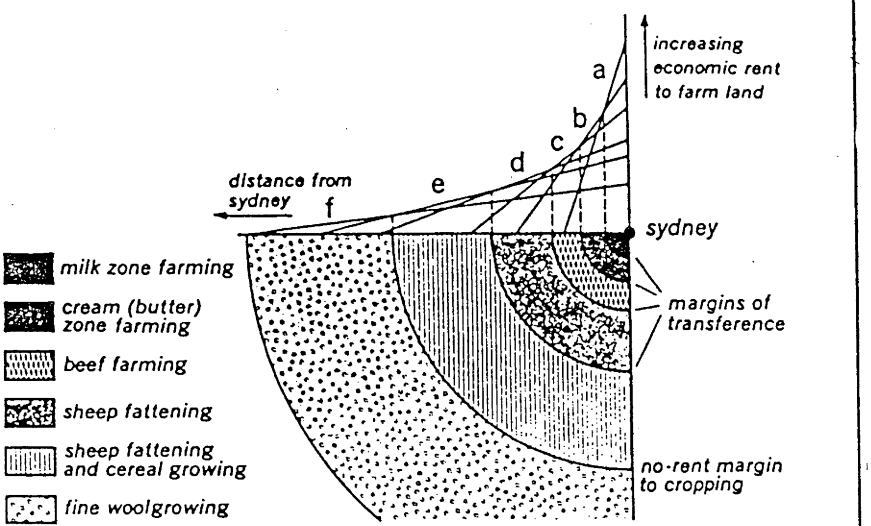
2.4 Empirical Evidence on von Thunen's model

There are very few studies which have used the principles and method developed by von Thunen. At the same time, von Thunen's theory has been subjected to various interpretations and criticisms. Most writers have tended to criticize von Thunen's model because of the initial conditions which have little apparent applications to reality. As emphasized by Chisholm, von Thunen's theory was not intended to exist in reality but what is most important is the method to analyze agricultural land use near urban areas.

Empirical evidence has shown that there are very few studies which conform well to the von Thunen's model. The writers who advocate the relevence of von Thunen' principles are such as Rutherford et al. (1966), Chisholm (1968), Horvath (1969), Found (1971), Katzman (1974), and Thiele (1984). Using the traditional assumptions of the von Thunen model, Rutherford et al. observed that the land use as a function of distance from Sydney, which is the primate city, have a tendency toward concentric zonation as shown in Figure 2.2. However, the pattern is truncated by Sydneys coastal position and physical conditions. The zones of land use are based on real levels of profit around Sydney, less transportation costs which are taken to increase at a uniform rate.

Utilizing the crop theory of von Thunen's model, Horvath (1969) observed that the agricultural patterns in the immediate surrounding of

Figure 2-2: Types of Land Utilization in New South Wales

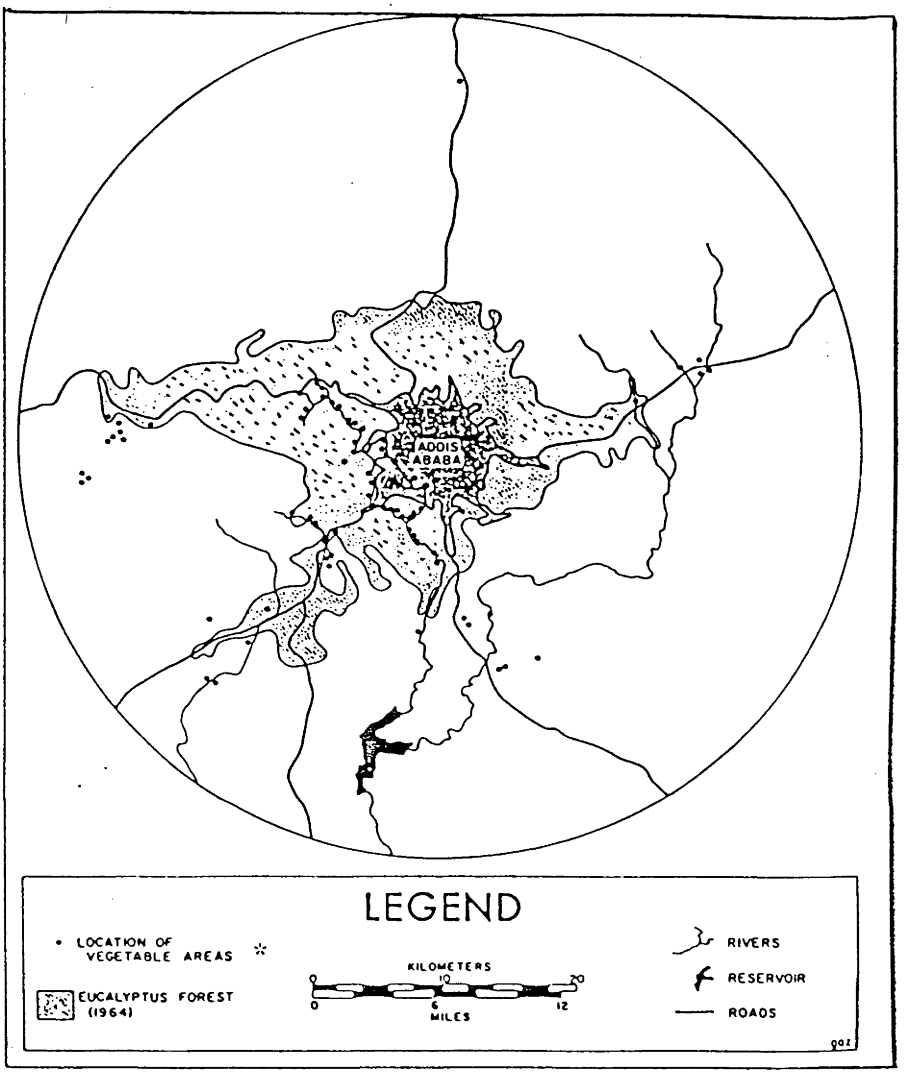


Source: Rutherford, J. et.al. 1966, New Viewpoints in Economic Geography, Martindale Press.

Addis Ababa, Ethiopia has remarkable parallels with von Thunen's crop theory. The most striking empirical evidence comes from the eucalytus forest surrounding the capital city, producing firewood and building material for the city. Beside this, the shape of the forest resembles the theoretical patterns suggested by von Thunen that resulted from the introduction of an improved transportation where costs were drastically reduced. The patterns and sequence of land use are similar to that postulated in the Isolated State, with the exception of milk production. Vegetable production is also found in close proximity to the city as shown in Figure 2.3 below.

In 1974, Katzman attempted to compare the von Thunen and industrial- urban hypothesis (IU). The latter had stimulated considerable interest in the spatial structure of agriculture. Katzman concluded that the von Thunen and industrial-urban hypothesis models are independently formulated explanations of regional variations in agriculture structure and income. The main differences between the two

Figure 2-3: Forest and Vegetable Areas in Addis Ababa, Ethiopia



* The source of the location of vegetable areas is field mapping and aerial photography.

Source: Horvath, R.J. 1969, "Von Thunen's Isolated and the area around Addis Ababa, Ethiopia", Annals, Vol. 59, No. 2.

models are; a) the von Thunen model emphasized the access to the commodity markets, while the IU model emphasised access to industrial-urban complexes; and b) IU model emphasized market imperfections associated with monopoly and monopsony in rural areas dominated by small towns. Based on Brazilian frontier data, the study found that the spatial structure conforms well to the von Thunen model. There is limited land-labour substitution, as the labour-land ratio is

unrelated to distance from market. The numerical results also showed that agricultural counties closer to the market enjoy higher product prices, land values, capitalization and rates of land utilization.

The latest empirical evidence using a modified von Thunen's model, Graham Thiele (1984) revealed that production around the town of Dodoma, (planned to be the new capital of Tanzania) can be regarded as composed of concentric rings, an inner ring of charcoal production and an outer one of grain production. Modification of the model was required when labour, not land, was the scarce factor of production. Based on these modified assumptions, that is, using returns to labour (gross margin per standard man-day), which is to be maximised rather than gross margin per hectare, and farm level data on charcoal and grain enterprises, a model of the spatial economy of Dodoma was derived.

Using the mathematical formulation of Found (1971), Thiele found that at a distance of 24 kilometers from the town, staple food grain production replaces charcoal production as a means of securing subsistence. This occurs when the opportunity costs of producing charcoal, selling it, and buying grain was less than that used in producing the same quantity of grain directly. The study consisted of two components: a case study based on a survey of 72 households of Matumbala, some 16 kilometers south of Dodoma, and 19 grain enterprises in the village of Nkulabi. The second component was a study of the general spatial economy with respect to grain and charcoal production from a sample of 32 villages south of Dodoma. This confirmed the findings of the case study.

Contrary to the above empirical evidence, there are writers who are sceptical about the relevence of the von Thunen's model in modern times. That is, the conformation to von Thunen's theory is not applicable when the primary force determining the agricultural pattern is no longer the transportion costs to the market. For example, Robert Sinclair (1967) observed that in many advanced and industrialized cities of the world the basic forces determining agricultural land use near an urban area are associated with urban expansion. Where these forces are operating, he hypothesises that the agricultural pattern is one of increasing intensity with distance from the city. This reverses the pattern postulated by von Thunen's theory.

2.5 Sinclair's Theory of Urban Sprawl

The basic idea of Sinclair's hypothesis is that the pattern of agricultural land use near expanding urban areas of todays' advanced and industrialized world has changed since modernization has caused various changes, particularly in the field of transportation. Developments in the field of transportation have resulted in all types of transport costs declining greatly in relation to most other agricultural production costs. Transport costs are also not necessarily directly proportional to distance and bulk. Beside the declining importance of transport costs, many cities have experienced rapid urban expansion with rural-urban migration and population growth resulting in constantly expanding built-up areas. This is a significant fact which differentiates many cities from von Thunen's idealised static city. The spread of the urban region around a city influences rural land use , far in advance of the actual built-up area. Sinclair points out that this influence has little to do with the city market, but results from the nature of the expansion process.

According to Sinclair, the nature of urban expansion is determined by many forces, among which the most basic are:

a) urban and rural land price differences;

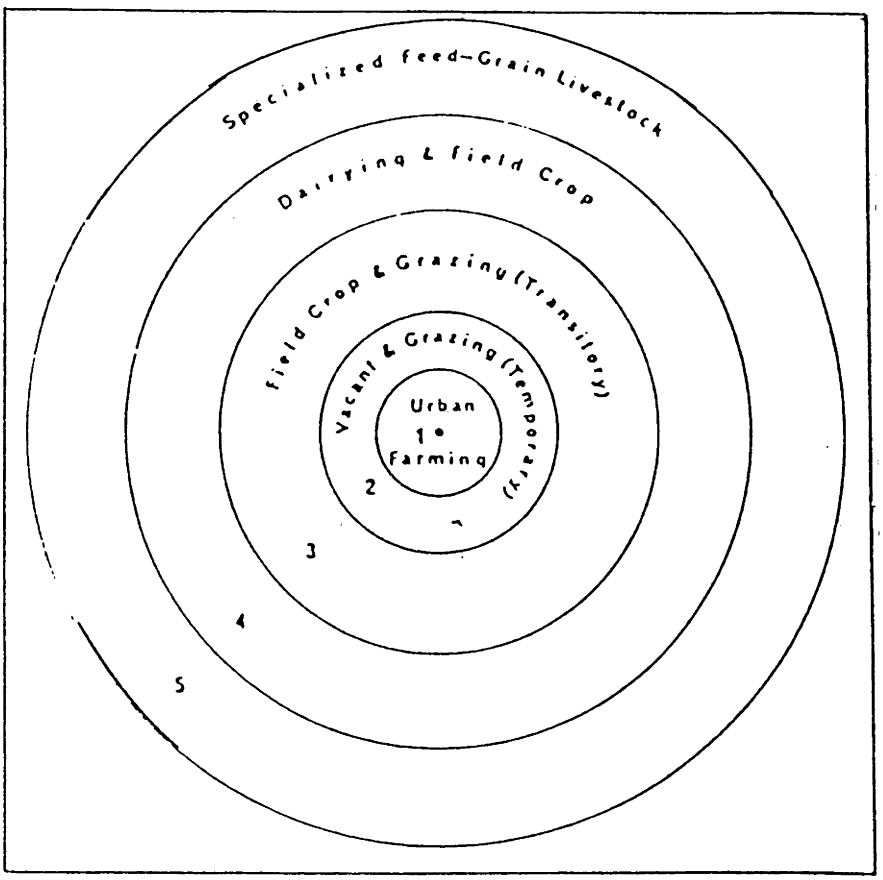
b) the flexibility offered all land users by modern automobile transportation; and

c) the whims and judgements of human beings.

The first of these forces is most important in Sinclair's analysis, as todays urban land is much more valuable than rural land. With urban expansion, the land near urban areas is subject to anticipation of urban encroachment and the degree of anticipation declines with distance from the encroaching city. This has a direct influence upon agricultural land use practices, particularly upon the intensity of agriculture. That is, farms which are subjected to urban influences will reduce capital investment and farm labour resulting in the decreasing intensity of agriculture. Using this relationship, Sinclair postulates a land use zone around expanding metropolitan areas as shown in Figure 2.4 below.

In zone 1, at the edges of the built-up area, Sinclair postulates

Figure 2-4: Sinclair's Land Utilization Belt



Source: Sinclair, R. 1967, "Von Thunen and Urban Sprawl", Annals, Vol.57, No.1.

that land is either changing to urban uses, or being held by speculators or developers for future development. Only isolated, 'factory-type' farming might still be pursued such as poultry-keeping, green houses etc. Zone 2 is a zone of mainly vacant land, where urban subdivision is not yet taking place but where farming, if it exists at all, is carried out with enterprises that are short-lived. Zone 3 is an area of transitory agriculture, where farming activities are carried out, but with an anticipation of urbanization at some future date. In this zone, farmers do not wish to invest capital, hence cash crops have taken over where more intensive animal husbandary once prevailed, and overall, agriculture has steadily become less intensive. Finally, zone 4 and 5 is a broad zone of dairying, field crops and specialized feed-grain livestock.

To justify his hypothesis, he presented and examined numerous empirical studies on the problem of rural-urban fringe land influenced by anticipated urbanization. The studies presented to support his

hypothesis were: Moore and Barlowe (1955), Gottman (1961), Grotewald (1959), Honzatko (1960), Lessinger and Krueger (1959). Other empirical evidence examined in this study and generally supporting the plausibility of his hypothesis include Griffin and Chatham (1958), Gasson (1966), Smith (1966), Best (1968), Walshe (1971), Shilton (1973) and OECD (1979).

These studies showed that the urban influence on surrounding rural areas takes two forms. First, there is the actual take-over of rural land for urban uses as seen in the expansion of the built-up area. The study by Griffin and Chatham in southern California found that urban expansion resulted in the decline and shifting of citrus production; while Smith observed in Adelaide that the influence of urban expansion resulted comparable shifts in vegetable production. The second form of urban influence is in a much wider and ever expanding area, much of it well beyond the built-up area, called the influence of the city's 'shadows'. This is also in line with Sinclair's hypothesis. A study by Gasson (1966) and followed by Radford (1969) concluded that the problem of the urbanization of rural areas showed up when farming properties become the homes for people who commute to work in the city (London in their study), that is, people live in the country but who do not work in it.

Another study which also supports Sinclair's hypothesis is that by Shilton (1973), who studied urban influences on the agricultural areas of the central coast of New South Wales. Shilton observed that the discrepencies of development between the highlands and lowlands of the central coast of Sydney tend to support Sinclair's hypothesis, where urban pressures have had a debilitating influence on Central Coast agriculture, particularly lowland farms adjacent to urban areas. Lowland farmers have continued farming, but on a much reduced scale, and often on a part-time basis.

Concern for rapid urban growth and it's influences has resulted from the OECD study (1979), which contained 20 case studies describing the situation and impact of urban growth on peri-urban agriculture of 20 cities in OECD countries. The study observed that the pressure of urban expansion creates substantial changes in physical and economic conditions in the peri-urban area, namely population and manpower and

land transfers. With urban expansion due to the rapid population growth, large areas of peri-urban agriculture were consumed for urban uses, causing land prices to rise to extremely high levels. This is the basic force in Sinclair's hypothesis. At the same time, Reinsel and Reinsel (1979) identified population growth as perhaps the most important factor which causes expectations of land values to rise over time. This is because the aggregate quantity of land is fixed, assuming other things being equal.

2.6 Conclusions

Review of the literature of spatial patterns of agricultural enterprises near urban areas suggest two models with completely contrasting conclusions. The applicability of the two theories for this study depends on the basic forces which determine the pattern at a particular period of time. As emphasized by Sinclair, von Thunen's theory in explaining agricultural patterns near urban areas is generally applicable when the urban area is stable and static and the primary force determining the pattern is transport cost to the market. When these conditions apply, the pattern of agricultural land use is one of decreasing intensity with distance from the city. Sinclair observed that the von Thunen's theory still applies in underdeveloped parts of the world, and that this proposition is tenable as shown by the studies of Chisholm, Horvath and Thiele. For advanced and expanding urban areas, the basic forces determining agricultural land use near urban areas are associated with urban expansion, with the agricultural pattern being one of increasing intensity with distance from the city. That this is plausible is shown by the studies of Gasson, Walshe, Shilton and others. Which model is applicable in any particular case is clearly important if agricultural investment and extension officers are to be able to give long term advice to the farming community. More specific details of the application of these two models will be given at the beginning of Chapter IV. This study now turns to a more detailed examination of Selangor State in Malaysia as a background to examining the data on enterprise location in the State contained in the aerial Topography Landuse Surveys of 1966, 1974 and 1982.

CHAPTER 3

PROJECT AREA - STATE OF SELANGOR

3.1 Introduction

Crucial to an understanding of the spatial location of agricultural enterprises in Selangor is an awareness of the economy of the State. This chapter provides the necessary background. The State of Selangor is situated in the central portion of the west coast of Peninsular Malaysia, bounded by Negeri Sembilan to the south, the Central Mountain Range and Pahang to the east, the Bernam River and Perak to the north, and the Straits of Malacca to the west. It surrounds the Federal Territory of Kuala Lumpur, the nation's capital which was detached administratively from the jurisdiction of the Selangor State from 1 February, 1974 (Malaysia, 1974). The analysis and discussions in this study will include the Federal Territory. This is because for most planning purposes by the government, the Federal Territory is usually treated as a district in the State of Selangor.

Kuala Lumpur, the nation's capital and the largest metropolis in Malaysia occupies an area of about 243 square kilometres (Department of Statistics, 1983a, p.1). Before 1974, Kuala Lumpur city had 93 square kilometres of municipal area. According to Lienbach (1975, p.281), Kuala Lumpur with a major port outlet of Port Kelang, centrally located and having political advantages, emerged as the dominant centre in the Peninsular over other towns. Kuala Lumpur as the centre of the national administration and government, commerce, finance and trading in Malaysia has thus developed extensive communication facilities and transportation networks in the country. These have greatly contributed to the growth of the surrounding region in Selangor where much of Malaysia's urban and industrial activity are located. Kuala Lumpur had a population of about million in 1980, compared to had a population of

about 650 thousand people in 1970 (Department of Statistics, 1983b)[1]

3.2 Population and Administrative Districts

Selangor had a population of 1.515 million (revised) in 1980 Together with the population of kuala lumpur there are about 2.5 million people in the study area. Compared to a population of 1.63 million in 1970

This represents an increase of about 0.87 million (50 percent) over 10 years. Selangor had a high population growth rate of 4.3 percent, while the Federal Territory growth per annum was 4.1 per cent in the 1970-80 period. These growths rate are higher than Malaysia's average annual growth rate of 2.3 percent over the same period. The difference is due to the high net migration rate experienced by the State and the Federal Territory in the last decade when a migration rate of 9.5 percent and 8 per cent, respectively, was recorded The highest migration growth rate was in Pahang with 13.2 per cent. The number of migrants recorded in the census for Selangor and the Federal Territory in 1970 and 1980 was 199,700 and 477,000 people, respectively. (Table 1 in Appendix A).

The State is now divided into nine administrative districts: Gombak, Petaling, Kelang, Kuala Langat, Kuala Selangor, Sabak Bernam, Sepang, Ulu Langat and Ulu Selangor as shown in Figure 3.1. Each district is divided into 'mukim' or sub-districts. The districts of Kelang and Petaling are generally urban districts, with the latter being the center of manufacturing activity in the State and Malaysia. The other seven districts are mainly agricultural- based producing rubber, palm oil, copra, rice, cocoa, coffee and other minor products. The population distribution in 1980 by district shows that the districts of Petaling had the highest population with about 360,100

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[1]In 1970, Federal Territory of Kuala Lumpur was part of Selangor. The 1970 population figure was estimated on the basis of the population enumerated in the Enumeration Blocks falling within the new expanded boundary of Federal Territory. The population of Kuala Lumpur before the creation of the Federal Territory area was 0.452 million people (Department of Statistics, 1971).

Figure 3-1: Map of Selangor

Source: Property Market Report, 1982.

people, followed by Kelang with a population of about 279,300 people. (Table 6 in Appendix B).

3.3 Urbanization in Selangor

In the early sixties, Kuala Lumpur, Kelang and Petaling Jaya were the only major urban centres in Selangor. With intensive industrial development in the State, which is mainly concentrated in the Kelang Valley region, these towns grew more rapidly, particularly Kelang and Petaling Jaya towns as shown in Table 3.1. The Kelang Valley region extends about 48 kilometres west from Kuala Lumpur to Port Kelang, 32 kilometres south to Kajang/Bangi towns and 29 kilometres north to Rawang (Ackerman, 1980, p.82)[2] With the development of Port Kelang as a major outlet for Malaysia's exports, the satellite and industrial town of Petaling Jaya and the new capital town of Shah Alam have further increased the urban and industrial area of the Kelang Valley. Beside these developments, the new towns of Sungai/Way Subang, Subang Jaya, Ampang/Ulu Kelang and Bangi/Kajang were also fast expanding in the 1980's. Aiken and Leigh (1975, p. 546) have projected that by 1990 a conurbation will have emerged in the Kelang Valley with a probable population of more than two million people. See Figure 3.2.

As a result, the Kelang Valley region which covers about 37 percent of the study's area, accounts for about 80 per cent of the study area's population in 1980 (Draft Plan of Kelang Valley, undated). Beside these major urban areas, there are other small towns in each district which serve as administrative and service centres and sometimes have limited commercial activity. These district towns include Kuala Kubu town in Ulu Selangor district, Tanjong Karang and Kuala Selangor towns in the Kuala Selangor district, Sungai Besar town in Sabak Bernam district and Teluk Datuk in Kuala Langat district etc. See again Figure 3.1 above.

Shah Alam town, the new Selangor state capital is the first fully integrated and preplanned town in the country. It is situated in the heart of Kelang Valley which is just 21 kilometres from the national capital, about 27 kilometres from Port Kelang, and only ten minutes'

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[2]In terms of administrative area, Kelang Valley region include the Federal Territory, the districts of Petaling, Gombak, Ulu Langat and Kelang in Selangor.

Table 3-1: The Growth of Urban Centres in the Kelang Valley, 1957-80

Urban Centre	Population			Average Annual Growth Rate (%)	
	1957	1970	1980	1957-70	70-80
Kuala Lumpur	316,230*	648,300	977,100	5.5	4.1
Kelang	75,649	113,607	203,413	3.1	5.3
Petaling Jaya	-	93,447	298,629	-	11.6
Shah Alam	-	6,000	32,000	-	16.7
Bangi/Kajang	-	23,000	85,000	-	13.1

Source: Shankland Cox Partnership, 1979, Kelang Valley Review, London.

Department of Statistics, various reports, Malaysia, Kuala Lumpur.

* Refers to the population of Kuala Lumpur before the creation of the Federal Territory.

The formula used to calculate population growth rate is:

$r = 1/n \log e\ Pn/Po$

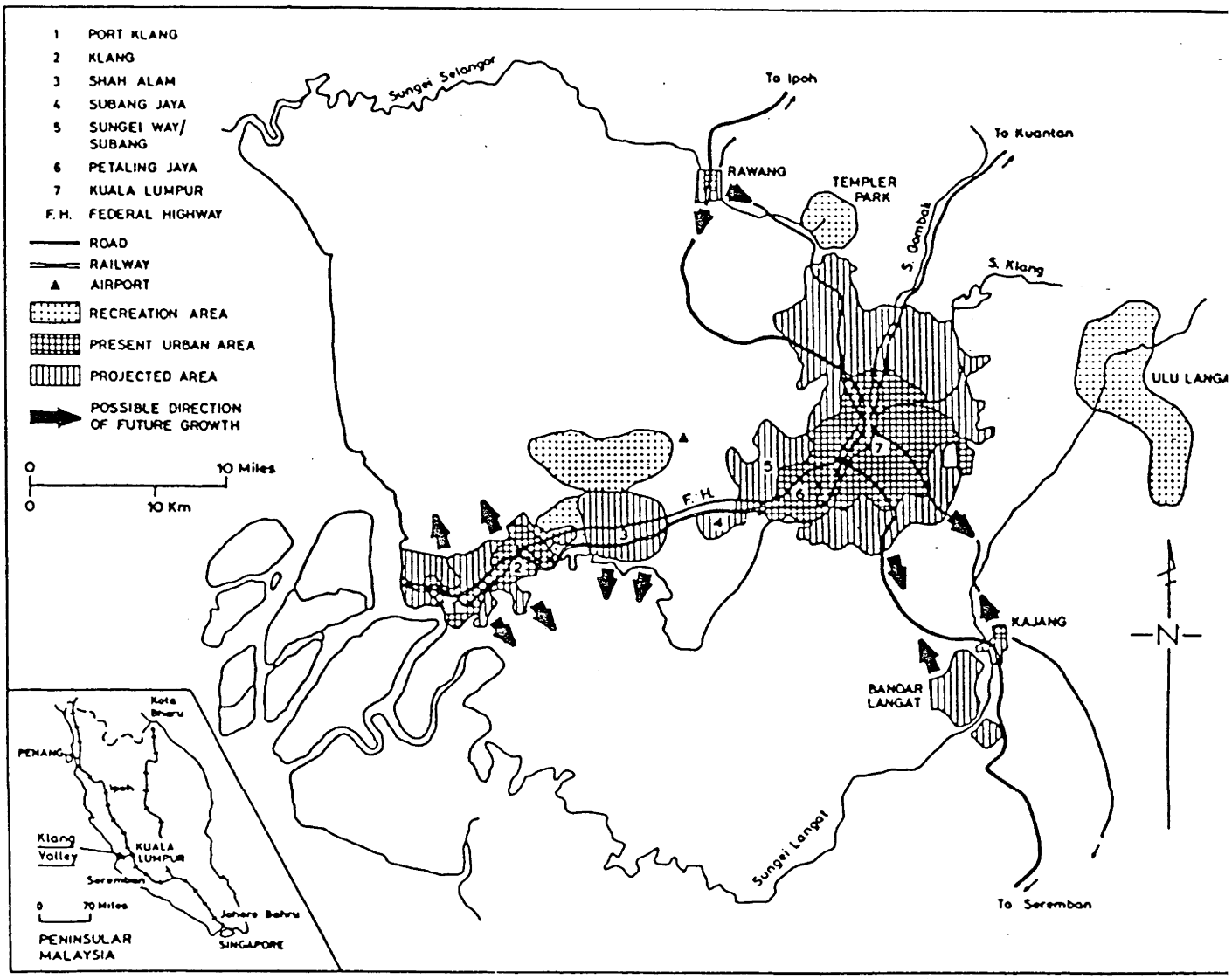
where n = exact no. of years between Po & Pn,
Po= population of the initial years,
Pn= population at the later year.

drive from Subang International Airport (New Straits Times, 29 October, 1984). Access to Shah Alam town is fast and easy, via the Federal Highway through adjacent Petaling Jaya. Shah Alam has now a population of about 32,000 people but by the year 2,000 a population of 194,000 is projected (Shankland Cox Partnership, 1979 p. 20 and 53).

3.4 Socio-Economic Status

Selangor is now the second most prosperous State after the Federal Territory. Per capita income in Selangor reached M $2,979 in 1983 (Malaysia, 1984, p.152). Selangor's economically advanced development is due mainly to its central location in the rubber and tin producing belt of the west coast of Peninsular Malaysia that arose during colonial rule. In addition to this geographic advantage, Selangor (and

Figure 3-2: The Emerging Kelang Valley Conurbation, 1974-1990



Source: Kelang Valley Report, cited in Aiken and Leigh, 1975, "Malaysian Emerging Conurbation", Annals, Vol. 65, No. 4.

its previous capital Kuala Lumpur) was the centre of the national government and administration and this resulted in the concentration of civil service and commercial employment. The commercial and administrative development of Kuala Lumpur thus attracted industrialization after independence (Fisk and Osman-Rani, 1982, p.275), coupled with concerted efforts by the government to provide infrastructure for rapid industrial development in Selangor.

Due to the above developments, Selangor is now one of the five most developed states in terms of Gross Domestic Product (GDP) in Malaysia. The other states, which include Federal Territory, Penang, Pahang and Negeri Sembilan, each have values above Malaysia's average of about M$2,120 as shown in Table 3.2 below. An analysis of

Selangor's economic structure showed further the importance of Selangor as the core region of the country's economy. (See Table 2 and 3 in Appendix A).

Table 3-2: Malaysia: Summary of GDP and Per Capita GDP for Selected States, 1980-83

($ in 1970 prices)

State	Gross Domestic Product		Average Annual	Per capita GDP	
	1980 M$Mill.	1983 M$Mill.	Growth Rate(%)	1980 ($)	1983 ($)
High Income					
Selangor	4,323.5	5,069.3	5.4	2,853	2,979
F.Territory	3,690.1	4,419.0	6.2	3,777	4,046
Middle Income					
Johore	3,057.2	3,583.2	5.4	1,866	2,041
Pahang	1,607.0	1,987.2	7.3	2,012	2,187
Perak	2,934.9	3,536.2	6.4	1,626	1,888
Penang	2,133.3	2,604.9	6.9	2,235	2,596
Trengganu	875.1	1,082.9	7.4	1,619	1,853
Low Income					
Kedah	1,284.7	1,463.9	4.4	1,151	1,261
Malaysia	26,228.0	31,398.0	6.2	1,908	2,120

Source: Malaysia,1984, Mid-Term Review, Fourth Malaysia Plan,1981-85, Table 5.2

Kamal Salih et.al. (1978, p.89), show that Selangor has higher shares in the modern sectors of the economy, namely manufacturing, and service industries than the poorer states in which agriculture is more important. This is summarized in Table 3.3 and will be discussed further in section 3.6.

Table 3-3: GDP per capita, Sectoral shares of GDP by State, 1970

State	GDP per capita		Sectoral Shares * of GDP		
	($M)	Index	A	I	S
Selangor	1,520	167	14	38	48
Penang	939	103	18	22	60
Perak	911	100	29	35	36
N. Sembilan	907	99	37	25	38
Pahang	855	94	42	23	35
Johore	835	92	40	21	39
Malacca	761	83	31	10	59
Kedah/Perlis	605	66	58	12	30
Trengganu	536	59	38	22	40
Kelantan	420	46	43	12	45
Pen. Malaysia	912	100	29	28	43

* Sectors: A - Agriculture, forestry, fishing
I - Mining, Manufacturing, construction and utilities.
S - Transport, commerce, goverment, and other services.

Source: Department of Statistics, Population Census, 1970; Economic Planning Unit, GDP by state. Calculation was performed by D.J. Blake (Cited in Kamal Salih et al., 1978).

3.4.1 Household Income

Another measure of economic welfare is the per capita household income, which relates more directly to the living standard of individuals in the State. According to the Mid-Term Review of the Fourth Malaysia Plan, 1981-85 (Malaysia, 1984), Selangor had recorded a monthly per capita income of M$171, while the Federal Territory had a monthly income of M$308 in 1982 as shown in Table 3.4 below. Selangor's household income is about 34 percent higher than the Peninsula average of $128. In terms of rural-urban per capita income, Selangor has a marked disparity as compared to other poorer states. It is also observed that the urban household income in Selangor is more than double that of the rural household income. However, Selangor's rural household income was still much higher than in other states.

Table 3-4: Peninsular Malaysia: Per Capita Monthly Household Income by State and Urban-Rural Strata, 1982

($ in current prices)

State	Total	Urban	Rural
Johore	116	181	89
Kedah	78	143	70
Kelantan	92	114	84
Malacca	109	154	95
Negeri Sembilan	130	207	98
Pahang	102	180	89
Perak	91	130	74
Perlis	76	-	76
Penang	120	140	101
Selangor	171	268	120
Trengganu	90	113	74
Federal Territory	308	308	-
Peninsular Malaysia	128	204	89

Source: Malaysia, 1984, Mid-Term Review, Fourth Malaysia Plan,1981-85, Table-5.5

3.4.2 Other Socio-Economic Indicators

Besides the above measures of income, the gap between Selangor and other states extends to other socio-economic indicators as shown in Table 3.5 below.

Table 3-5: Selected Socio-Economic Indicators by Selected States, 1983

States	Health Services		Health conditions		Pub. Ut.
	Doctor Per 10,000	Acute Hosp. Bed Per 1,000	Infant Mortality Rate	Crude Death Rate	% Pop. with piped water
Kelantan	1.2	1.1	21.9	6.7	34
Pahang	2.0	1.7	21.1	5.2	66
Sabah	1.3	2.5	21.5	4.4	43
Selangor	3.7	0.8	14.0	4.7	84*
Fed.Terr.	8.2	1.9	16.5	4.4	-

Source: Malaysia, 1984,Mid-Term Review, Fourth Malaysia Plan, 1981-85, and Census, 1980.

Note: Pub. Ut.= Public Utilities

* include Federal Territory

3.5 Physical Infrastructure Development

It is generally recognised that economic development involves the growth of an efficient infrastructure. However, there is debate as to the nature of the causal relationships. Writers such as Hoyle (1973) and Lienbach (1971) view an efficient transport system as of fundamental importance to the development of an economy. Others view them merely as a means of linking satellites to the metropolis (Missen and Logan, 1977). According to Fisk and Osman-Rani (1982, p. 44-45), the infrastructure development in Malaysia is well-developed, particularly in Peninsular Malaysia where much of the investment that had taken place before independence was geared towards marketing and exporting tin and rubber. Selangor is well endowed with large tin deposits (after Perak state), and also with fertile soil for planting rubber. Its central location resulted in heavy investment in its road system and communication facilities. In terms of the distribution of roads per thousand square miles, Selangor has the third highest mileage after the much smaller states of Penang and Malacca. (Table 4 in Appendix A). Selangor is also well served by the main north/south railway line system. This line is also linked to Port Kelang, where over 22 percent of Malaysia's total cargo was handled in 1978.

3.6 Industrial Development

Fisk and Osman-Rani (1982), suggest that Selangor developed the largest concentration of manufacturing activity because of the spatial imbalance in the concentration of administration, trading and commercial functions under colonial rule. By 1969, this factor had resulted in the State producing about 50 per cent of the country's total value added output (Department of Statistics, 1970). By 1983 Selangor and Federal Territory together accounted for about 40 percent of the total manufacturing output and about 23 percent of the total manufacturing employment located in Selangor and a further 11 percent in Federal Territory (Malaysia, 1984). The declining contribution of industrial output is due to the government's policy, implemented from the early 1970's, of dispersing industrial plants, particularly resource-based industries to other states. However, the policy of

dispersing industry to the rural districts of Selangor has been ineffective since industry is found to be highly concentrated. According to a recent consultant report (Shankland Cox Partnership, 1979,p.1), growth has been more concentrated in and around Kuala Lumpur than was envisaged in the accepted strategy of dispersal to other growth centres in 1973. For example, the 'rural' industrial estate in Sabak Bernam was begun in early 1970's but is still not fully occupied (Ackerman, 1980).

An analysis of industrial development in Malaysia in 1973 by Fisk and Osman- Rani (1982,p.275) by types of industry again shows the concentration of industries in Selangor. From Table 3.6, about 47 percent of the regional distribution of manufacturing value-added was located in Selangor. It is also observed that large firms tend to be more concentrated geographically within Kuala Lumpur and the Kelang Valley region. These large industries contributed more than 58 percent of the value-added in Selangor. Fisk and Osman-Rani, argue that it is reasonable to expect large scale industries to have only a few establishments to supply the domestic market.

Most domestic resource-based industries such as those processing food and grain, textiles, wood products, rubber, palm oil, coconut products etc. tend to be dispersed. For example, Selangor has only a low percentage distribution of value-added for wood products and textiles with about 15.5 percent and 16.5 percent respectively in 1973. The location of these industries, which tend to be dispersed throughout the country, is largely supply determined and emphasizes the importance of transport costs. Fisk and Osman-Rani also observed that external economies of scale are less important in the choice of location for the above domestic and resource-based industries.

3.7 Land use and Agricultural Development

The total physical area of Selangor and the Federal Territory in 1982 was about 823,832 hectares as shown in Table 3.7[3] The total land

[3]The decline from 1966 to 1974 did not result from actual loss of land but rather a more rigid defination in the land use classification such as narrow channels were left out.

Table 3-6: Malaysia:Regional Distribution of Manufacturing Value-Added in 1973 (Percentage)

Industry	Selangor	Penang, Perak& Johore	Other States	Sabah& Sarawak	Total Value Added	
	%	%	%	%	$ m	%
Food	39.9	40.6	15.5	4.0	379.4	15.3
Beverages	72.8	15.3	1.9	10.0	68.0	2.7
Tobacco	92.9	4.3	2.8	(a)	130.5	5.3
Textiles	16.5	81.7	1.3	0.4	140.6	4.2
Wearing app. &footwear						
Leather products	27.3	62.2	0.3	10.2	42.9	1.7
Wood products	15.5	25.6	36.7	22.2	391.1	15.8
Furniture paper prod.	51.5	27.9	9.6	11.0	41.9	1.7
Printing & publishing	75.4	16.7	2.4	5.5	121.2	4.9
Chemical & plastic	74.5	18.4	6.2	0.9	221.5	8.9
Rubber products	39.1	45.1	14.2	1.6	226.1	9.1
Non-metallic min. prod.	51.5	41.8	4.6	2.1	124.8	5.0
Non-ferrous metal prod.	99.5	0.2	0.2	(a)	9.7	0.4
Basic iron & fab. metal	58.0	35.9	3.5	2.5	195.4	7.9
Non-elect. machinery	67.8	24.8	6.3	1.2	88.3	3.6
Electrical machinery	41.7	55.5	2.5	0.3	189.0	7.6
Transport equipment	62.0	28.2	2.8	7.0	66.9	2.7
Others (b)	21.0	21.2	50.0	7.8	75.4	3.0
Total	46.9	34.0	13.1	6.8	2,476.7	100

Source: Fisk and Osman-Rani, 1982, The Political Economy Of Malaysia, Oxford Press, Kuala Lumpur.

Notes: (a) Neglible proportion.
(b) mainly petroleum refineries which accounted for two-thirds of the total.

use area in 1974 was about 826,123 hectares. This was about 2,900 hectares larger than the total physical area. This is because of the introduction of the crop equivalent factor for mixed cropping associations. An equivalent factor of 75 percent was used for agricultural land found to be intercropped (Wong, 1969, p.5). In 1982, the total area of land in use increased again to about 828,032

hectares, which is 4,200 hectares larger than the physical area, showing an increasing intensification of land use.

Agriculture is one of the major forms of land use in the State and occupies most of the foothills and coastal plains. Out of the total land use area of 826,123 hectares in 1974, about 341,656 hectares (41 per cent) are cultivated. By 1982, cultivated area had declined slightly from the 1974 figure. Between 1966 and 1974, the major reduction of non-agricultural land use was from swamps (21,312 ha.), unused lands (18,739 ha.), grassland (14,446 ha.), and forest (11,063 ha.). This land was used for agricultural development (38,243 ha.), urban and associated areas, (an increase of 6,460 ha.) and tin-mining (an increase of 4,149 ha.).

Table 3-7: The Landuse Summary of Selangor and Federal Territory

Description	1966	1974	1982	Increase (+) or decrease (-)	
		(hectares)		1966-74	1974-82
1. Total Physical Area	840,328	823,194	823,832	-17,134	+ 638
2. Total Landuse Area	842,818	826,123	828,032	-16,695	+1,909
3. Cultivated (agriculture) Area	312,430	341,656	339,519	+29,246	-2,037
4. Newly cleared Area	5,175	14,192*	-	+9,017	-

Note * Excludes 4,900 acres which were cleared for urban development.

Source: Wong,I.F.T., 1979, The Present Land Use of Peninsular Malaysia, Vol I-Text, Ministry of Agriculture, Kuala lumpur.

----------,undated, The Present Land Use of Selangor, 1982, Ministry of Agriculture, K.L.

Table 3.11 shows the summary of agricultural land use in the State. The main agricultural crop grown in the State is rubber. In 1966, there was a total of 190,092 hectares of rubber but declining to 154,340 hectares in 1974, and to 131,583 hectares in 1982, representing

a reduction of about 31 per cent of the rubber hectarage in the State. Nationally, Selangor's rubber hectarage in 1974 was the sixth largest in Peninsular Malaysia. (Table 5 in Appendix A). Rubber is grown extensively on large commercial estates and smallholdings on the foothills and the plains. Distribution of rubber hectarages between estate and smallholdings is shown in Table 3.8 below.

Table 3-8: Distribution of Rubber Hectarage between Estate and S/h in Selangor and F.T., for 1966, 1973 and 1982

(hectares)

Year	Smallholding (% in Selangor and F. T.)	Estate	Selangor & F.T.(% in Pen. M'sia)	Total in Peninsular Malaysia
1966	N.A.	N.A.	190,092	1,774,265
1973	56,885 (41 %)	81,268 (59 %)	138,153 (8 %)	1,693,935
1982	80,475 (61 %)	51,108 (39 %)	131,583 (7.8%)	1,693,000

Source: Department of Statistics, 1975, Rubber Statistics Handbook,1973, Malaysia, Kuala Lumpur.

Department of Statistics, 1984, Rubber Statistics Handbook,1982, Malaysia, Kuala Lumpur.

Note: F.T. = Federal Territory S/h = Smallholding

The major crop of increasing importance is oil palm. This crop is cultivated most extensively on the coastal plains. By 1974, a total of 82,840 hectares had been planted with oil palm. This was an increase of about 51,060 hectares or about 160 percent over 1966. In 1982, the cultivation of oil palm increased further to 107,646 hectares, a further increase of about 30 percent. Selangor in 1981 was the fourth largest producer of palm oil in Peninsular Malaysia. Palm oil is mainly produced by estates as shown in Table 3.9 below.

The third most important crop, in terms of the area cultivated is coconuts. This is concentrated particularly on the coastal plains in the district of Sabak Bernam. In this region of the State, unlike the other tree crops (rubber and oil palm), intensive intercropping particularly with cocoa, has taken place. In 1974, coconuts occupied

Table 3-9: Distribution of Oil palm Hectarages between Estate and Smallholding in Selangor, for 1973, 1981 and 1982

Year	Hectares			
	Smallholding, States Schemes, Felda, Felcra and RISDA *(%)	Estates (%)	Total in Selangor (% in Pen. Malaysia)	Total in Peninsular Malaysia
1973	11,625 (16)	62,428(84)	74,053(17%)	435,812
1981	18,771 (18)	84,352(82)	103,123(10%)	983,148
1982	N.A.	N.A	107,646(10%)	1,046,200

Source: Department of Statistics, 1975b, Oil palm, Coconut, Cocoa and Tea Statistics, 1973, K.L.

Department of Statistics, 1983c, Oil palm, Coconut, Cocoa and Tea Statistics, 1981, K.L.

Note: * - refer to block schemes

about 51,394 hectares, that is 15 percent of the agricultural area of the State. This represent an increase of about 3,953 hectares since 1966 and makes Selangor the second largest producer of coconut in Peninsular Malaysia. By 1982, coconut cultivation had only increased marginally. However, the cultivation of intercrop cocoa under coconuts increased significantly by 2,384 hectares, representing an increase of about 170 percent since 1974. (Table 3.11). Coconuts are mainly cultivated by smallholders and the distribution of areas is shown in Table 3.10 below.

Padi cultivation is mainly confined to the north-west coast in the districts of Kuala Selangor and Sabak Bernam. In 1974, a total of 22,584 hectares was under paddy, that is about 6 percent of the total agricultural land. There was virtually no change by 1982. Less important crops (in 1982) include coffee (5,864 ha.), diversified crops (5,012 ha.); pineapples, grown for fresh consumption (661 ha.); and tea (638 ha.). Finally, mixed horticulture, market gardening and orchards combine to form quite a significant land use category and one which is of increasing importance.

In 1974, mixed horticulture was cultivated on 12,501 hectares,

Table 3-10: Distribution of Coconut Hectarage between Estate and Smallholding in Selangor, 1981

(Hectares)

Year	Coconuts		Total Coconut Area in Selangor	Total Area in Peninsular Malaysia
	S/H	Estates		
	(%)	(%)	(%)	
1981	45,700 (94)	4,580 (6)	50,280 (22)	227,800

Source: Department of Statistics, 1983c, Oil palm, Coconut, Cocoa and Tea statistics, 1981, Malaysia, Kuala Lumpur.

this represent an increase of 4,169 hectares or 50 per cent since 1966. Thus, mixed horticulture staged quite an impressive increase in cultivation after cocoa, oil palm and market gardening. By 1982, the area under mixed horticulture had declined marginally, but cocoa and oil palm had increased markedly. Market gardening experienced the same pattern as mixed horticulture. That is, the cultivation of market gardens increased quite significantly between 1966 and 1974, to 1,202 hectares. This represents an increase of about 510 hectares or 74 percent. By 1982, the area of market gardening had declined to 1,088 hectares. Orchards also experienced the same pattern of development as mixed horticulture and market gardening. Between 1966 and 1974, the cultivation of orchards increased about threefold to 1,284 hectares, but by 1982, the area of orchard cultivation had decreased marginally to 1,270 hectares.

3.8 Conclusions

To conclude, the study area has experienced very rapid economic development, urbanization and industrialization. This has resulted in high population growth due mainly to migration, which consequently expanded the built-up areas of Kuala Lumpur and the conurbation in the Kelang Valley region. These developments undoubedly have had a significant impact on agricultural production and area, particularly in the peri-urban districts immediately surrounding the Federal Territory

of Kuala Lumpur. We will now discuss the application of the theories of spatial location, discussed in Chapter 2, to Selangor, even though the available data is far from ideal for this purpose.

Table 3-11: Summary of Selected Agricultural Landuse in the Study Area

Landuse Catergory	1981/82	1974	1966	Increase (+) or Decrease (-)	
	(Hectares)			1974-82	1966-74
Mixed Horti-culture	11,555	12,501	8,332	- 1,294	+4,169
Market gardening	1,088	1,202	692	- 382	+510
Rubber	131,583	154,340	190,092	-27,262	-35,753
Oil palm	107,646	82,840	31,780	+24,802	+51,060
Coconut	51,470	51,394	47,441	+ 77	+ 3,952
Pineapple	611	1,061	1,023	- 450	+ 38
Tea	638	552	947	+ 86	-395
Coffee	5,864	5,877	6,049	- 13	- 172
Cocoa	3,786	1,402	13	+2,384	+1,389
Orchards	1,270	1,284	482	- 25	+ 802
Fish Ponds	282	132	86	+ 130	+ 46
Others	178	296	89	- 118	+207
Paddy	22,480	22,584	22,250	- 104	+334
Diversified crops	5,012	5,249	3,119	- 257	+2,130
Shifting cultivation	3	3	33	-	-30
Improved pasture	861	679	-	+ 182	+ 679
Total	339,519	341,656	312,430		

Source: Wong, IFT, 1979, The Present Landuse of Peninsular Malaysia, Vol 1- Text, Ministry of Agriculture, Kuala Lumpur.
....., undated, The Present Landuse of Selangor, 1982, Ministry of Agriculture, Kuala Lumpur

CHAPTER 4

METHODOLOGY AND DATA SOURCES

4.1 Theoretical Framework

The basic theoretical framework used in this study is von Thunen's theory of location of agricultural production (1826) and Sinclair's theory of urban sprawl and its impact on agricultural production near urban areas (1967). The relevance and applicability of these two theories in this study depend upon the basic forces operating over the study period, that is between 1966 and 1982. According to Harvey (1966) and Hurst (1974), von Thunen's method of analysis is inherently descriptive, as the concepts are generally introduced more for expository purposes. But later writers, following von Thunen's method, particularly Losch (1954), Dunn (1954), and Found (1971) adapted it as a normative mode. For Sinclair's theory, the method of analysis will be descriptive as the theoretical construct is based upon an analysis of the contemporary urbanization process.

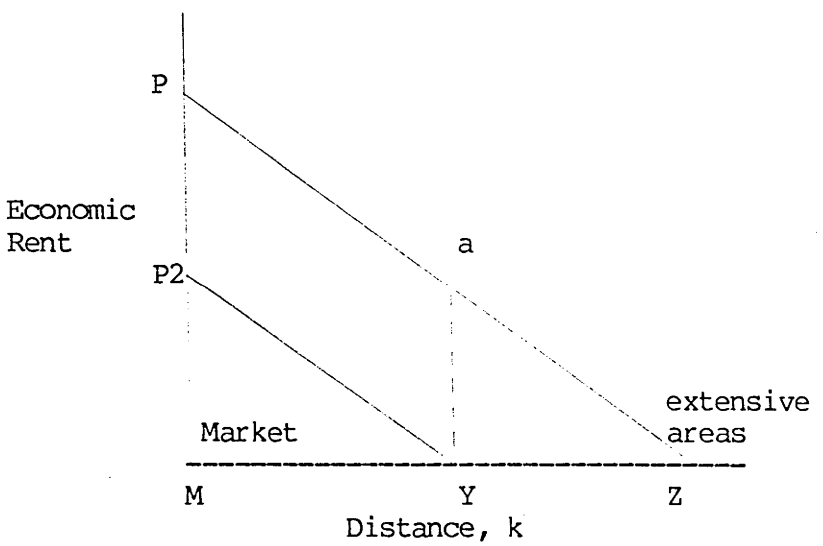
4.2 Von Thunen's Model

Using the normative mode, von Thunen's model explains the functional relationships of three factors, namely: the distance of the farms from the market, the prices received by the farms and the amount of economic rent. According to Hurst (1974,p.110), there are a number of methods of illustrating economic rent such as the relative profits per unit land area, distance and transportation costs. Hurst explained the concept of economic rent as a function of the slope of the transportation gradient, PZ and P2Y as shown in Figure 4.1 below. This is drawn on the assumption that all farmers, from the market centre to the marginal producer, Z, receive the same market price, and have the same yield and costs of production. The farmer at Y, an intermediate

location, will receive a profit represented by P2P (=aY). This savings in transport costs, is the economic rent.

When applying the crop theory of the model, the variations in economic rent for each commodity result in varying patterns of agricultural production. We can thus conclude that the locational relationship between these commodities is the relative slope of the transport gradient (-Ef) as obtained in equation 1 below. In other words, the competitive strength of a product is related both to yield per unit farmed and the transportation rate.

Figure 4-1: Economic Rent and Transport Gradient



Based on a number of simplifying assumptions (Chapter II), where the single major variable is transport costs, von Thunen postulated that location rent associated with any one commodity or a combination of crops will decline with distance from the market. Using this functional relationship, most writers have concluded that the economic rent declines linearly, even though von Thunen had envisaged a more complicated relationships (Found,1971, p.57) Following Found (p. 58), this relationship which expresses as a function of distance, the location rent derived from a single crop, can be stated as follows:

$$R = E (P - a) - Efk \quad \ldots\ldots\ldots (1)$$

where R = dependent variable, economic rent per unit of land,

E = yield per unit area,

P = market price per unit of commodity,

a = costs of production per unit of land exclude transport costs,

f = transportation costs per distance per unit of commodity, and

k = distance to the market,

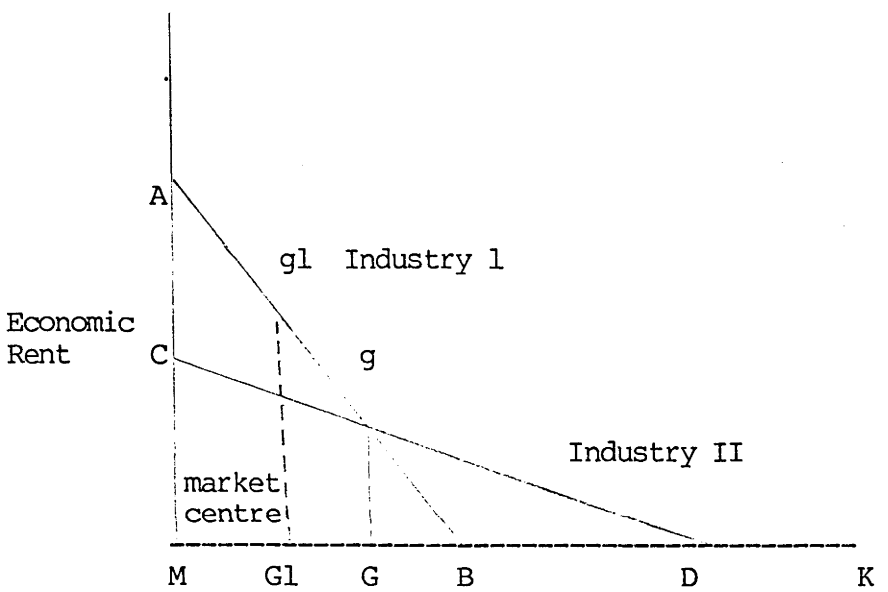
4.2.1 Economic Rent and Distance

The above equation is a straight line with a negative slope, indicating a linear decline in economic rent with distance. Found (1971) and Hurst (1974, p. 109), noted that the steepness of the slope depends on the transportation cost. Commodities which have low yields and or low transportation costs, will have lower gradients and tend to be produced at a greater distance from the market. The effect of lowering transport costs (in real terms), for example the availability of new communication routes, will be to flatten the curve (Katzman,1974, p.686; Hallet, 1979, p.51). This will result in lowering the economic rent and thus extend the extensive zone of agricultural production areas. Rent declines with the distance from the market until a no-rent distance is reached. Beyond this point, called the extensive margin of production, production is economically unfeasible.

Figure 4.1 only describes a linear relationships between two variables, distance and economic rent, in respect of one product. In most situations, agricultural production usually involves a combination of crops. Figure 4.2 describes a simple, two industry (enterprises) model where the relative competitive abilities of two products for location are compared. Using the marginal analysis approach, as used by Oyeleye (1973), the distance-rent function lines of AB and CD can represent the marginal rent line of Industry I and II respectively. The marginal rent line of AB (Industry I) is greater than CD (Industry II). Since Industry I is greater than Industry II near the market, therefore Industry I will produce near the market and extend its production spatially until its marginal rent equals marginal (opportunity) costs, both expressed as a function of distance. This relationships will determine the spatial limit of Industry I at point

G. Point G is also the inner limit of industry II, where its marginal rent function intersects with the highest marginal rent function which cuts it from above. The outer boundary of Industry II is established where marginal rent CD equals marginal cost, that is, the baseline MK. According to Oyeleye (1973, p. 41), these two conditions must exist in order for ring formation to develop as envisaged by von Thunen.

Figure 4-2: A Two-Industry Model

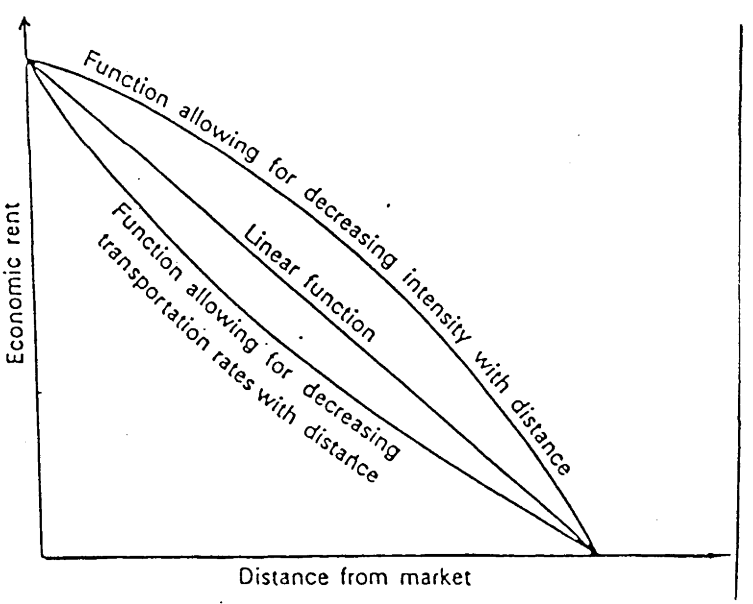


The two-industry model shows how the economic rent can result in varying patterns, or rings, of agricultural land use around a market centre, M. Following Hurst's approach, the economic rent is represented by any line perpendicular to MD from the transport gradient (marginal rent lines). From Figure 4.2, the economic rents for Industry I (eg. horticulture) and Industry II (intensive arable) may be determined from lines drawn respectively from AB and CD perpendicular to MD. A and C are the respective market prices of the two industries at M. At gG, the economic rent for horticulture and intensive arable are equal. To the left of gG, for example point glGl, the economic rent for horticulture is found to be greater. Then the farmer at Gl will gain more if he specializes in the cultivation of horticulture. If this model is now rotated about its axis, MD, a set of rings is generated with radii MG and MD as postulated by von Thunen.

The same analysis can be developed for three or more commodities,

and also for competition between two systems of growing the same crop. For example, the per hectare production of any crop can be increased by using more labour or fertilizer. Thus farms near the market can cultivate more intensively because the resulting increase in production costs pays off in higher economic rent. On the other hand, the advantages of intensive farming for distant farms is less because it is offset by increasing transport costs. Transport costs refer not only to the costs of transporting products to the market, but also to such overall costs as the transporting of supplies to the farm. For distant farms it is desirable to have less intensive systems because the operation of the law of diminishing returns becomes even greater.

Figure 4-3: Alternative Rent-distance Functions Due to Variations in Transport Costs



Source: Found,W.C. 1971, Theoretical Approach to Rural Landuse Patterns, London

Instead of a linear relationship, Found (1971,p.54) argued that a curvilinear relationship is more probable. His argument was based on Dunn's (1954,p.6-55) suggestions, that is, optimum intensity of land use changes in response to changes in the 'effective' price of the product, and transportation rates per-unit distance often decline as

the distance increases. For the first point, it is expected that there will be a decline in land use intensity, and consequently output, with distance, since the price per unit of output (after subtracting transportation costs) declines with distance. This results in a curvilinear relationship with an increasing rate of decline as shown in Figure 4.3. The exact shape, however, depends on the specific production process. With respect to the second point, this would cause a rent-distance function to become curvilinear with a decreasing rate of decline. As these analyses seem conflicting, Found (p.60) formulated a completely general hypothesis: the economic rent declines with distance from the market with the general rate of decline depending on the transportation rate.

For our purposes, however, it is sufficient to assume that economic rent declines linearly with the increase in distance from the urban centre. This is because the transportation system used by the agricultural sector for most agricultural products in Selangor is road transport. The point raised by Dunn, that the transportation rate per unit distance often declines as the distance increases, usually applies to waterways and railroads where there are heavier fixed costs of loading and unloading. These are not important in Selangor.

4.2.2 Extensions of the Ideal State

The above formulations which von Thunen postulated were based on ideal conditions. Von Thunen was consistently aware that the idealized conditions of the Isolated State were not found in reality. There are a host of factors which influence the location of agricultural production, such as existence of a navigable waterway, a nearby town, mountain barriers, railway lines and roads, import duties and trade restrictions, the variability in soil fertility and production costs, subsidies and taxes etc. These factors were all explored by von Thunen in the second part of his work as modifications to his general scheme. But they did not affect the basic principles underlying his theory. For example, the influence of a navigable river and a subsidiary town simply resulted in modifications to the shape of von Thunen's land utilization belts. (Figure 2.1 in Chapter II, lower side of the model). This is because all these factors tend or have a certain

influence upon the price of products and hence upon the location of production (Chisholm, p.30).

In this study, the ideal conditions of the von Thunen model are not applicable. As such, most writers have suggested that modifications to the general model are neccessary. However, Losch (1954) and Dunn (1954) have considered and modeled these more elaborate real situations and found that they tend to complicate the analysis, but still preserve the essence of von Thunen's theory. Consequently, this study also considers one variable, that is the road transportation cost. It is then assumed : i) that the transport costs increase proportionately as the distance from the market increases; ii) that the transportation system extends equally to all the agricultural production areas.

4.2.3 Limitations of von Thunen's model

The main criticism from most writers relates to the restrictive assumptions of t he Von Thunen model, such as: production taking place around an isolated market, complete availability of information, rational economic behaviour, and the soil being of constant fertility. As discussed above, von Thunen was well aware of his assumptions and that The Isolated State was a model and was never meant to represent reality. Another limitation of the model, as noted by Hurst (1974, p.112), is that it is static and deterministic.

4.3 Sinclair's Urban Sprawl

Sinclair's model explains the relationship of land use near urban areas that are subjected to an anticipation of urban expansion, where the degree of anticipation declines with distance from the encroaching city. With this relationship, Sinclair (1967, p.78) postulated that the ratio of urban to rural land values increases, resulting in the relative value of agricultural utilization decreasing as an urban centre is approached. This relationship is expressed diagramatically in Figure 4.4.

Figure 4.4 (a) illustrates a single agricultural land use which is measured in terms of V, defined as the value of carrying out this type

Figure 4-4: Sinclair's Relationship of Value for Agriculture and Distance

Figure 4.4 (a)

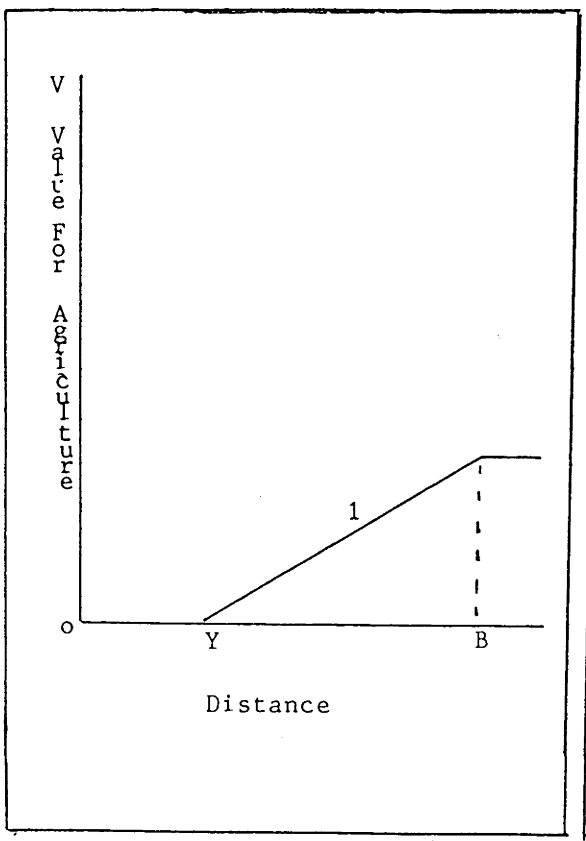
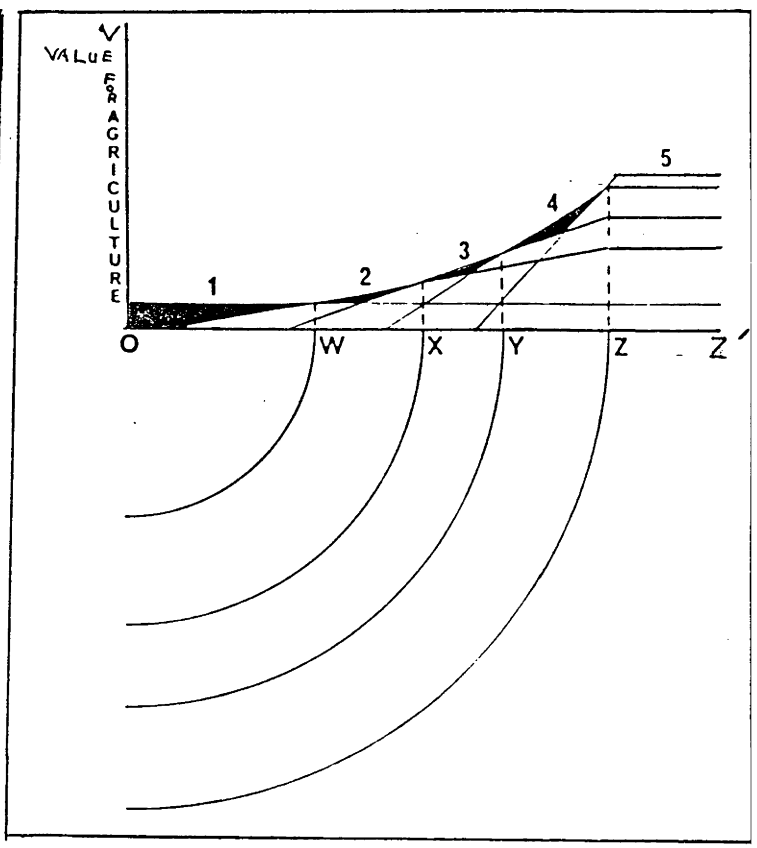


Figure 4.4 (b)



Source: Sinclair, R, 1967, "Von Thunen and Urban Sprawl", Annals, Vol. 57, No. 1.

of agriculture. As the urban centre O is approached, V decreases as the probability of urbanization increases. Conversely, as the urban centre becomes more remote, V increases until it levels off at point B, where there is no more anticipation of urban land prices. According to Sinclair, the steepness of V-slope depends on the intensity of the agricultural investment and in certain cases, might be better expressed in terms of length of time of agricultural investment. With urbanization, that is as the city is approached, the value of such intensive investment in farming declines rapidly.

This analysis can be extended for numerous competing land uses, each with different V slopes. For example, in Figure 4.4 (b), land use 1 prevails in zone OW, because its V slope is less steep than land use

2. Land use 1's advantage ceases at point W, the least intensive land use. For land use 2, more intensive land use will exist in zone WX, and so on. For land use 5, which is outside the urban influence, it will extend to an undetermined distance from the city. Other factors beside the direct urban influence determine land use in this zone, ZZ'. With O as city centre and OW, OX, OY etc. as radii, a series of rings corresponding to von Thunen rings can be obtained, as shown in Figure 2.4, Chapter II.

The above relationships of value for agricultural land use and distance (Figure 4.4) are not Economic Rent models. But according to Sinclair, this does not conflict with von Thunen's theory of economic rent. In fact, it is quite in line, as for Land use 1, where potential intensive urban uses will provide high Economic Rent. In other words, the land use providing the greatest return is making the highest bid for the land and is displacing other types of land use. Hence, the economic rent still declines with distance from the city as postulated by von Thunen. But when the economic rent is translated into agricultural patterns of land use, the conformity with von Thunen rings disappears.

4.3.1 Modifications of Sinclair's model

As with von Thunen, Sinclair was also aware that his theoretical pattern is seldom obtained in reality. This is because there are many factors which influence the idealized assumptions. Firstly, the assumptions of uniformity and simplicity are never found. Secondly, urban spread tends to be chaotic, but usually along transportation arteries, with certain growth nodes and is also affected by planned public development. This may result in zonal patterns. Thirdly, the uneven nature of growth can result in changes and the elimination of zones within the pattern, particularly where two metropolitan areas merge. Fourthly, urban expansion is dynamic, resulting in agricultural zones that are constantly shifting outwards. And finally, the general process by which the forces of urbanization influence the agricultural land use pattern can be interrupted by various public policies such as exclusive agricultural zones. These variations and irregularities can modify and disrupt substantially Sinclair's idealized land use model,

but they do not affect the validity of the principles for agricultural land use patterns near modern urban areas.

The relevence of Sinclair's model in this study thus depends very much on identifying the basic factors and major contributors to urban growth and expansion. As observed in Chapter III, Selangor and the Federal Territory have the highest level of urbanization and industrialization, and are also the area with the highest level of population growth. This is due to high net-migration rate. Another major indicator of urban expansion and influence, was rising land prices, particularly agricultural land prices near the built-up areas of the city. In this study, these two indicators will be analyzed to support Sinclair's model. However, there are a number of factors identified in the study area which will modify these variables, such as special Malay Reservation areas and land laws gazetting specific land use.

4.4 Nature of Data and Collection

In this study, secondary data will be mainly used. The main sources of secondary data are 'The Present Land use of Peninsular Malaysia, 1974' and '1982'. These are aerial topography land use surveys giving data at the district and mukim level. Unfortunately, information at the mukim level for 1982 had not been released in time for this study. Data from various research reports are also used to supplement the analysis. Based on the above information, a spatial pattern of agricultural development over the study period, that is in 1966, 1974 and 1982 is developed. Using this base, the second stage of data collection involved collecting specific information, such as crops which experienced changing spatial pattern of cultivation. For the crop categories such as 'market gardening,,'mixed horticulture, and rubber, it was intended that additional information would be collected giving average cost of production per hectare, distance from the delivered market, prices received, costs of transportation etc. However, in the course of trying to gather such secondary data this study experienced major problems as there are very few studies on spatial agricultural land use near urban areas and on the influence of urban pressures on land use in Malaysia, and particularly in the study

area. The available information is restricted to data on area for all categories of crops by districts (1966, 1974 and 1982) and mukims (1966 and 1974). It would have been particularly helpful to have had also data as to the number of farmers cultivating the crops at the mukim level.

4.4.1 Methodology of Data Analysis

Due to the limitations of data availability, the approach used to analyze the data is, mainly, by area aggregation at the district and mukim level. Using this area aggregation, a spatial analysis of agricultural location is developed with respect to the relative distance from the major town centre, Kuala Lumpur. To simplify the analysis, agricultural land use by adminstrative districts was placed in four groups or zones, as follows:

a) within urban centre, that is the area of the Federal Territory;

b) the peri-urban districts, that is, the districts immediately surrounding the Federal Territory namely the districts of Gombak, Petaling and Ulu Langat;[1]

c) the intermediate districts, that is, those districts beyond the peri-urban districts such as Kelang, Kuala Selangor, Kuala Langat, Sepang, and Ulu Selangor; and

d) the distant districts, namely the district of Sabak Bernam.

It is expected this classification will change over time. In other words, for 1966 there will be more "distant" districts, as road development at that time was less compared to 1982. It is also to be emphasized that the above zones are quite arbitrary. Finally, it must be emphasized that this study is limited to the State of Selangor which

[1]Peri-urban is used by OECD study to refers to areas in the periphery of urban agglomerations where economic and social activities, particularly agricultural production are directly affected by the presence and the expansion of the city.

is an arbitrary administrative area. Trade over the State border with neighbouring states is free both as regards commodities and labour. There is no reason therefore why all production rings (von Thunen's or Sinclair's) should be found within the State

4.5 Conclusions

This chapter has discussed the specific details of the two models of location of agricultural production near urban areas, their applications and limitations. The chapter also presented the sources of data which are then analysed in chapter five. The usefulness and limitations of the data available for the study was also noted. We now turn to the analysis and results.

CHAPTER 5

ANALYSIS AND RESULTS

5.1 Introduction

The theoretical framework and procedures used to analyze the data were presented in Chapter IV. The results of the analysis are presented in this chapter, which consists of several sections. The first three sections analyse the distribution of the area of the major agricultural land uses for the study years of 1966, 1974 and 1982. This is followed by an analysis of the general spatial changes between the study periods with the objective of identifying the basic forces operating in the study area which determine land use. The final section discusses the basic forces which determine future land use, and the problems of farm adjustments in the light of these developments.

Tables 1 and 2 in Appendix B show the area distribution of important perennial crops and food crops by districts in Selangor with increasing distance from the city centre of Kuala Lumpur. These two tables show the actual land use in 1966, 1974 and 1982, and will be used in the analysis in sections two, three and four. Table 1 shows the area for the important perennial crops, namely rubber, oil palm, coconut and cocoa. While Table 2 shows the area for important categories of food crops, namely mixed horticulture, market gardening, orchards and diversified crops.

5.2 Agricultural Land use in 1966

Rubber was the major perennial crop cultivated in the State in 1966 with 190,092 hectares, followed by coconuts with 47,441 hectares. Oil palm was the third most important perennial crop planted with 31,780 hectares. Coconut cultivation, however, is mainly found in the north coastal district of Sabak Bernam and is not considered to be too

relevent in this spatial analysis of agricultural land use near urban areas. This is because coconut cultivation is mainly influenced by the favourable agro-climatic factors along the coastal belt. Agro-climatic factors also influence the location of paddy cultivation in the State. This is mainly located on the flood plain of the north coastal districts of Sabak Bernam and Kuala Selangor.

Under the food and fruit category, mixed horticulture is the major land use with a total area of 8,332 hectares in 1966 as shown in Table 2, Appendix B. This is followed by diversified crops with 3,119 hectares, market gardening with 692 hectares[1] and finally, orchards with only 482 hectares. The total area under food and fruit cultivation of 12,625 hectares only constituted about 4 percent of the total cultivated area (312,430 ha.) in the State. This shows that food production (excluding paddy) generally receives minimum attention, while the plantation agriculture specializes in perennial export crops resulting in uneven agricultural development with respect to the food needs of the rapidly growing population in the State and Federal Territory of Kuala Lumpur.

Within the urban centre of the Federal Territory of Kuala Lumpur, it is observed that agricultural land use only occupies 32.6 percent (7,799 hectares) of the total land use (See Table 3 in Appendix B). The major portion of the Federal Territory area in 1966 was already occupied for non-agricultural purposes, particularly by urban and associated areas (33%), grassland and scrub forest (17%), tin mining areas (11%) etc. Of the total 7,799 hectares under agricultural land use, 7,257 hectares was under rubber (93%). The balance of the agricultural area of about 7 percent was mainly under mixed horticulture (329 ha.), market gardening (140 ha.), diversified crops (58 ha.) etc. In other words, Kuala Lumpur town in the mid 1960's with a total population of about 400,000 people had relatively insignificant areas under food production with a total area of about 500 hectares.

Rubber cultivation in 1966 was generally found to be spatially

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[1]The total area of market gardening might be larger as the aerial photography could only mapped areas of 1.2 hectares (3 acres) or larger. Field checking revealed that there were often very much smaller with an average size of 1 acre (Wong, 1979).

distributed with increasing cultivation as distance from the urban centre increases to the peri-urban and intermediate districts (except for the district of Sabak Bernam with only 434 hectares of rubber).[2] . The main significant areas of rubber cultivation are found on the fertile undulating foothills in the peri-urban and the intermediate districts. Ulu Langat and Ulu Selangor had the largest rubber areas with 30,258 and 36,709 hectares, respectively. Generally, these districts are agronomically more suitable for rubber cultivation. This spatial observation is quite consistent to a study by Lee Boon Thong (1975, p.40). Using the same Land use map Surveys of 1966, he found that the proportion of land utilized for the cultivation of crops increased with distance from the town centre ($r = +0.8$, significant at 99 percent level). This is shown in Figure 5.1 below.

The cultivation of food crops, particularly market gardening, is expected to be mainly within or near the periphery of the urban centre as postulated by von Thunen. This is because the cultivation of fresh vegetables and mixed horticulture involves intensive cropping, particularly high input of labour and/or capital coupled with the problem of producing perishable output. An analysis of the areal distribution of market gardening in 1966 shows that the intensity of cultivation is spatially distributed within the urban area of Kuala Lumpur and cultivation area generally decreases as distance from the city centre increases towards the peri-urban districts. For example, the Federal Territory area had the largest area of market gardening with 140 hectares but as we move spatially outwards to the peri-urban districts, the intensity of market gardening decreases. District of Gombak had 63 hectares, Petaling had 74 hectares and Ulu Langat had 74 hectares of market gardening. However, the study could not identify spatially the actual location distribution of market gardening areas in 1966.

An analysis at the mukim level shows that the cultivation of fresh vegetables was mainly concentrated in certain mukims. (Table 4 in Appendix B). For the district of Gombak, the market gardening areas

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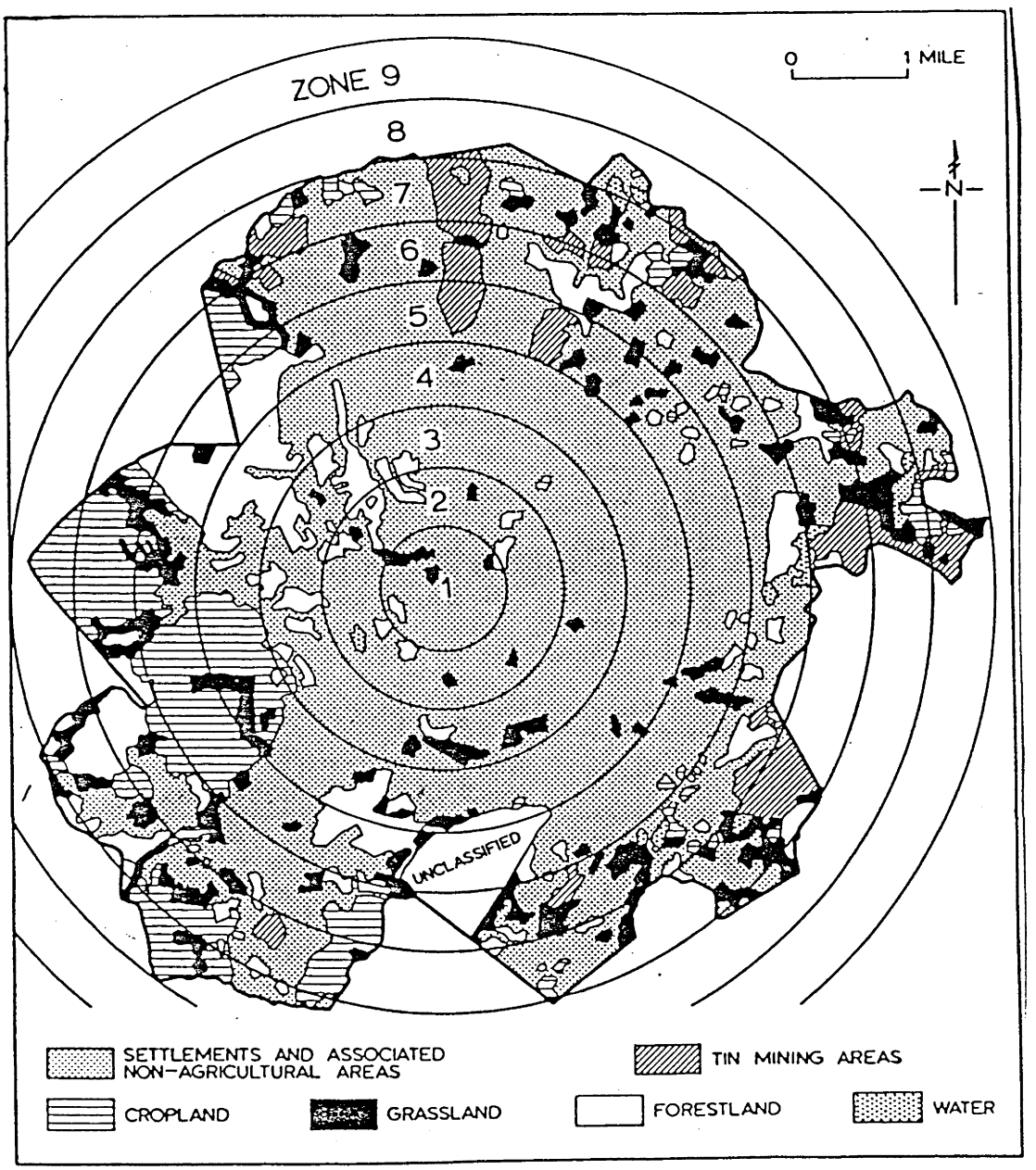
[2]According to Wong (1969), the cultivation of rubber in Sabak Bernam is agronomically not suitable due to the nature and type of soil.

Figure 5-1: Landuse Gradation in Kuala Lumpur in 1966



Source: Thong, L.B. 1975, "Landuse Gradation in Kuala Lumpur", Journal Geographica, Vol. 10

were mainly in the mukim of Rawang (33 ha.) and Batu (25 ha.); while for Petaling district they were mainly in the mukim of Petaling (62 ha.). For Ulu Langat district, the main market gardening areas were concentrated in the mukim of Ampang with 32 hectares. The concentration of market gardening areas in certain mukims was probably influenced by the ethnic distribution as traditionnally, commercial cultivation of fresh vegetables is mainly undertaken by Chinese farmers (Malaysia, 1979, p.164).

In the intermediate districts, the cultivated area of market

gardening was very small (eg. Kuala Selangor had 5 hectares and Sepang had only 2 hectares in 1966), except for the district of Kuala Langat. It is very surprising to find that Kuala Langat is the major producer of fresh vegetables in Selangor with 289 hectares in 1966. This area is more than double the area of market gardening in the Federal Territory. This is a very significant development as the intermediate district of Kuala Langat is about 70 km. from Kuala Lumpur and about 30 km. from Kelang town.[3] At the mukim level, it is observed that market gardens were mainly cultivated in the mukims of Batu (176 ha.), Tanjung Dua Belas (49 ha.) and Teluk Panglima Garang (42). According to Wong (1969), Kuala Langat's fresh vegetable produce probably goes to Kelang town and Port Kelang where there is also a large ready market. It is probable that some vegetable produce from Kuala Langat was also marketed to Kuala Lumpur as there were already good road links between Kuala Lumpur and Kelang town with the completion of Federal Highway in early 1960's. This reduced the travelling time from about 3 hours to only 45 minutes and the distance by road to about one third. The lowering of transport costs probably facilitated the large cultivation of market gardening areas in Kuala Langat. In addition there were other factors such as an intensive government extension programme (Malaysia, 1979, p.171). The lowering of these transport costs would have reduced the location advantage of those areas in closer proximity to the large Kuala Lumpur markets.

Beside market gardening, mixed horticulture is also important in the State as a potential source of agricultural products, particularly fruits, mixed vegetables and certain food crops. 'Mixed horticulture' is a wide category of land use which includes all the typical forms of diversified 'garden cultivation' found in haphazard patterns around family dwellings. The crops grown include mixed vegetables, yams, tapioca, pineapples, bananas and papayas. For mixed horticulture located near large urban centres, there is evidence of an increase in fruit trees in the crop composition. In 1966, mixed horticulture is found to be spatially distributed in all districts, but spatially concentrated in the peri-urban districts of Ulu Langat with 1,571 hectares.

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[3]The measurement of distance is from the main town of Teluk Datuk.

5.3 Agricultural Land use in 1974

In 1974, the non-agricultural land use in the Federal Territory of Kuala Lumpur increased from 67.4 per cent to 70.8 per cent. (Table 3 in Appendix B). The urban and associated areas increased markedly from 7,938 hectares (33%) to 10,366 hectares (43%) in 1974, an increase of about 30 percent. On the other hand, the total agricultural land use declined from 7,799 hectares (32.6%) to 6,972 hectares (29.2%). The reduction of agricultural areas was mainly due to rubber areas declining by about 1,000 hectare. As shown by Table 3 in Appendix B, the increase of urban and associated areas was due to the reduction of agricultural areas, grassland and scrub forest which declined from 4,082 hectares (17%) to 2,945 hectares (12%) in 1974, and tin mining areas also declined from 2,684 hectares (11%) to 1,864 hectares (7%).

Another important observation which is related to the urban expansion and influence is that the total area of senile rubber in 1974 was very much larger than would be expected in situations where regular replanting (with better high yielding rubber clones or with alternative crops) was taking place. There were about 1,951 hectares of over-age (senile) rubber. This was 32% of the total rubber area in the Federal Territory. Furthermore, the young rubber area was only 138 hectares. Table 5.1 shows that the problem of senile rubber also extended to the immediately surrounding peri-urban districts. Gombak district had the highest percentage of senile rubber with 31 percent and followed by Petaling district with 18 percent. Ulu Langat had only 15 percent, although it has very large rubber areas. A detailed examination at the mukim level indicates that the problem of senile rubber was more acute for areas closer to the urban built-up areas and influence. (See Map of Selangor with district and mukim boundary in Figure 1, Appendix C). For example, in the district of Gombak, the mukims of Batu and Setapak had 45 percent and 49 percent of senile rubber, respectively. In Petaling district, only the mukim of Petaling experienced a high percentage of senile rubber and this mukim is located exactly in the direction of urban expansion along the Kuala Lumpur-Kelang axis. The problem of senile rubber around Kuala Lumpur and Petaling Jaya, and the connection of this deterioration with an anticipation of urban expansion was noted by Douglas in 1972. Beside the problem of senile

trees, the study area also experienced the problem of land being left idle and abandoned. Figure 5.1 and 5.2 showed that there were significant areas under scrub and grassland near the built-up urban centre.

However, the other categories of agricultural land use such as market gardening and mixed horticulture both experienced an increase in cultivated area. Market gardening area more than doubled from 140 hectares in 1966 to 302 hectares in 1974 in the Federal Territory area. For mixed horticulture, the area increased from 329 hectares to 402 hectares (22%). The significant increase of market gardening areas conforms with expectations because of the expanding market for fresh vegetables due to rapid population growth as was indicated in Chapter III. These major market gardening areas were found to be distributed at the edge of urban built-up areas. See Figure 5.2. A striking feature of Figure 5.2 is the fact that mixed horticulture and vegetable production is very closely related to the built-up urban areas and the major roads. This pattern of land use is quite parallel with the modified version of von Thunen's model. (Figure 2.1 in Chapter II, lower side of the model).

An analysis of the spatial pattern of agricultural land use towards the peri-urban districts also showed that the cultivated area of rubber increases, while for market gardening it generally decreases. As observed in the Federal Territory, the cultivated area of market gardening also increases in all the surrounding peri- urban districts, with Ulu Langat experiencing the largest increase of 132 hectares. (Table 5.2). At the mukim level for the district of Ulu Langat, the mukim of Ampang had the largest expansion with an increase of 112 hectares (350%). This is followed by the mukim of Cheras, with an increase of 29 hectares; while the mukim of Semenyih declined. The possible reason for the rapid increase in these mukims was because they are generally located on the boundary of the Federal Territory, with large concentration of residential settlements.

For the intermediate districts, almost all districts also experienced an increase in market gardening area (with exception of the urban districts of Kelang). For the Kuala Langat district, it also experienced an expansion in market gardening area but an analysis at

Table 5-1: Summary of Senile Rubber Areas in the Federal Territory and Peri-urban Districts, 1974

Districts/ Mukims (selected)	Rubber Areas (Ha.)	Senile Areas (Ha.)	% of Senile Areas	Remarks
1. Federal Territory	6,174	1,951	32%	-
2. Gombak D.	12,014	3,675	31%	
M. Batu	2,688	1,204	45%	) Adjoining
M. Setapak	2,043	1,008	49%	) the Federal
M. Ulu Klang	711	25	4%	) Territory
M. Rawang	6,573	1,438	22%	boundary.
3. Petaling D.	14,986	2,667	18%	-
M. Petaling	3,305	1,389	42%	) Adjoining the
M. Sg. Buluh	3,780	377	10%	) Fed.Territory
M. Damansara	13,909	722	13%	boundary.
M. Bukit Raja	2,273	179	8%	
4. Ulu Langat D.	30,919	4,740	15%	
M. Ampang	123	31	25%	) Adjoining the
M. Cheras	3,984	650	16%	) Fed.Territory
M. Kajang	5,555	879	16%	boundary.
M. Semenyih	6,392	850	13%	
M. Ulu Langat	6,638	1,200	18%	

Note: D refers to district and M. refers to mukim.

Source: Wong, I.F.T., 1979, Present Land use of Peninsular Malaysia, Vol I-Text, Min. Ag., Department of Agriculture, K.L.

the mukim level shows that the mukim of Batu experienced a reduction in area. However, other mukims such as Tanjung Duabelas which expanded its area from 49 hectares to 113 hectares. Kuala Selangor also expanded its vegetable (114% increase) and mixed horticulture (110% increase) areas, probably with the completion of the bridge over the Kuala Selangor river. This reduced the travelling time significantly. The expansion of agricultural areas in the peri-urban districts and particularly in the intermediate districts, are changing locational advantages due to rapid expansion of road development and continued expansion of demand in Kuala Lumpur and Kelang Valley region generally.

Table 5-2: Market Gardening Areas in the F.Territory and Peri-urban Districts for Selected Mukims between 1966 and 1974

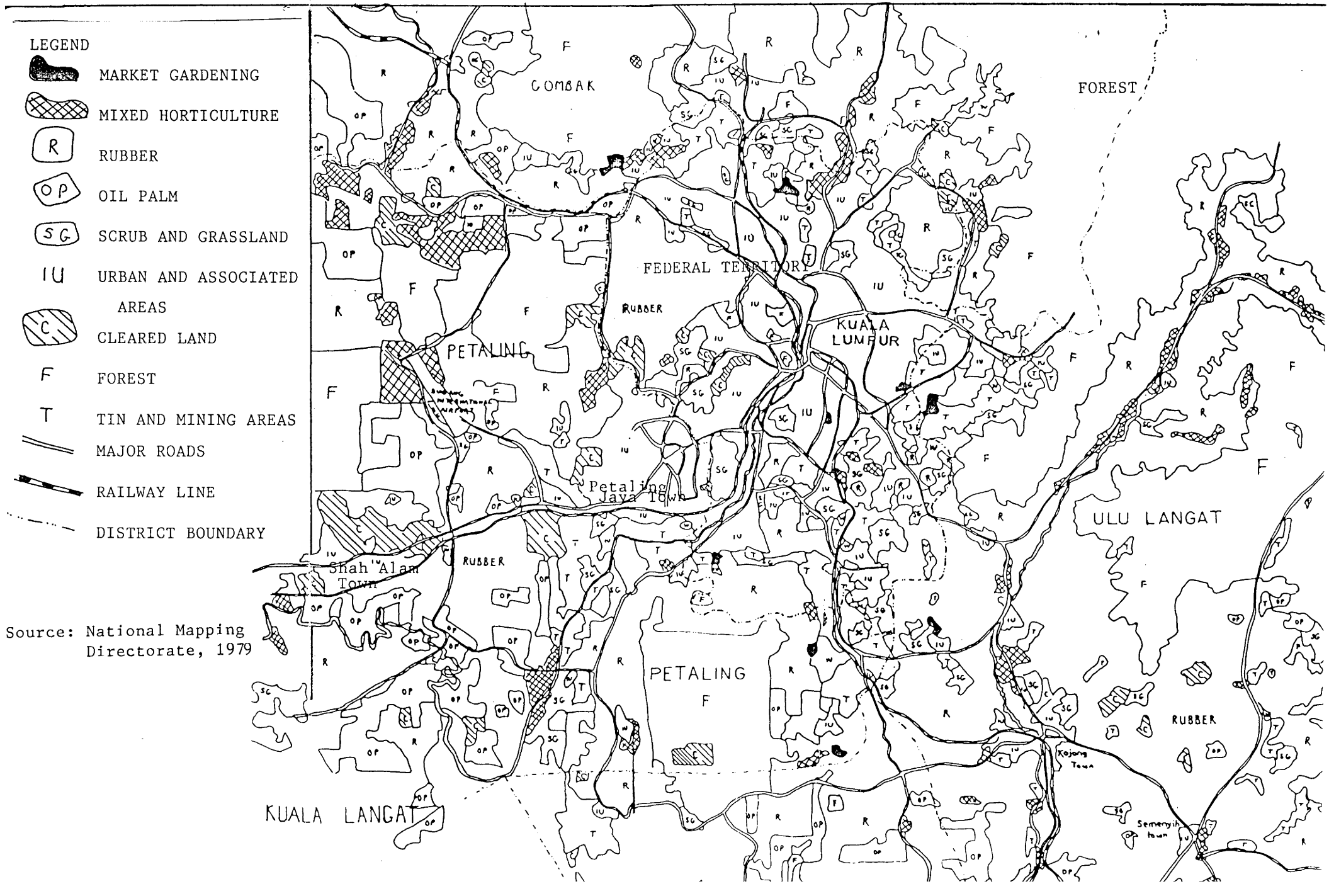
(Hectares)

District/ Mukim (selected)	Distance from K.L. centre.	1966	1974	% increase 1966-1974
Federal Territory	-	140	302	116%
Gombak District	-	63	113	79%
M. Batu	18 km.	25	65	160%
M. Rawang	40 km.	33	28	-5%
M. Setapak	16 km.	3	3	-
M. Ulu Kelang	13 km.	4	17	325%
Petaling District		74	113	53%
M. Petaling	24 km.	62	93	50%
M. Sg. Buluh	32 km.		20	67%
Ulu Langat District		74	206	178%
M. Ampang	12 km.	32	144	350%
M. Cheras	20 km.	10	41	310%
M. Kajang	42 km.	10	17	70%
M. Semenyih	42 km.	18	3	-83%

Note: * Distance from Kuala Lumpur city centre to the remote agricultural areas along the main road to the mukim.

Source: Wong, I.F.T. 1979, Present Land use of Peninsular Malaysia, Vol I-Text, Ministry of Agriculture, Kuala Lumpur.

Figure 3.2: Land Utilization Map of Federal Territory and Adjoining Peri-urban Districts, 1974



Source: National Mapping Directorate, 1979

Von Thunen singled out distance, in terms of transport costs, as a major force determining the land use patterns. Major construction of road transportation in the study area has enabled transport costs to decline significantly over the study period. Although studies on transportation costs for agricultural products, particularly for perishable and bulky output are very limited in Malaysia, available empirical evidence shows that the costs of road transport have declined significantly during the study period. Studies by Sarkar (undated) and Onn (undated) in the early 1970's have consistently shown that transport and marketing costs constituted only between 7-8 per cent for chillies (from Tanjong Malim, Ulu Selangor; Malacca; and Cameron highlands, Pahang) and tomatoes (from Tanjong Karang, Kuala Selangor; and Malacca) and 10 per cent for local cabbages (from Cameron Highland) of the consumers' price, even when vegetables were brought to Kuala Lumpur from about 90 kilometres in Tanjong Karang and 190 kilometres from Malacca and Cameron Highland. This is shown in Table 5.3.

Table 5-3: Producers share and Marketing costs for Selected Vegetables*

Description	Tomatoes		Red Chillies		Local Cabbages	
	M$	%	M$	%	M$	%
Producers share	15	60	21	56	10.3	29.4
Wholesale margin	2.5	10	1.5	4	11.0	31.4
Retailer margin	5.5	22	12.2	32.5	10.0	28.6
Marketing costs#	2.0	8	2.8	7.5	3.7	10.6
Consumer's price (per picul)	25	100	37.5	100	35	100

* The source is undated but would be referring to the early 1970s.

\# Marketing costs consists of internal transport, baskets and transport to Kuala Lumpur.

Source: Sarkar, K.K., Undated 'Marketing margins of certain agricultural commodities in Kuala Lumpur, A Note', Review of Agricultural Economics, Vol.5, no.1.

Onn, C.K., Undated 'The cabbage industry in Pen.Mal' Review of Agricultural Economics, Vol. 4, No.1

For rubber areas, only Petaling district experienced a significant

reduction in area of about 5,000 hectares (25 %), while Gombak had a marginal decline of about 800 hectares (6 %). The reduction in the rubber area of Petaling was largely compensated for by the increase in oil palm (about 3,100 hectares) and in mixed horticulture (about 1,300 hectares). Another possible reason is the expansion of urban and associated areas, as within this period a number of satellite towns were beginning to be developed, such as Sungai Way/Subang, Subang Jaya, Shah Alam, and Bangi. On the other hand, the district of Ulu Langat, most of which is very hilly and which is agronomically particularly suitable for rubber growing experienced a slight increase in area (600 hectares). For the intermediate districts, it is found that the rubber areas decline significantly, particularly in the districts of Kuala Selangor, Kuala Langat and the urban district of Kelang. Here the reduction of rubber areas is correlated with an increase in oil palm cultivation. The expansion of oil palm areas is mainly concentrated in these intermediate districts, which constituted about 87 per cent of the oil pal in the State in 1974.

The lack of interest among rubber estates and smallholders in the peri-urban districts in replanting with oil palm, with its higher returns (Lim and Chai, 1978) and lower labour requirements could be explained by the 'urban-threat' hypothesis of Sinclair. This will be discussed in section 5.6. Various studies have shown that the net-cash flow from oil palm is up to fifty per cent greater than that of rubber. (Table 5 in Appendix B). In addition, labour costs constitute about 54 per cent of the total cost of production for mature oil palm (Arshad, 1982). For rubber, however, it requires even more labour, especially in the smallholder sector where over 90 per cent of the production cost is in labour cost as shown below.

5.4 Agricultural Land use in 1982

The non-agricultural land use in the Federal Territory of Kuala Lumpur increased further from 70.8 per cent in 1974 to 78 per cent in 1982. The continued increase of non-agricultural land use, was due to the continued rapid expansion of urban and associated areas which increase by a further 3,100 hectares. Total agricultural land use in the Federal Territory declined to only 5,196 hectares, which constitute

Table 5-4: Labour Cost and Total Production Cost for Selected Crops

($M ringgit)

Crops	Year	Labour cost	%	Total cost of production
1.Coconut (Mawa v.)	10	1,009	84.6	1,192
2.Coconut (Tall v.)	10	620	97.6	635
3.Cocoa (intercrop)	8	770	53.8	1,430
4.Oil palm	8	510	53.5	957
5.Rubber (FELDA)	10	1,570	84.1	1,866
6.Rubber (smallholder)	10	1,200	98.4	1,220
7.Paddy (High tech.)	-	880	54.6	1,612
8.Paddy (Low tech.)	-	900	77.9	1,156

* Year indicates the base year used in the computation of production cost.
v = variety

Source: Arshad Ayob, 1982, 'The Labour Factor in Malaysian Agriculture', Proceeding seminar of The State of Malaysian Agriculture, 12-14 th August, 1982 The Agriculture Institute of Malaysia, Kuala Lumpur.

only 22 per cent of the total area as compared to 29 percent in 1974. The reduction of agricultural area occurred mainly in rubber, which declined by 1,668 hectares. Beside the significant conversion of rubber areas for urban uses, the proportion of senile rubber trees is estimated to increase rapidly although in 1974 it was already found to be significant.

The area under market gardening and mixed horticulture in the Federal Territory, is also observed to decline somewhat. The reduction of market gardening areas might seem surprising given the continously increasing demand for fresh vegetables as the population of Kuala Lumpur and Kelang Valley increased more rapidly in the late 1970's and early 1980's. The phenomenon of declining market gardening areas, mixed horticulture and orchards seems to extend to the surrounding peri- urban districts of Gombak and Petaling. It is thought that these modest declines are likely to be explained by the direct competition of such land for urban, particularly residential uses. (See Figure 2 and

3 in Appendix C). These figures show that rubber land in 1974 is occupied by residential areas in 1982. The decline of market gardening areas was also reported by the recent annual Treasury's Economic Report 1982/83 (1982). The report observed that the loss of market gardening areas around major towns was one of the factors that have pushed up vegetables prices since mid 1980. Prices of fruit and vegetables increased substantially. They account for 6.9 per cent in the food sub-index, rose by 9.6 per cent during the first eight months of 1982 compared with 8.6 per cent in the corresponding period.

5.5 General Spatial Changes For Perennial and Food Crops

5.5.1 Perennial Crops

The general trend in the first period, between 1966 and 1974, is that oil palm experienced an increase in cultivation, while rubber declined. In the second period, between 1974 and 1982, the trend of increasing cultivation was reduced even for oil palm. This is presented in Table 5.5 below. Specifically, rubber cultivation declined in almost all districts in the first period for the districts of Ulu Langat and Ulu Selangor, which registered marginal increases in rubber cultivation of 647 ha. and 103 ha., respectively. These two districts are generally considered as most agronomically suitable for rubber growing in the State. The decline of rubber cultivation is observed to be spatially correlated with an increase in oil palm cultivation, particularly in the intermediate districts indicating large scale crop substitution and a policy of diversification among estates, particularly in Kuala Selangor and Kuala Langat districts.

The main reason for the significant increase in oil palm cultivation in the State was because oil palm is found to be more profitable than rubber. Also as noted above, oil palm production requires less labour, which is getting increasingly more expensive in real terms in the 1980's. According to Shand (1984), agricultural real wages have risen in response to the problem of labour shortages in agricultural sector. Studies by Labour Department (1981), Nayagam and Abdullah (1981), Arshard (1982) etc. have all shown that labour

Table 5-5: Area Increase (+) or Decrease (-) for Major Perennial Crops in The Study Area, 1966, 1974 and 1982

Districts	Rubber		Oil palm	
	1966-74	1974-82	1966-74	1974-82
Within urban	Hectares	(%)	Hectares	(%)
F.Territory	-1,042(-14)	-1,668(-27)	+3	0(-)
Peri-urban				
Gombak	-828(-6)	-2,003(-17)	+1,759(+884)	+28(+1)
Petaling	-4,948(-25)	-3,526(-24)	+3,110(+110)	+1,721(+29)
Ulu Langat	+661(+2)	-1,116(-4)	+1,059(+868)	+805(+68)
Intermediate				
Kelang	-6,878(-42)	-2,399(-25)	+5,880(+186)	+3,290(+36)
Kuala Langat	-8,752(-46)	-1,041(-10)	+15,414(+180)	+2,106(+9)
Kuala Selangor	-10,322(-42)	-7,314(-52)	+10,925(+181)	+9,213(+54)
Sepang	-3,377(-15)	-2,918(-15)	+4,940(+106)	+3,623(+58)
Ulu Selangor	+103(0.3)	-724(-2)	+6,372(+110)	+2,038(+16)
Distant				
Sabak Bernam	-369(-85)	0(0)	+1,598(+390)	+1,932(+96)
Total	-35,752(-19%)	-22,758(-15%)	51,060(160%)	24,806(30%)

Note: 0 = no increase in cultivation

Source: Calculated from Table 1 in Appendix B.

shortages are already significant throughout the country, with certain areas or states found to have severe shortages. Shand cited a recent study by Barlow (1984), which shows that the real wage rate of directly employed male rubber tappers fluctuated with little increase between 1960 and 1975, but rose steeply thereafter from M$3.63 in 1975 to M$6.93 per day in 1981, a rise of 63 per cent as shown below.

Table 5-6: Malaysia: Nominal and Real Wage Rates of Directly Employed Male Rubber Tappers*, 1947-1981

Year	Earnings per Day		Year	Earnings per Day	
	Nominal	Real &		Nominal	Real
	M$	M$		M$	M$
1947	1.00	1.12	1965	3.83	3.75
1951	3.00	2.70	1970	4.35	3.99
1957	3.31	3.18	1975	5.67	3.63
1960	3.76	3.76	1981	12.63	6.93

* Female tappers earned less.

& The official retail price index was used, linked to the subsequent price index for 1975 and 1981 (1959=100)

Co in Barlow (1984)(cited in Shand, 1984).

On the other hand, the rubber estates and smallholders in the peri-urban areas are not diversifying to oil palm cultivation. Rather, they are keeping their rubber with an ever increasing proportion of senile trees, with even lower economic returns. The lack of interest in replanting with oil palm, is undoubtedly because these agricultural areas are located within only 40 kilometres radius of the Kuala Lumpur city centre. In other words, the owners of this agricultural land are facing uncertainty due to the rapid advance of urban area since the early to mid 1970's. This uncertainty is further increased as farm mangement needs a long term view, particularly for perennial crops such as oil palm which require a long gestation period for owners to realize their investment returns.

5.5.2 Food Crops

Table 5.7 becomes critical to this study, relying as it does on district data covering the two 'inter-census' periods. Land use under food crops in the first period is observed to have increased for most categories. With mixed horticulture experiencing the most significant increase in area of about 4,100 hectares (50 per cent). This is followed by orchards and market gardening which increased by 802 hectares (166%) and 510 hectares (74%), respectively. The expansion of the food crops area is in line with the increased demand as Kuala Lumpur's population had almost double by 1974. In constrast, in the second period there was a declining trend of market gardening and mixed horticulture in the urban and peri-urban districts and stagnation in the intermediate districts. This reverse trend in the second period is possibly related to the rapid economic development and urbanization in the State, particularly in the Kelang Valley region. The evidence in Table 5.7 suggests that the decline in these intensive agricultural enterprises decreases with the distance from the centre of the 'urban threat'.

To sum up, the rapid economic development has resulted in the increased competition between urban and rural uses. As observed above, urban and associated areas expanded markedly, while agricultural areas were declining with large proportion senile rubber trees. With this limited but consistent evidence, this study hypothesizes that the basic operating force that will determine land use in the future is the pressure of the urban expansion as postulated by Sinclair.

5.6 The Influence of Urban Expansion

A study by OECD (1979) in Europe, observed that the pressure of urban expansion creates substantial changes in physical and economic conditions in the peri-urban area. The study identified the two major elements of change as: a) population and manpower and b) land transfer. In line with this observation, it is appropriate to analyze these major elements of change in this study. The above discussion has indicated that during the second period, (between 1974 and 1982), rapid urban growth due to in-migration and concentration of industrialization

Table 5-7: Area Increase or Decrease for Food Crops by Districts In Selangor between 1966, 1974 and 1982

Districts	Mixed Horticulture 1966-74	Mixed Horticulture 1974-82	Market Gardening 1966-74	Market Gardening 1974-82	Orchards 1966-74	Orchards 1974-82
Within urban	Hectares (%)					
F. Territory	+72 (+22)	-52 (-13)	+162 (+116)	-302 (-11)	+7 (+100)	-2 (-8)
Peri-urban						
Gombak	+381 (+59)	-278 (-27)	+50 (+79)	-66 (-58)	+108 (+235)	-42 (-27)
Petaling	+1,329 (+167)	-41 (-2)	+39 (+53)	-12 (-11)	+186 (+286)	+15 (+6)
U. Langat	+85 (+5)	0 (0)	+132 (+178)	+1 (0)	+113 (+104)	-3 (-0.9)
Intermediate						
Kelang	+784 (+61)	-211 (-10)	-9 (-39)	-2 (-14)	+24 (+24)	+1 (0)
K. Langat	-23 (-1)	-5 (0.3)	+47 (+17)	0 (0)	+144 (+221)	0 (0)
K. Selangor	+731 (+110)	-9 (-0.6)	+58 (+114)	0 (0)	+124 (+1240)	0 (0)
Sepang	+179 (+38)	+18 (+3)	+7 (+350)	0 (0)	+87 (+318)	+16 (+14)
U. Selangor	+552 (+87)	-368 (-31)	+21 (+100)	0 (0)	+16 (+43)	0 (0)
Distant						
Sabak Bernam	+78 (+16)	+1 (0.2)	+2 (-)	0 (-)	-6 (-75)	0 (-)
Total	+4,168 (+50%)	-946 (-7.6%)	+510 (74%)	-381 (-9.5%)	+802 (166%)	-12 (-1%)

Note: 0 = no increase in cultivation

Source: Calculated from Table 2 in Appendix B.

had already occurred in the study area. This had a significant impact on agricultural production through the reduction in cultivated area, increasing senile trees, land left idle and abandoned. The reduction of agricultural areas was due to the increasing demand for land space, such as for the construction of residential settlements, urban physical infrastructures such as roads, recreation areas etc.

5.6.1 Population Growth

As discussed in Chapter III, Selangor and the Federal Territory have experienced very high urban and population growth. This has resulted in an increase in the number and the density of resident population per district as shown in Table 6, Appendix B. It shows that rapid population growth occurred in the peri-urban areas with higher average growth rate than the urban centre of Kuala Lumpur. The district of Gombak had the highest average growth rate with 8.3 per cent, followed by Petaling with 5.9 per cent and Ulu Langat with 5.4 per cent. This observation is consistent with the study of OECD (1979, p.15), where a greater increase in population growth takes place in the urban-fringe areas than in the core area, owing to the relatively higher cost in central area, improvement in transportation and communication and people's desire to live in open and rural surroundings. The greater percentage population pull towards Gombak district is offset in absolute terms by Petaling district with its much larger base period size which reflects its better proximity to Kuala Lumpur, but with cheaper housing rents and more rural environment. A projection by Shankland in 1979 further indicates that population growth will be continued to 1990, with peri-urban districts absorbing a total of about 390,000 people due to net-migration from the intermediate districts and also neighbouring states of Selangor.

5.6.2 Urban Pressure on Land Prices

The increasing demand for land space for urban use has the most direct effect on land prices. The most significant direct influence of urban expansion is expressed in the physical growth of the city. Spatially, however, this influence is minor and only affects those agricultural areas in the direct route of urban expansion such as along the major road corridors. Beside this, the indirect influence is more spatially widespread where rising agricultural land values were due to future anticipation of urban growth. According to the OECD study (1979, p. 19), agricultural land prices surrounding most urban cities have risen precipitously over past years, reaching extremely high levels. The study identified that the price formation of agricultural land near urban areas is a function of its distance from the urban

agglomerations, its present land use, speculation ie. its expected future use, its present set of amenities, land use and taxation policy.

The physical expansion of Kuala Lumpur and the emerging conurbation in the Kelang Valley, as observed by Aiken and Leigh (1975), has resulted in the rapid reduction of agricultural areas in the Federal Territory and adjoining peri-urban districts. As discussed above, between 1966 and 1982, total agricultural land in the Federal Territory, mainly under rubber, had declined by about 33 percent. At the same time, the proportion of senile rubber trees increased. This phenomenon has resulted from the rapid turnover of agricultural land being sold at high prices as reported by the Treasury's Property Market Reports since 1979. These annual reports observed that agricultural land with potential for development, particularly land with road frontage and adjacent to or near housing estates have recorded very high prices since late 1970's. Table 5.8 demonstrates this point by showing the escalating prices of agricultural land in the Kampung Sungai Penchala Malay Reservation area.[4] (See Figure 2 in Appendix C for the location of this area).

The substantial price increase of agricultural lands which have potential to be converted for development purposes reflects the rapid price increases since 1975 (shown in Figure 5.3) of residential and commercial properties in Kuala Lumpur and Petaling Jaya. The substantial upward trend of properties prices have generally generated enough speculation to influence agricultural land prices to rise in the outer areas of the peri-urban and in intermediate districts. Speculation is another important factor identified by the OECD study which can have considerable influence on land prices.

Speculation refers to the expectation that current prices of land rise in anticipation that it will command higher prices in the future, mainly to the continued urban expansion (OECD, 1979). This speculation leads to excessive activity on the part of speculators. It is observed that speculation is quite rife in outer peri-urban areas where most agricultural land prices have recorded substantial price increases. The

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[4]This area is located to to the north of Taman Tun Dr. Ismail, a popular housing estate.

Table 5-8: Prices of Agricultural land sold in Sungai Penchala, Federal Territory, 1978, 1980 and 1982

Location	Price Per Acre (M$ current prices)		
	1978	1980	1982
Land with road frontage suitable for residential use.	$ 50,000-60,000	$ 110,000	$ 272,000-297,000
Interior land suitable for residential/ag. use	30,000-40,000	65,000	161,000
Other interior land (greater than 1 acre)	15,000-20,000	50,000	124,000

Source: Ministry of Finance, 1981 Property Market Report, 1980, Kuala Lumpur, Malaysia.

....., 1983, Propery Market Report, 1982, Kuala Lumpur, Malaysia.

Table 5-9: Indicative Price For Large Rubber Estates in Petaling District, 1982 -1983

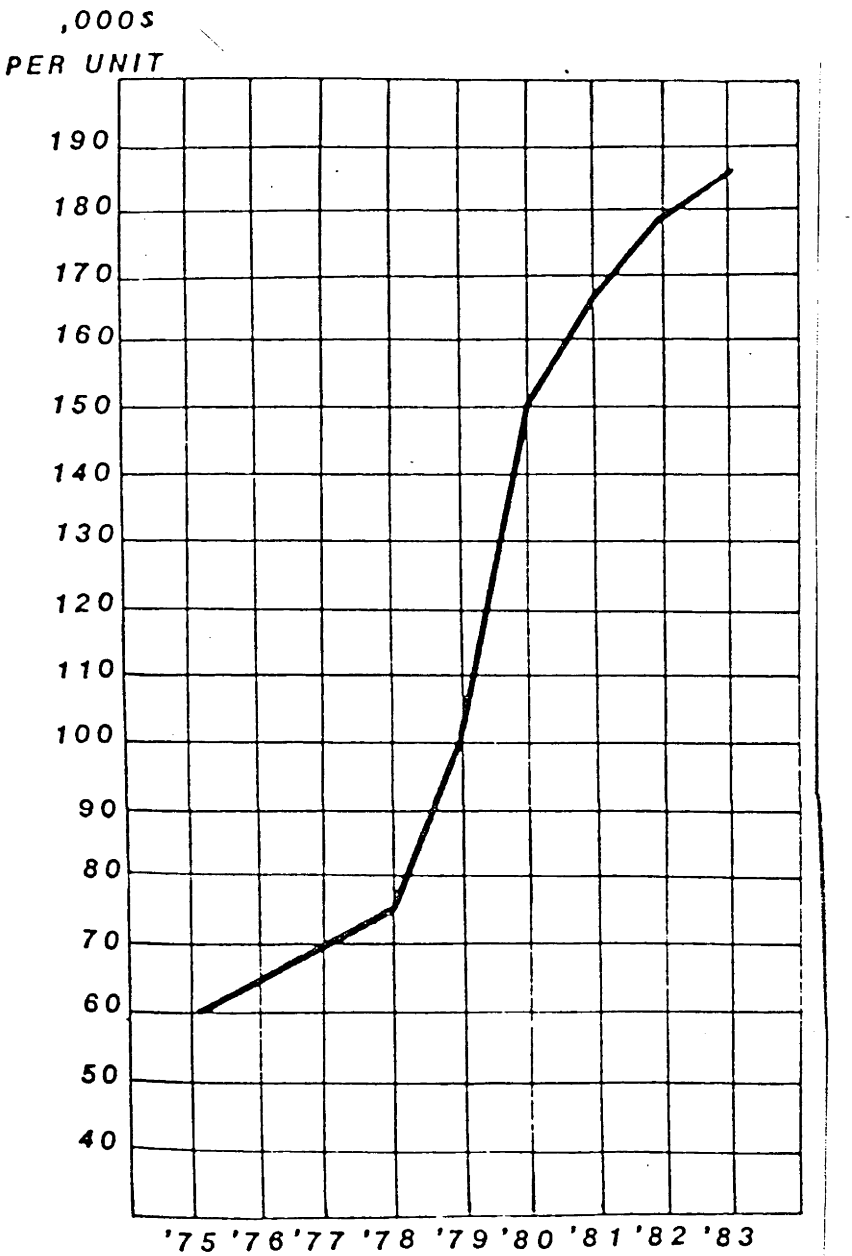
(M$ current prices)

Location of land	Area of land (Hectares)	Price per Hectare	
		1982	1983
Petaling Jaya	100-200	-	$140,000
	400-1,000	$99,000	-
Shah Alam	100-200	-	$100,000
	400-1,000	$86,000	-

Source: Ministry of Finance, 1984, Property Market Report, 1983, Malaysia, Kuala Lumpur.

Treasury's Property Market Report 1983 (1984, p.105), showed the indicative price increase for large rubber estates in the district of Petaling. (Table 5.9).

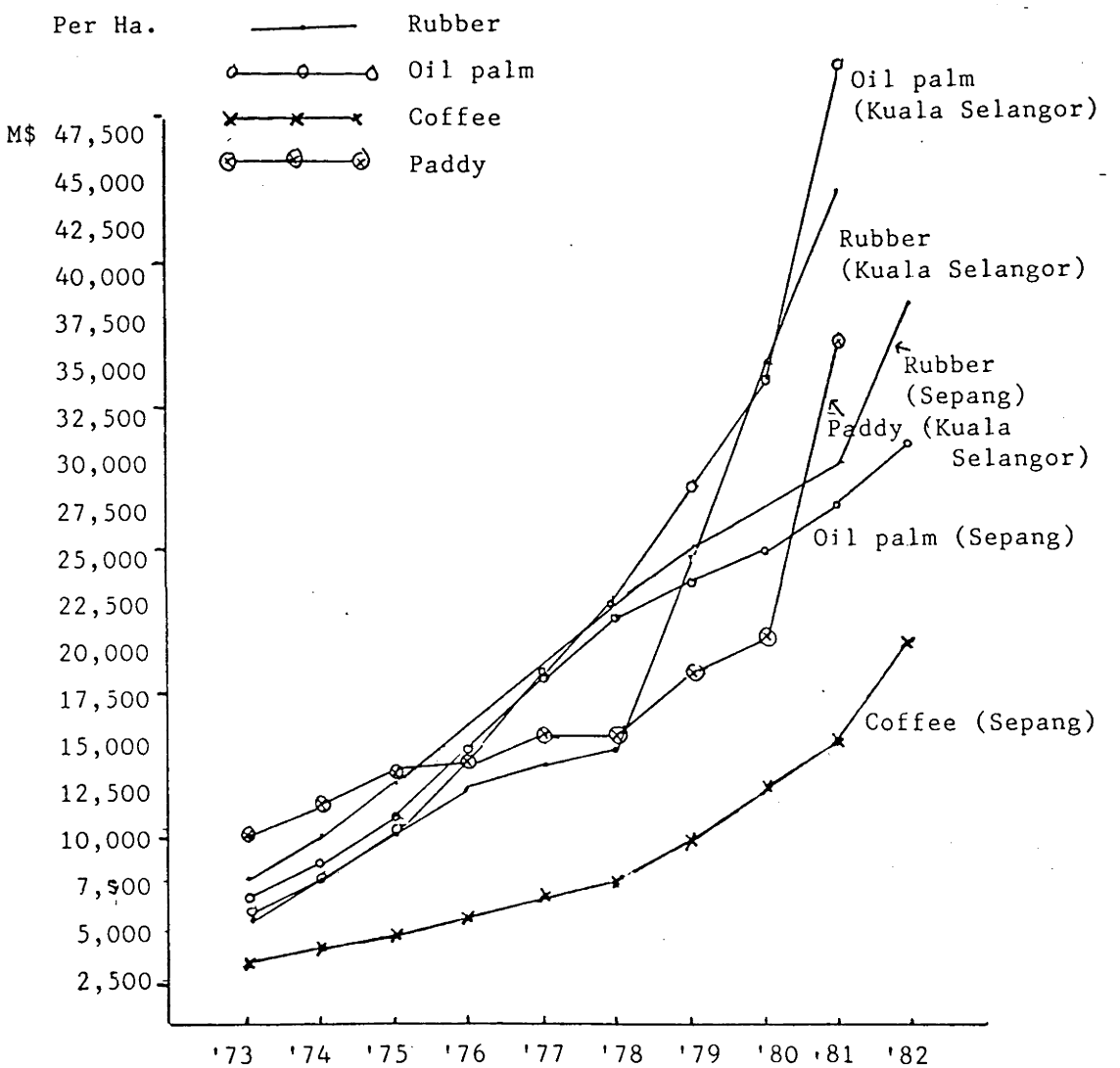
Figure 5-3: Prices of 2 Storey Terrace Houses in SS2 Area, Petaling Jaya



Source: Ministry of Finance, 1984, Property Market Report, 1983, Kuala Lumpur.

In fact, the influence of speculation extends up to the intermediate districts as indicated in Figure 5.4.

Figure 5-4: Prices of Agricultural Land Transacted in Intermediate Districts



Source: Property Market Report, 1981 and 1982.

5.7 Conclusions

In general, the agricultural landuse patterns in 1966 within the urban area of Kuala Lumpur and adjoining peri-urban areas cannot be said to satisfy the crop location theory of von Thunen's model. However, there is some empirical evidence that is market gardening and mixed horticulture are found in close proximity to the city with

decreasing intensity of cultivation area as the distance from the city increases and along the major roads. This is in keeping with von Thunen's model. However, the lack of more convincing empirical evidence for the theoretical findings suggested by von Thunen have been mentioned by many writers.

The pattern of development of agricultural land generally continued in a consistent, expanding fashion to 1974. Thus the areas of market gardening and mixed horticulture continued to expand. Spatially, the expansion occurred within the urban area, peri- urban areas and in the intermediate districts. This conformed with expectations because of the expanding demand for fresh vegetables and fruits due to population growth. The expansion of these agricultural areas in the peri-urban and particularly, in the intermediate districts such as Kuala Selangor was a result of major road construction into these areas during the period. The reduced transport costs and travelling time reduced the locational advantages of farms in proximity to the urban areas. The reduction of transport costs would further limit the relevence of von Thunen's model.

By 1982, rapid population growth, urbanization and industrialization, had resulted in the expansion of Kuala Lumpur's urban built-up areas, and in fact, an urban conurbation had started in the Kelang Valley as predicted by Aiken and Leigh (1975). Market gardening amd mixed horticulture areas in the peri-urban areas declined, while rubber areas also declined, with increasing percentage of senile trees. However, the reduction of rubber areas in the intermediate districts is correlated with an expansion of oil palm areas. The lack of interest by rubber estate owners and smallholders in replanting with oil palm and other alternative crops was probably due to uncertainty, especially since perennial crops require a long gestation period to realized their investment returns. Beside this, substantial increases in agricultural land prices have been reported, not only in the peri-urban districts but also in the intermediate districts. The impact of these urban pressures can be significant on agricultural production. These may require adjustments in farm sizes, types and mixtures of enterprises and methods of operation, that is, the possible shift from full-time to part-time farming. Such

adjustments have to be made when agricultural lands are purchased by urban people, or when farmers seek non-farm employment. All this evidence on the reduction of agricultural areas is directly related to rapid urban expansion as postulated by Sinclair.

CHAPTER 6

SUMMARY AND POLICY IMPLICATIONS

6.1 Summary of the Study

The objective of the study was to examine the changing spatial pattern of land use and agricultural production in the State of Selangor, and particularly near the major urban centre of Kuala Lumpur. The study examined the pattern of land use and agricultural production in the years of 1966, 1974 and 1982, based on the aerial topography mapping surveys. These provided the areal distribution of agricultural production by administrative units, namely districts and sub-districts (mukim).

A major conclusion of this study relates to the applicability of the contrasting theories of spatial allocation of agricultural enterprises used in the study. In general, the changing pattern of land use over the whole study period does not support von Thunen's model of location of agricultural land use near urban areas. However in 1966 and 1974 market gardening was cultivated in close proximity to the city, and the intensity of the cultivated area decreased as the distance from the city centre increased. Furthermore, a certain degree of increasing intensity was observed between 1966 and 1974. In contrast, by 1982, rapid urban growth, the influence of population growth and the concentrated industrialization which developed in the State from the mid 1970's had a major disruptive influence on the spatial location of agricultural production. Peri-urban agricultural areas adjacent to the urban centre experienced the greatest change. These changes suggest that Sinclair's 'urban threat' hypothesis is the more relevent theory of agricultural enterprise location for Selangor in the 1980's and beyond.

With rapid economic development, modern road transportation costs have declined significantly. As a result, distance in terms of

transport costs has become less significant as a factor influencing land use patterns. In other words, the locational advantage of farms within and adjoining the urban areas is reduced over more distant farming areas, such as in the intermediate districts, and also in the nearby states of Perak, Pahang and Negeri Sembilan. The rapid economic development also resulted in marked population growth in the study area. The rapid population growth was due to the high net-migration, as Selangor and its previous capital, Kuala Lumpur is the centre of national administration and development, and the industrialization hub of Malaysia. These developments have contributed significantly to changes in agricultural production and land use in the State generally, and specifically in areas surrounding the urban centre of Kuala Lumpur. In response to the increase in market demand, there was a marked expansion of market gardening and mixed horticulture areas between 1966 and 1974, especially in the peri-urban districts immediately surrounding the Federal Territory. Beside these changes, the agricultural producers also responded to advances in technology in moving from one enterprise to a more favourable one. Thus, the study observed that rubber cultivation was replaced with oil palm, as the latter provided much higher returns and also required very much less labour -labour that was becoming more expensive in the State.

The replanting of rubber areas with oil palm was mainly located in the coastal intermediate districts of Kuala Selangor, Kelang and Kuala Langat. The peri-urban districts did not experience such a marked switch from rubber to oil palm. This can be explained by the continued rapid urban expansion and influence as postulated by the Sinclair's urban sprawl. Estate and smallholding owners faced an element of uncertainty, as their agricultural areas are located within less than 40 kilometres radius of Kuala Lumpur. This uncertainty is compounded by the nature of perennial crop production and management: which requires a very long term view and long term planning. It was more noticable that in rubber areas close to the capital there were increasingly large areas of senile (over age) rubber.

Another factor indicative of the continuing change in the agricultural sector as a result of the urban pressures was the rapid turnover in agricultural land sales in the intermediate districts

although urbanization is very unlikely in the immediate future. At the same time, the prices of the agricultural land have increased very sharply to levels that are beyond the current income generating capacity of agriculture enterprises. The high price of agricultural land was widespread, occuring in such outer areas of the intermediate districts of Sepang, and Kuala Selangor. These are generally considerd beyond the normal commuting distance.

6.2 Limitations of the Study

A study of this nature should expect numerous data constraints when undertaken so far from the study area and when using only secondary information. Unfortunately, mukim level data on enterprise types and areas were not available for the last period (1982) so that the conclusions of the study must be tentative. Ideally such a study should have access to time series information on actual location of farming areas, acreage and utilization of labour together with information on ownership patterns by location, types of farming or enterprises and method of operations over the study years. At the same time, collection of relevent and related studies with respect to spatial location of land use near urban areas in Malaysia generally and in the study area specifically would be helpful. However, as far as is known, this study is the first of its kind in the country.

6.3 Policy Implications and Future Research

The general findings of the study have very significant policy implications for future agricultural development strategies and government investment in agriculture in the study area. This applies particularly to the provision of infrastructure, the placement of extension workers, and the types of crops to be encouraged. The study has shown that rapid urban growth has created substantial uncertainty for farm owners particularly for agricultural areas located within the peri-urban districts. To ensure efficient utilization of the public funds, the Selangor's Department of Agriculture and other related development agencies which involve long term infrastructure investments should concentrate agricultural investment in outer areas of the

intermediate districts of Ulu Selangor, Kuala Selangor, Kuala Langat and Sepang and also the more distant district of Sabak Bernam. In these areas, the possibility of urban expansion in the rest of this century is reasonably remote. However such areas are ideally located to exploit the changing and expanding urban food market.

Agricultural development strategies require urgent consideration of redirecting the cultivation of food crops, particularly market gardening and mixed horticulture towards outer areas and intermediate districts. Generally the locational advantages of these areas have improved markedly due to better accessibility and the larger market. Market gardening and mixed horticulture areas in peri-urban districts were declining and losing out to urban uses by 1982, although they had experienced a marked increase between 1966 and 1974. The changes in the market are caused not merely by the growth of the population but also by the substantial increases in per capita income. This study implies the need for detailed studies on the income elasticities of demand of the wide range of possible fruits and vegetables that can be grown and that are mostly likely to be in increasing demand over the coming years. Research is also required into the policy implications of the significant turnover in agricultural land in the intermediate districts. The change of land ownership might be resulting in changes in land use, changes in the type of farming and future agricultural output. The generally high prices of land in Selangor are probably counter-productive to the stated objectives of the government to increase the size of farm holdings and to reduce the rate of tenancy. This suggests another area of research: the extent of part-time farming, the incomes derived from it and the types of farming which can most easily be operated efficiently in a mixed occupation mode of living. Finally, the 'urban threat' hypothesis suggests that a contrasting situation of agricultural enterprise location may well exist in Johore State which has areas that are within easy distance of the high income Singapore market but are under a very much lower threat of urban development than is the case in Selangor State.

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APPENDIX A

Table 1

Peninsular Malaysia: Population and Net Migrants by Selected State, 1980

State	1980 ('000)	1980 (%)	Rate of Natural increase per 1,000, 1980	Net inter-state migration rate, 1970-80 (%)	Net Migrants ('000) 1970	Net Migrants ('000) 1980
Johore	1,638.2	11.9	26.1	-0.6	n.a	n.a
Kedah	1,116.1	8.1	23.6	-5.3	-25.4	-107.0
Kelantan	893.8	6.5	30.2	-3.7	-47.8	-88.0
Malacca	464.8	3.4	24.1	-7.2	-40.3	-92.0
Negeri Sembilan	573.6	4.2	24.4	-3.8	-21.6	-62.0
Pahang	798.8	5.8	25.8	13.2	65.8	103.0
Perak	1,805.2	13.1	23.7	-5.8	-114.7	-257.0
Perlis	148.3	1.1	22.6	-0.1	n.a	n.a
Penang	954.6	7.0	19.8	0.3	n.a	n.a
Terengganu	540.6	3.9	31.4	-0.6	n.a	n.a
Selangor	1,515.5	11.0	17.0	9.5	199.7 *	180.0 *
Federal Territory	977.1	7.1	33.5	7.9		297.0 *
Peninsular Malaysia	11,426.6	83.1	24.7	-		

Source: Department of Statistics, 1970 and 1980 Population and Housing Censuses, and Vital Statistics, Peninsular Malaysia, 1980".

Lim Lin Lean (1983), and Ministry of Labour (1984, p. 42) (Cited in R.T. Shand, 1984)

* Net-migrants reported at census date.

Table 2

Malaysia: Structural Changes In State Economies, 1980-83

State	State share in total manufacturing output (%)		State share in total manufacturing employment (%)		Industrial estate
					Number
	1980	1983	1980	1982	1983
Johore	13.1	13.9	13.0	13.1	12
Kedah	1.4	1.4	3.1	3.5	6
Kelantan	0.8	0.8	1.8	2.4	6
Melaka	3.2	3.4	4.5	3.3	7
N. Sembilan	5.9	6.4	2.9	3.4	5
Pahang	3.7	3.9	4.2	4.5	8
Perak	9.3	9.7	10.8	10.3	9
Perlis	0.5	0.5	0.3	0.3	1
Penang	14.6	15.5	18.0	15.7	8
Sabah	1.2	1.1	0.9	3.4	7
Sarawak	2.9	2.5	2.7	4.0	6
Selangor	28.4	26.6	25.2	22.5	15
Terengganu	1.1	1.2	1.5	2.2	9
F. Teritory	13.9	13.1	11.1	10.9	1
Total	100.00	100.0	100.0	100.0	101

Source: Malaysia, 1984, Mid-Term Review, Fourth Malaysia Plan 1981-85, Table 5.6, Kuala Lumpur.

Table 3

Malaysia: Gross Domestic Product by State and Industry of Origin, 1983

($ million in 1970 prices)

Sector	Selangor	%	Federal Territory	%	Malaysia
Agriculture, Forestry etc.	585.2	8.3	11.5	0.2	7,030.0
Mining and Quarrying	171.5	12.5	32.6	2.4	1,371.0
Manufacturing	1,496.5	26.6	736.9	13.1	5,628.0
Construction	294.3	16.8	299.2	17.1	1,751.0
Utilities	134.5	17.4	163.3	21.2	771.0
Transport and communication	671.7	27.8	411.7	16.4	2,509.0
Wholesale/retail, hotel	793.9	18.8	1,091.2	25.8	4,234.0
Finance, insurance etc.	216.7	8.6	650.2	25.9	2,512.0
Goverment services	391.0	9.3	807.5	19.3	4,191.0
Other services	229.3	28.2	140.6	17.3	813.0
Total	4,984.6	16.2	4,345.2	14.1	30,810.0
GDP at purchaser's value ($ million)	5,069.3		4,419.0		31,398.0
Population	1,701.6		1,092.3		14,811.2
Per capita GDP	2,979.1		4,045.6		2,119.9
Ratio to Malaysian's average	1.41		1.91		1.0

Source: Malaysia, 1984, Fourth Malaysia Plan, 1981-85, Table 5.3, Kuala Lumpur.

Table 4

Peninsular Malaysia: Distribution of Roads by Surface Type and by States, 1977 (Miles)

State	Paved	Gravel	Earth	Total	Paved Roads per thousand sq. miles
Johore	1,705	179	76	1,960	232
Kedah	1,000	453	15	1,273	272
Kelantan	461	46	149	656	80
Malacca	542	4	-	546	846
Negeri Sembilan	884	135	13	1,032	244
Pahang	1,302	444	197	1,943	93
Penang	639	-	34	673	1,646
Perak	1,800	63	46	1,909	225
Perlis	171	43	-	214	541
Selangor *	1,787	286	-	2,073	564
Trengganu	703	49	117	869	139

* include Federal Territory

Source: Ministry of Transport, 1979, Yearbook of Transport Statistics, Malaysia , Kuala Lumpur (cited in Fisk and Osman-Rani, p. 48).

Table 5

Total Planted Hectarage of Major Perennial Crops by Selected States, 1966, 1974 and 1982

(Hectare)

State	Rubber			Oil palm				Coconut		
	1966	1974		1966	1974	1981		1966	1974	
Johore	471,456	463,965	(1)*	41,071	154,263	317,109	(1)	52,128	61,220	(1)
Kedah	134,895	239,372	(4)	137	4,916	10,702	(6)	3,266	2,526	(5)
Negeri Sembilan	199,904	202,611	(5)	2,244	25,522	47,490	(5)	606	739	(6)
Pahang	188,845	264,274	(3)	4,919	125,509	278,139	(2)	2,760	5,124	(4)
Perak	252,565	276,419	(2)	15,919	52,357	106,002	(3)	42,343	46,985	(3)
Selangor/F.T.	190,092	154,340	(6)	31,781	82,341	103,123	(4)	47,441	51,394	(2)
Pen. Malaysia	1,776,443	1,939,960		99,307	485,055	933,148		176,316	199,065	

Source: Wong, I.F.T., 1971, Present Landuse of Peninsular Malaysia, Ministry of Agriculture, Department of Agriculture, Kuala Lumpur.

Department of Statistics, 1983, Oil palm, Coconut, Tea and Cocoa Statistics, 1981, Malaysia, Kuala Lu

....., 1984, Rubber Statistics Handbook, Malaysia, 1982, Malaysia, Kuala Lumpur.

* ( ) Ranking of Major producers.

APPENDIX B

Table 1

Area of Important Perrenial Crops by Districts in Selangor and Federal Territory, 1966, 1974 and 1982

(Hectares)

Districts	Rubber			Oilpalm			Coconuts			Cocoa		
	1966	1974	1982	1966	1974	1982	1966	1974	1982	1966	1974	1982
Within Urban												
F. Territory	7,216	6,174	4,506	-	3	3	4	-	-	-	-	-
Peri-urban Districts												
Gombak	12,842	12,014	10,011	199	1,958	1,936	17	19	19	-	-	-
Petaling	19,934	14,936	11,460	2,813	5,923	7,644	9	118	114	-	-	496
Ulu Langat	30,258	30,919	29,75	122	1,181	1,936	8	11	11	-	-	141
Intermediate												
Kelang (urban)	16,572	9,693	7,294	3,157	9,037	12,327	5,121	5,748	5,680	-	30	41
Kuala Langat	19,189	10,437	9,396	8,558	23,972	26,073	6,918	5,360	5,276	-	-	-
Kuala Selangor	24,352	14,051	5,717	6,043	16,963	26,131	11,094	13,927	14,207	-	619	1,100
Sepang	22,586	19,209	16,291	4,678	9,613	13,241	705	523	595	-	-	141
U. Selangor	36,709	36,812	36,088	5,801	12,173	14,211	27	28	28	-	-	486
Distant												
Sabak Bernam	434	65	65	409	2,007	3,939	23,533	25,542	25,542	13	753	1,522
Total	190,092	134,340	131,583	31,730	82,840	107,646	47,441	51,394	51,470	13	1,402	3,786

Source: Wong, I.F.T. 1979, Present Landuse of Peninsular Malaysia. Vol. I-Text, Ministry of Agriculture, Department of Agriculture, Kuala Lumpur.

Table 2

Area of Important Food Crops in Selangor and Federal Territory, in 1966, 1974 and 1982

(Hectares)

Districts	Mixed Horticulture			Market Gardening			Orchards			Diversified Crops		
	1966	1974	1932	1966	1974	1982	1966	1974	1982	1966	1974	1982
Within urban												
F. Territory	329	402	349	140	302	268	6	12	11	58	23	20
Peri-urban Districts												
Gombak	645	1,026	748	63	113	47	46	154	112	53	135	96
Petaling	795	2,124	2,083	74	113	101	65	251	266	295	266	252
Ulu Langat	1,571	1,650	1,656	74	206	206	138	220	218	62	216	238
Intermediate												
Kelang(Urban)	1,233	2,067	1,856	23	14	12	110	136	136	573	1,225	1,015
K. Langat	1,469	1,446	1,441	289	337	337	65	209	209	784	1,110	1,096
K. Selangor	667	1,399	1,390	5	62	62	10	134	134	503	694	693
Sepang	467	645	663	2	9	9	27	113	129	247	828	864
Ulu Selangor	635	1,187	819	22	44	44	37	53	53	122	258	249
Distant												
Sabak Bernam	471	549	550	-	2	2	8	2	2	422	494	489
Total	8,332	12,501	11,555	692	1,202	1,083	482	1,284	1,270	3,119	5,249	5,012

Source: Jong, I.F.T. 1979, Present Landuse of Peninsular Malaysia, Vol.I Text, Ministry of Agriculture, Department of Agriculture, Kuala Lumpur.

Table 3

Major Non-agricultural and Agricultural Landuse in Federal Territory, 1966, 1974 and 1982

Hectares (%)

Types of Landuse	1966		1974		1982	
1. Non-agricultural Landuse	16,105	(67.4)	16,931	(70.8)	18,708	(78.3)
1.1 Urban and associated areas	7,938	(33.2)	10,366	(43.4)	13,456	(56.3)
1.2 Grassland and scrub forest	4,082	(17.1)	2,945	(12.3)	2,050	(8.6)
1.3 Tin mining areas	2,684	(11.2)	1,864	(7.8)	1,573	(6.6)
2. Agricultural Landuse	7,799	(32.6)	6,972	(29.2)	5,196	(21.7)
2.1 Rubber	7,257	(30.3)	6,174	(25.8)	4,506	(18.9)
2.2 Mixed horticulture	329	(1.4)	402	(1.7)	349	(1.5)
2.3 Market Gardening	140	(0.5)	302	(1.3)	263	(1.1)
Total Landuse (1) + (2)	23,904	(100)	23,904	(100)	23,904	(100)

Source: Wong, I.F.T. 1979, Present Landuse of Peninsular Malaysia, Vol. I-Text, Ministry of Agriculture, Department of Agriculture, Kuala Lumpur.

Table 4

Distribution of Market Gardening and Mixed Horticulture in Selected Major Mukim, 1980

Hectares

Districts/Mukim (Selected)	Approximate distance from K.L. city centre *	Market Gardening	Mixed Horticulture
Federal Territory	-	140	329
Peri-urban Districts			
Gombak district	-	63	645
Mukim Batu	18 km.	25	100
Mukim Rawang	40 km.	33	261
Mukim Setapak	16 km.	3	232
Mukim Ulu Kelang	13 km.	4	52
Petaling district	-	74	795
Mukim Petaling	24 km.	62	103
Mukim Sg. Buluh	32 km.	12	602
Ulu Langat District		74	1,571
Mukim Ampang	12 km.	32	6
Mukim Cheras	20 km.	12	247
Mukim Kajang	42 km.	10	290
Mukim Semenyih	42 km.	18	117

Source: Wong, I.F.T. 1979, 'Present Landuse of Peninsular Malaysia', Vol I-Text, Ministry of Agriculture, Department of Agriculture, Kuala Lumpur.

Table 5

Relative Profitability of Rubber and Oil palm

Crop	Internal Rate of Return (%)		
	Low Price	Average Price	High Price
Average Yield Level			
Rubber	16.6	17.4	18.7
Oil palm	20.6	24.2	27.5
15 % Below Average Yield			
Rubber	13.9	14.5	15.0
Oil palm	16.7	20.1	23.0

Major assumptions:

a) Prices - 180-220 cts/kg for rubber and $700-900/tonne for oil palm.

b) Rubber yield profile is derived from average performance of clones currently recommended for large-scale planting; and yield of oil palm is based on performance of DXP planting material.

c) Costs - all 'sunk' capital and fixed recurrent costs have been omitted from this analysis. For rubber, additional cost of distribution, selling charges, duty and cesses have been included.

Source: Lim, K.P. and Chai, W. 1978, Cocoa-coconuts and oil palm as possible alternatives in replanting old rubber, Harrisons and Crosfield, (M) LTD., Kuala Lumpur.

Table 6

Targets of Population Growth, 1980-1990 by Administrative Districts

(000's)

Districts	Population 1970	Population 1980 *	Average Growth Rate (%)	Population 1990 @ (estimate)	Population 1990 @ (projected)	Growth Rate 1980-90 @ (projected)	Implied Migration 1980-90 @ (projected)
Federal Territory	543.3	977.1 (revised)	4.1	1,000	1,289.3	2.6	92.0
Peri-urban Districts							
Gombak District	72.5	175.9 (unrevised)	8.3	130.1	240.0	6.3	77.1
Petaling district	198.0	350.1	5.9	396.8	637.2	4.9	149.0
Ulu Langat District	113.0	148.4	4.3	174.1	334.5	8.3	164.0
Intermediate Districts							
Kelang (urban)	207.9	279.3	2.9	344.6	511.7	4.0	76.5
Kuala Langat	-	101.6	-	121.4	167.2	3.3	9.4
Kuala Selangor	-	110.4	-	140.6	159.3	1.3	-24.5
Sepang	-	46.0	-	48.3	49.1	0.2	13.1
Ulu Selangor	-	81.7	-	115.2	143.2	2.2	- 4.6
Distant District							
Sabak Bernam	-	103.3	-	128.4	130.8	0.2	-39.0

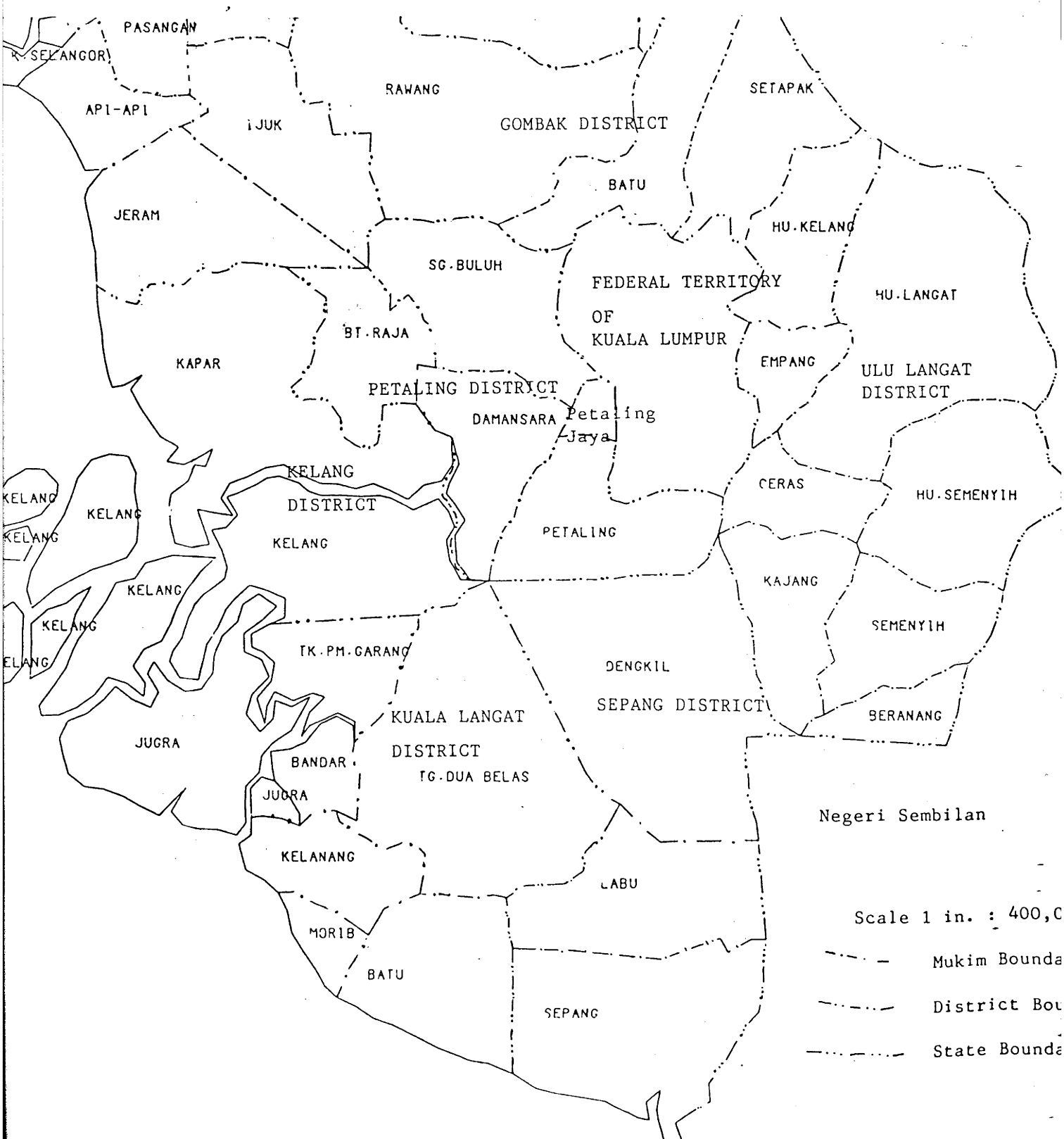
Source: _Revised figures when districts boundary were redrawn in 1974.

* Department of Statistics, 1983, 1980 Population and Housing Census, Malaysia, Kuala Lumpur.

@ Estimated by Thankland Cox Partnership, 1979, Kelang Valley Review, London.

APPENDIX C

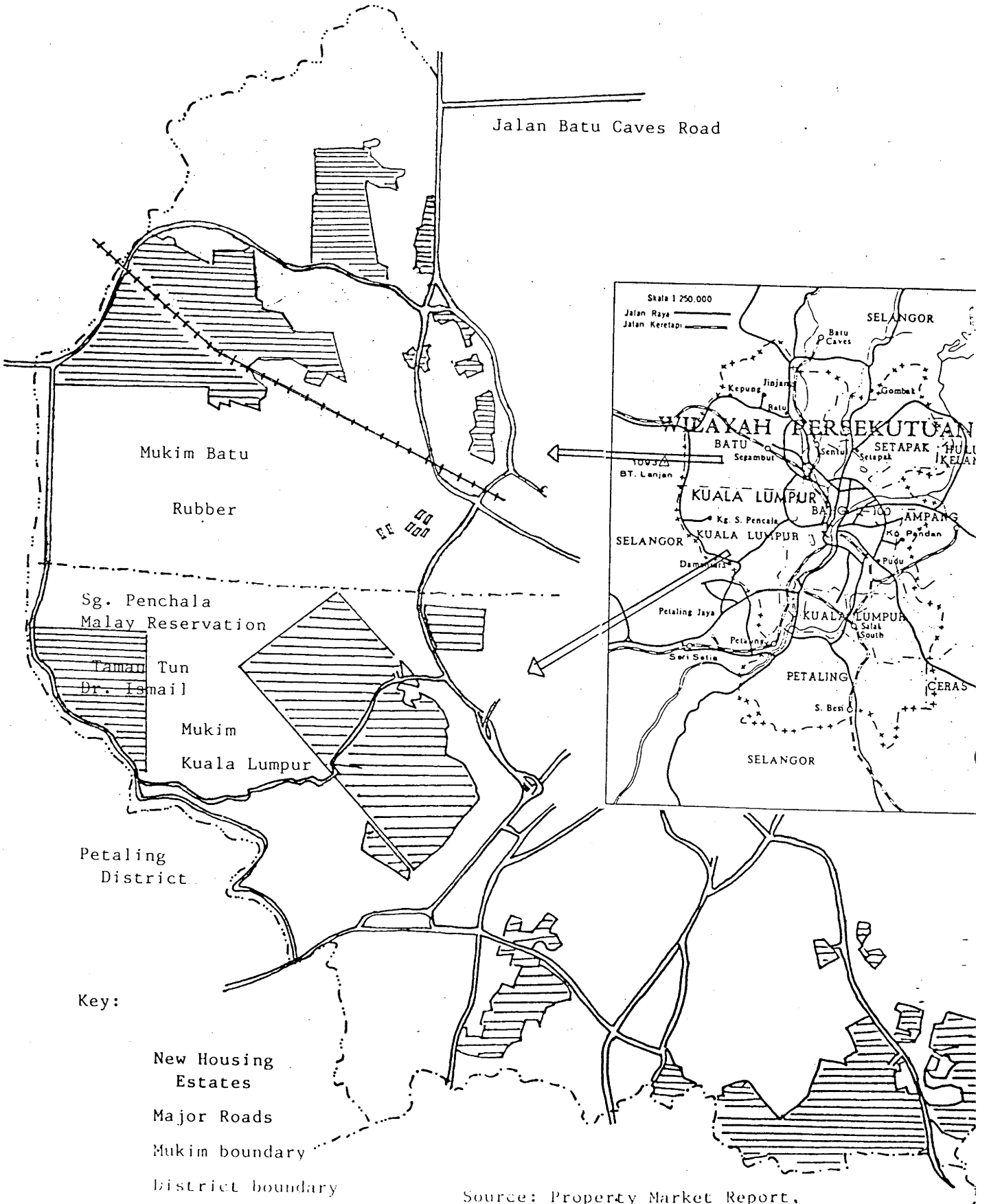
Figure 1 - MAP OF SELANGOR WITH DISTRICT AND MUKIM BOUNDARY



APPENDIX C

FIGURE 2

NEW HOUSING ESTATES IN MUKIM BATU AND KUALA LUMPUR, FEDERAL TERRITORY, 1982

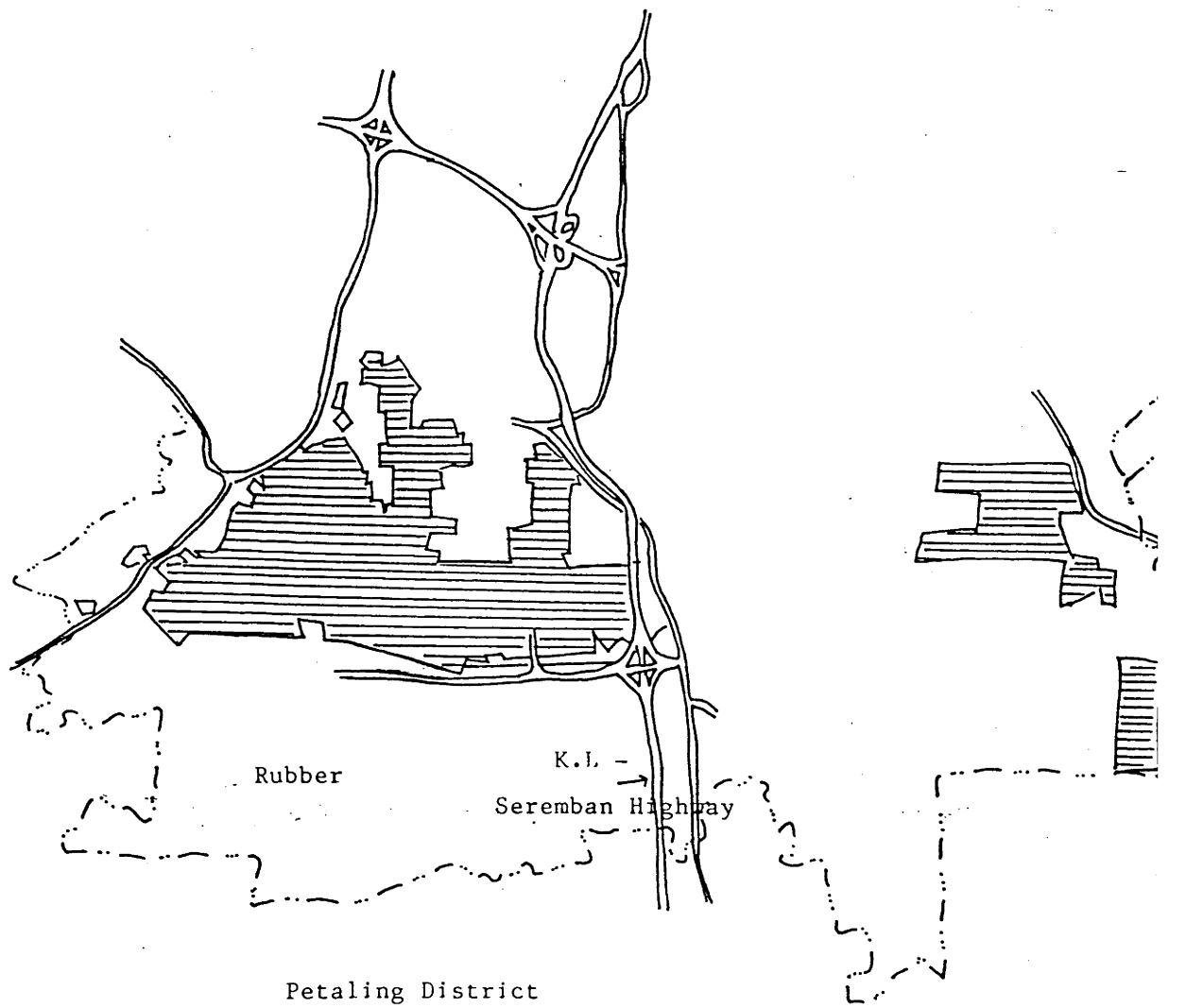


Source: Property Market Report, 1983.

APPENDIX C

FIGURE 3

NEW HOUSING ESTATES IN AREA FIVE FEDERAL TERRITORY, 1982



Key:
- New Housing Estates
- Major Highway and Roads
- District boundary

Source: Property Market Report, 1983