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THE RICE SECTOR OF PENINSULAR MALAYSIA

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The Rice Sector of Peninsular Malaysia. A Rural Paradox

School of History, The University of New South Wales
Sydney, Australia, 2052

The Rice Sector of Peninsular Malaysia

A Rural Paradox

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Foreword

It is the avowed goal of the Malaysian government to make the country a developed nation by 2020. Towards this end, the National Development Policy has as its objective the attainment of balanced development in order to create a more united and just society. In the Introduction to the Sixth Malaysia Plan (Government of Malaysia, 1991) it is stated that the National Development Plan will encompass the following critical aspects:

- striking an optimum balance between the goals of economic growth and equity;
- ensuring a balanced development of the major sectors of the economy so as to increase their mutual complementarities to optimise growth;
- reducing and ultimately eliminating the social and economic inequalities and imbalances in the country to promote a fair and more equitable sharing of the benefits of economic growth by all Malaysians;
- promoting and strengthening national integration by reducing the wide disparities in economic development between states and between urban and rural areas in the country;
- developing a progressive society in which all citizens enjoy greater material welfare, while simultaneously imbued with positive social and spiritual values, and an increased sense of national pride and consciousness;
- promoting human resource development including creating a productive and disciplined labour force and developing the necessary skills to meet the challenges in industrial development through a culture of merit and excellence without jeopardising the restructuring objectives;
- making science and technology an integral component of socio-economic planning and development, which entails building competence in strategic and knowledge-based technologies, and promoting a

science and technology culture in the process of building a modern industrial economy; and
- ensuring that in the pursuit of economic development, adequate attention will be given to the protection of the environment and ecology so as to maintain the long-term sustainability of the country's development.

The biggest challenge to the achievement of these goals lies in that sector of the economy in which traditional Malay values are most deeply rooted—the rice growing or padi sector. Although wet rice cultivation is of relatively recent origin in the Malay peninsula compared with its appearance on the mainland of Southeast Asia, the culture and lifestyle associated with it have become the essence of Malay mythology. It is paradoxical, however, that the lifestyle so idyllised by expatriate writers such as Swettenham (1895), Lockhart (1936), and Stacey (1953)—though seen in a more realistic light by more recent, indigenous, authors such as Shahnon (1965; 1972)—is one which, despite the extent of resources poured into it since 1960, has failed to provide incomes that reach the national poverty line for many tens of thousands of rural households.

The rural economy of the Malay peninsula has been subjected to the impact of western agricultural systems for over two centuries. The introduction of pepper, nutmeg and cloves into Penang by the East India Company from about 1790 constituted the beginning of export-oriented, plantation agriculture in the peninsula. The expanding role of the plantation system as the form of agricultural land use preferred by the British colonial authorities has been well documented (Jackson, 1968; Drabble, 1973; Barlow, 1978) and rubber cultivation by estate companies came to dominate Malayan rural production by the 1930s. During the period of colonial rule, official interest in the subsistence, primarily the rice, sector was limited, spasmodic, and largely concerned with maintaining the status quo in social and local political terms. A generally *laissez-faire* attitude prevailed towards the economic development of the Malays (Andaya and Andaya, 1982) in the context of the British concept of indirect rule.

Extensive interest in the rice sector, by government and scholarship alike, postdates the Second World War. By far the majority of pre-war published sources deal with agronomic questions or with rather technical issues relating to such matters as land tenure. As Horii observed in 1981, 'At the time of independence there existed only a few reports which were concerned with the actual situation and socio-economic problems of the village community, and only in recent years have there appeared pioneering works on Malay rice farming villages conducted by social scientists'. Since about 1960, related both to the much greater concern paid by Malay-dominated national governments to the non-commercial rural sector, and to the rapid expansion in the numbers of local scientists and academics,

this situation has changed markedly. The rice sector has been subjected to a flood of socio-economic surveys resulting in official government publications, articles in academic journals, monographs and theses. Many have been of a fact-finding kind, sometimes related to planned development for the region studied; many others have sought to highlight the social and economic problems that exist in the rice-growing districts. As an addition to the now extensive literature that focuses on the Malaysian rice sector, this monograph seeks to draw together a proportion of that work in an attempt to understand the paradox that characterises the sector and the dilemma that consequently faces Malaysian policy makers.

My introduction to the rice growing sector and padi landscapes of what, then, was the Federation of Malaya occurred during the years 1957–1960 when I was working as a young geography teacher at the Sultan Abdul Hamid College in Alor Setar, Kedah. Most of the College students of those years have since achieved eminence in Malaysian public, professional or corporate life. It is to these Malaysians, of all ethnic groups, that this book is dedicated.

P.P. Courtenay
Cairns, May 1994

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Glossary of Malay Terms

dat	This term has a range of meanings: (i) manners or etiquette; (ii) proper, in the sense of correct; (iii) the natural order e.g. rivers run downhill; (iv) law—in the sense of rules of law; (v) law—in the sense of concepts of law.
endang	wet rice field (term used mainly in the north of the peninsula).
nangkul cangkul)	a heavy hoe used to break up soil, usually swung over the shoulder.
otong royong	a practice whereby labour is exchanged amongst rice cultivators during the peak seasons such as transplanting and harvesting.
ampung	a village, especially including land planted with coconut or fruit trees around the houses.
lang mperata ylindrica)	a grass that burns easily, but which, because of its underground rhizomes, recovers from fire which may totally kill off other plants. It is often the dominant species on abandoned or degraded land.
ukim	the smallest administrative unit in Malaysia which can vary in size from a couple to some hundreds of square kilometres according to population density. A *mukim* ('civil parish') comprises a number of *kampung*. Whereas the boundaries of *mukim* are officially defined, there are no official boundaries between *kampung*.

nibung (Oncosperma tigillaria)	a tall, tufted palm resistant to damp and insects.
sawah	a wet rice field (term used mainly in the central and southern areas of the peninsula, and of Javanese origin, see p. 34)

Glossary of Political Terms

The Straits Settlements (S.S.)	the colonies of Penang (with Province Wellesley), Malacca and Dindings, and Singapore, administered until 1942 as a Crown Colony.
The Federated Malay States (F.M.S.)	colonial political entity created in 1895–6 and surviving until 1942, made up of the Malay states of Perak, Selangor, Negri Sembilan and Pahang.
The Unfederated Malay States (U.M.S)	the states of Perlis, Kedah, Johore, Trengganu and Kelantan which individually accepted British Advisers after 1895.
Federation of Malaya	political entity existing from 1948 to 1963, made up of the states of Perlis, Kedah, Penang, Perak, Selangor, Negri Sembilan, Malacca, Johore, Pahang, Trengganu and Kelantan.
Federation of Malaysia	political entity made up of: (i) 1963–65, the Federation of Malaya (defined as above), Singapore, Sarawak and North Borneo (Sabah). (ii) Since 1965, the Federation of Malaya, Sarawak and North Borneo (Sabah).
West Malaysia	political term used from 1963 to 1972 to describe the area previously known

as the Federation of Malaya. Since 1972 the preferred term has been 'Peninsular Malaysia'.

East Malaysia political term used from 1963 to 1972 to describe the territories of Sarawak and Sabah. Since 1972 the preferred usage has been 'Sabah and Sarawak'.

Malay Spelling

Current conventions have been followed in the spelling of Malay words and place names except in certain cases where long established English usage is retained for major geographical names (e.g. Malacca rather than Melaka; Trengganu rather than Terengganu).

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A study of this kind has clearly relied on material and ideas drawn from a wide range of sources. The published sources have been listed in the normal manner in the bibliography. As with any piece of academic work, however, there are very many individuals and organisations whose contribution has been of a much more personal kind, whether by means of formal interviews granted the author, more general discussion and guidance, the provision of data, the organisation of field visits, or technical back-up such as data processing, cartography, and typing or word processing.

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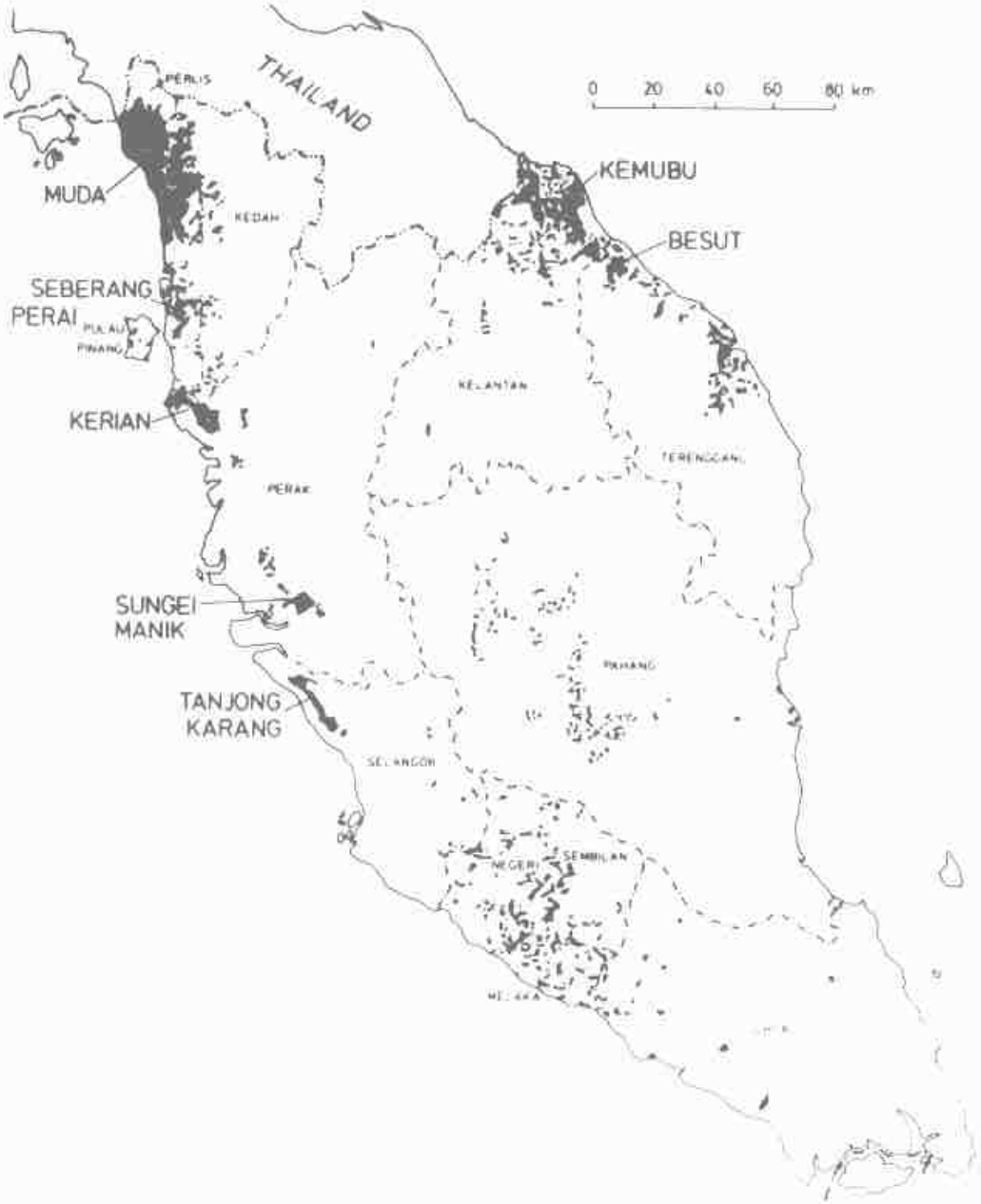

Frontispiece
Wet rice lands of Peninsular Malaysia

1 "The Battle for Long Term Development . . ." — an Introduction

'. . . a strategy designed to improve the economic and social life of a specific group of people—the rural poor'[1]

The nature of agriculture indeed, does not admit of so many subdivisions of labour, nor of so complete a separation of one business from another, as manufacturers. It is impossible to separate so entirely the business of the grazier from that of the corn-farmer as the trade of the carpenter is commonly separated from that of the smith. The spinner is almost always a distinct person from the weaver; but the ploughman, the harrower, the sower of the seed, and the reaper of the corn, are often the same. The occasions for those different sorts of labour returning with the different seasons of the year, it is impossible that one man should be constantly employed in any one of them. This impossibility of making so complete and entire a separation of all the different branches of labour employed in agriculture is perhaps the reason why the improvement of the productive powers of labour in this art does not always keep pace with their improvement in manufacturers. The most opulent nations, indeed, generally excel all their neighbours in agriculture as well as in manufacturers; but they are commonly more distinguished by their superiority in the latter than in the former. Their lands are in general better cultivated, and having more labour and expense bestowed upon them, produce more in proportion to the extent and natural fertility of the ground. But this superiority of produce is seldom much more than in proportion to the superiority of labour and expense. In agriculture, the labour of the rich country is

[1] The chapter heading is a quotation from Myrdal (1968) and the introductory quotation is from the World Bank (1975) Sector Policy Paper on Rural Development.

not always much more productive than that of the poor; or at least, it is never so much more productive as it commonly is in manufacturers.

(Adam Smith, "An Inquiry into the Nature and Causes of the Wealth of Nations," 1759).

I

'Diversity . . . precludes any universally applicable definition (of) the role of agriculture . . . . .'

The significance of the agricultural sector in the process of world economic betterment is undoubted, if only because so large a proportion of the world's population makes its living directly from the land. In the low income countries, as defined by the World Bank,[2] the agricultural sector contributed 29 percent of gross domestic product in 1991 and employed about 70 percent of the labour force. Gunnar Myrdal's contention (1968) that 'it is in the agricultural sector that the battle for long term economic development will be won or lost' is clearly a truism insofar as that sector so overwhelmingly dominates the economies of the world's poorest nations, as well as being a significant contributor to employment and national product in most middle income countries. Most, if not all, economic development theory, dating back at least to Adam Smith (1759), postulates change in the agricultural sector, whether it be to provide labour and resources for a non-agricultural sector, to benefit from 'spread effects' (Myrdal, 1957) generated by industrial growth, or to be modernised by positive government action. Structural transformation models of the Fisher-Clark type associate economic development with a progressive reduction in the proportion of gross domestic product that is contributed by agriculture (and the primary sector in general) and particularly in the numbers employed in farming.

In the four to five decades that have passed since the end of the Second World War, a number of east Asian countries, most notably the Republic of Korea and Taiwan, have made the transition from being less-developed, essentially rural, states to becoming increasingly prosperous industrial nations. In Southeast Asia, other nations, particularly Malaysia and Thailand, are seeking to emulate their success. In an important paper written during a period of active theoretical work on economic development, Johnston and Mellor (1961) noted, however, that 'Diversity among nations in their physical endowment, cultural heritage and historical context

[2] In 1990 the World Bank defined low-income developing countries as those with a gross national product per capita of US$650 or less in 1991 (World Bank, 1993).

precludes any universally applicable definition of the role that agriculture should play in the process of economic growth'. Later in the same paper they make what ought to be a self-evident point—that variations in soil, climate and in human resources are of such importance that many aspects of agricultural development are specific to a particular country, region, district and, ultimately, to an individual farm. The design of an appropriate strategy for increasing agricultural productivity thus requires a high degree of judgment and intimate knowledge of the physical resources and agricultural characteristics of a particular region. These agricultural characteristics must include not only particular adaptations of crop varieties and methods of husbandry to the local environment, but also the social and cultural milieu within which the farmer operates.

The study of the Malaysian rice industry, with which this monograph is concerned, seeks to present an understanding of the development of that industry within these various parameters. This objective is undertaken primarily by means of a detailed survey of the historical and contemporary literature, official reports and statistical data, augmented by field work carried out, mainly during the 1980s, in most of the rice growing districts of the peninsula. An attempt is made to relate the policies pursued by Malaysian governments, both colonial and national, to various of the theories and models of agricultural development that have been advanced especially in the second half of the twentieth century with the objective of determining which, if any, have been or are of particular relevance to the Malaysian situation.

II

'... a shift from low-productive, subsistence activities ...'

The contemporary Malaysian economy lies at the top of the World Bank's ranking of 'lower-middle-income' economies with an average gross national product per capita of US$ 2560 (1993). At the time of publication of the Sixth Malaysia Plan (Government of Malaysia, 1991), manufacturing industry contributed 27 per cent of gross domestic product at purchasers' values, compared with 19 per cent contributed by agriculture, forestry, livestock and fishing, 10 per cent by mining and quarrying (including petroleum), and the balance, approximately 44 per cent, by the tertiary sector and construction. Gross domestic product had grown at an average rate of seven per cent in real terms over the period 1970–1985 and continued at 6.7 per cent between 1985 and 1990. This high level of economic growth had been accompanied by a structural transformation in line with the government's objectives of modernisation and diversification in which a gradual shift was taking place 'from low-productive, subsistence activities to high-productive modern activities' (Government of Malaysia, 1986).

The Malaysian Institute for Economic Research in its Income Doubling and Distribution Plan (Jomo, 1990) proposes more rapid growth, with emphasis on industrialisation and modernisation, and a shift from wealth to income distribution as the focus for redistributive efforts after 1990, the last year of the Outline Perspective Plan for the period 1971–1990.

The broad parameters of the First Outline Perspective Plan and its four constituent five-year plans had been set by the New Economic Policy which, in the often quoted words from the Second Malaysia Plan (1971–75), were to foster national unity and nation building through the eradication of poverty and the restructuring of society 'to eliminate the identification of race with economic function and geographical location'. The Second Outline Perspective Plan, 1991–2000, embodies the current National Development Policy which seeks to attain balanced development in order to create a more united and just society (Government of Malaysia, 1991). The main thrust of the Sixth Malaysia Plan, the first phase in the implementation of the Second Outline Perspective Plan, is described in his foreword by Prime Minister Datuk Seri Dr Mahathir bin Mohammad as 'to sustain the growth momentum and manage it successfully so as to achieve the objective of balanced development'. The position and role of the rice growing industry in the new just and balanced society will be strongly influenced by the outcome of policies introduced to deal with the 92,000 rural households in hard-core poverty in the country as a whole (Government of Malaysia, 1991). In 1989, the Mid-Term Review of the Fifth Malaysia Plan (Government of Malaysia, 1989) recorded 54,400 rice growing households in the peninsula alone as 'poor'. No equivalent figure was published in the Sixth Plan.[1]

In 1957, the year of political independence, the pattern of the Malayan (as it then was) economy had been established during 170 years of British colonial enterprise which had developed from the *entrepot* activities of the Straits ports of Penang, Malacca and Singapore into a mature export economy based particularly on the mining and smelting of tin and the plantation production of rubber (Courtenay, 1972). This economic structure had a strong geographical expression, in that the most prosperous and developed regions, in terms both of income and infrastructure, were the tin bearing and rubber growing tracts of the west coast of the peninsula. The particular economic structure also had a marked ethnic expression. Although not fully paralleling the economic and geographical patterns, there were sufficiently close ties between the Indian immigrant workforce and the plantations, and the Chinese immigrant population and the tin mines and urban centres of the peninsula for a significant relationship to exist between economic activity, geographical location and ethnicity.

[1] The official definition of poverty in Malaysia is described in Chapter 5.

Within, or rather on the fringes of, this colonial economy, with its commodity base and export orientation, were the subsistence farmers. Although in fact not particularly long established in the peninsula (see chapter two), rice cultivation was the principal 'indigenous' activity. The economic mainstay of the small Malay kingdoms, wet rice production predominated in small deltas and riverine plains especially in the north. The relationship between rice production, the ethnic Malays and many of their cultural traditions was close, and remained so even when the 'new' export crops, particularly rubber, began to infiltrate into the village economies. The growing populations of the mines, plantations and urban areas of the peninsula's west coast were fed on grain readily imported from Burma and Thailand. Locally grown rice had little commercial potential and it thus remained essentially a subsistence crop in colonial Malaya, with only occasional official attempts made (see chapter three) to increase productivity and create a surplus for the local market.

The mode of production of the pre-colonial, and to some extent, pre-independence rice 'industry' had many of the characteristics variously termed 'traditional', 'subsistence', 'peasant' or even 'feudal' in the development models. Rostow (1960), for example, characterised a traditional society as one 'whose structure is developed within limited production functions, based on pre-Newtonian science and technology' . . . . . but 'in no sense static. . . . acreage could be expanded; some *ad hoc* technical innovations. . . . could be introduced . . . . . But the central fact about the traditional society was that a ceiling existed on the level of attainable output per head'. Politically, in Rostow's model, '. . . . central political role. . . . . often existed' but 'the centre of gravity of political power generally lay in the regions, in the hands of those who owned or controlled the land'. In describing his traditional society, Rostow was merely 'clearing the way' in order to develop his growth model and his sketch was very general. It does, nevertheless, include features identifiable in nineteenth century Malay rural society.

Hill (1977) has described the pre-colonial rice economy of Malaya in his historical geography of the industry and traced changes, in the form of expansion and intensification, that occurred during the colonial period. These included drainage and land development, and simple irrigation systems. He concluded, however, in the closing paragraph of his study that ends around 1910, that the spread of new social and economic orientations failed to bring to the Malay peasant benefits equalling those achieved by other segments of the broader community in the early years of the colonial economy. 'Even if he were materially better off than his grandfather had been, he was still at the bottom of the socio-economic heap'. Despite some government initiatives, especially during the 1930s, and the adoption by many rice growers, especially on the west coast, of rubber as a complementary, and commercial, crop, this relative position

had not improved up to the outbreak of the Second World War or, indeed, up to Malayan internal self-government in 1948.

As noted in chapter four, rural development with a particular emphasis to be put on the rice sector became a basic objective of Malaysian economic and social development after 1950, but it was not until the introduction of the New Economic Policy in 1971 that social objectives came to the fore in policies relating to the Malay rice-growing communities. In order to achieve the objectives of the New Economic Policy, positive discrimination was introduced to favour the *humiputera* (a new term adopted to designate the Malays, the aborigines of the peninsula and the indigenous peoples of East Malaysia). Amongst a wide range of initiatives directed towards correcting what was seen as a century of neglect, especially by the colonial British, of the 'native' peoples of the country, the rice sector became a major beneficiary of development efforts. The modernisation of the peasant economy, the perceived final phase of whichever development model might be chosen, had become a national objective, for ethnic, political and social as well as economic reasons.

The following chapters of this book set out to examine the development of the rice sector of Peninsular Malaysia within its particular physical, cultural and historical environments. That development has also been an integral part of national Malaysian economic and political strategies, themselves patterned by particular ideologies and growth theories. The present status and condition of the rice growing industry of Peninsular Malaysia, on which its future must necessarily be built, is a product of all these influences. A review particularly of the agricultural growth theories which have influenced the directions followed by these strategies constitutes the remaining sections of this chapter.

III

'. . . a position of low priority . . .'

Despite, or perhaps because of, the obviously pivotal position of agriculture, not only as the economic support system of those millions whose lifestyle is still essentially subsistence but also as the basis of substantial export industries, perceptions of its role in development have varied. In a very useful review of theories and models regarding this role, Hayami and Ruttan (1971) identified two broad approaches to it which they described as 'growth stage theories' and 'dual economy models'. In the growth stage theories, an evolutionary sequence from some unsophisticated, primarily agricultural, economy to a complex industrial/commercial economy is postulated. Such theories are seen as having their origins in the nineteenth century German tradition to which belonged both Marx and List and other writers of the German historical school. In more recent

decades, the 'structural transformation' hypotheses of Fisher and Clark, which saw development associated with changing economic emphases from the primary to the secondary to the tertiary and quaternary sectors, and the 'leading sectors' approach of Rostow with its 'stages of growth', similarly see the transition from an agricultural to an industrial society as the major characteristic of development. Growth stage theories commonly see the expansion of agricultural production as a precondition for the development of manufacturing, and domestic industrial development in its turn as the chief generator of, or encouragement for, agricultural progress. According to these theories, the contemporary mosaic of world 'levels of development', constructed by the use of any preferred development indices, thus corresponds to a pattern consisting of the different stages reached in the 'cross country development race' (Mountjoy, 1963) by various countries and/or regions. Generally, it is argued, the greater the emphasis on agriculture, the less far has the area in question progressed along the development continuum.

Dual economy models emerged from efforts to understand the co-existence, in a colonial context, of traditional (usually termed 'peasant') societies, which would have been put at the unsophisticated commencement of their sequence by growth stage theorists, with dynamic, world-market-oriented sectors which, though often involved in primary production, were clearly well advanced along the evolutionary track. In his *sociological dualism*, Boeke (1953) argued that western economic thought was inapplicable to the tropical/colonial situation. He posited, as his central tenet, a fundamental distinction between the objectives of economic activity in western and in eastern societies that would render ineffective any attempts to bring about technological changes in traditional agriculture through the introduction of exogenous inputs. *Enclave dualism* reflects the related efforts of trade theorists to explain, notably in colonial contexts, the lack of interaction between, usually spatially distinct, high productivity export sectors and low productivity domestic sectors. It underlies the patterns of economic activity that are recognisable in most, if not all, former colonial dependencies and its consideration is essential to the understanding of their continuing economic geography and of many of their current development problems (Courtenay, 1972).

Hayami and Ruttan describe sociological and enclave dualism as 'static', and contrast them with 'dynamic dualism' which recognises the general validity of the typology but abandons the view of an unchanging traditional agriculture. Models of the Lewis-Fei-Ranis type (Lewis, 1954; Fei and Ranis, 1964) see the traditional, subsistence, sector as characterised by disguised unemployment or under-employment, zero marginal productivity of labour, a positive 'institutionally determined' wage rate for labour which approximates its average productivity, and fixed land inputs. Under these conditions, such 'two-sector' models postulate the

transfer of labour from the subsistence sector to a commercial-industrial sector without reducing agricultural output or the supply price of labour to the modern sector. Subsistence agriculture plays an essentially passive role in these models as a potential source of 'unlimited labour' and 'agricultural surplus' for the rest of the economy.

In the context of the less developed countries, dual economy models are particularly relevant, though in their static version they have tended to provide intellectual rationalisation for development policies which have placed heavy emphasis on industrialisation and the modern sector (Hayami and Ruttan, 1971). Indeed, the suggested inability of traditional agriculture to benefit from modern technology seemed to support the earlier hypotheses of the one-sector growth models of the 1940s and 1950s, in which the industrial sector was seen as the unique key to development, able to pull the backward agricultural sector along with it (Thorbecke, 1969). Most third world governments, at least until the later 1960s, pursued the relatively straight-forward option offered by these models, favoured the expansion of the industrial and service sectors and 'relegated agriculture to a position of low priority' (Weitz, 1971).

Stimulated by the Latin American school of development thinkers (eg Furtado, 1963; Friedmann, 1966; Frank, 1969), who sought alternative approaches to those of the diffusionist models whose adoption had seemingly failed to solve the problems of poverty and economic backwardness, the dual economy concept was remodelled in the context of the dependency paradigm. This saw imperial systems as responsible for commercial enclave developments which impinge upon, but do not provide growth for, traditional peasant agriculture. Such an interpretation put the development problem into a clear political, rather than economic or sociological, focus and opened the way for a neo-Marxist analysis which many writers (eg Leys, 1977; Browett, 1982) claimed was more appropriate anyway and should supersede dependency hypotheses.

Whilst much academic writing in the 1970s and 1980s was strongly influenced both by dependency and Marxist theory, 'official' development thinking continued to rely on diffusionist ideas. Full acknowledgement of the implications of dependency theory or Marxism by bodies such as the World Bank or regional development funding agencies such as the Asian Development Bank would necessarily have been quite unacceptable to the world's dominant economic powers who provided the bulk of their finance. Nevertheless, the considerable industrial expansion in some countries (e.g. India), supported by unprecedented investment, was seen to be very slow in producing the expected spin-offs or spread effects. A redirection in official development approaches was signalled in 1973 by McNamara when, in his Annual Address as President of the World Bank, he identified the need specifically to address the productivity of the rural poor (McNamara, 1973). This awareness of the limitations of previous devel-

opment efforts led to a new emphasis on the inclusion of sociological perspectives in the work of development agencies. However, rather than changing the basic concepts of mainstream ideas, the development policies of the 1980s have been seen by Porter *et al.* (1991) merely as involving a 'more explicit adding-on of further variables to the existing equation'.

IV

'... accelerating the rate of growth of agricultural output ...'

The mechanism most commonly perceived as operating to modify traditional agricultural practices for the better is diffusion. Diffusion models, like most economic development models, are rooted in west European experience and see the route to agricultural development through the more effective dissemination of technical knowledge and the increasing commercialisation of subsistence farming. Responsible for providing much of the intellectual foundation for research and extension effort in farm management and production economics, the diffusion model rests upon the empirical observation of substantial differences in land and/or labour productivity among farmers in any given region.

Low economic rationality was seen as a norm of traditional societies which were perceived as viewing friendliness, hospitality and consensus as more valued ends than enhanced productivity (Rogers, 1962). Rostow (1960) saw the value systems of such societies as geared to what he called a 'long-run fatalism'—the assumption that the range of possibilities open to the individual's grandchildren would be just about what it had been for his grandparents. In terms of the development of traditional agriculture, extension and similar programs were expected to transform the peasant into an 'economic man' who would respond 'more rationally' to the technical and economic opportunities made available to him (Hayami and Ruttan, 1971).

Johnston and Mellor (1961) defined three specific phases of agricultural development, though 'at the risk of considerable over-simplification'. Phase I represented a period of development of agricultural preconditions, amongst which improvements in land tenure were thought likely to be the most essential requirement but which also included activities to promote greater receptivity to change. Phase II was seen as a period of expansion of agricultural production based on labour-intensive, capital-saving techniques and relying heavily on technological innovations. Innovations that did not require large increases in the use of purchased inputs, such as high yielding seed varieties, improved crop rotations or multiple cropping, were seen by Metcalf (1969) as most appropriate. Phase III was characterised by the expansion of agricultural production based on capital-intensive, labour-saving techniques. In later work, Mellor (1966) recognises technologically

stagnant, traditional agriculture, using well-tried methods designed to minimise risk, as the kind of system in which the phase I preconditions were needed. Phase II societies were exemplified by eighteenth century Britain with its new rotational systems, and by the pioneering techniques of twentieth century Japanese rice farming. Modern European, American or Australian agricultural practices were typical of phase III. The Japanese model was espoused by some theorists (eg Nicholls, 1960) and seen as 'particularly appropriate to Far Eastern conditions' (Johnston, 1951).

Basing his model on the extent of commercialisation, Weitz (1971) claimed to identify 'stages of farm evolution' whereby the subsistence farmer, who produces one dominant crop for domestic supply, evolves into a mixed farmer with diversified cropping for both domestic and market supply, and finally becomes specialised and fully market-oriented. Weitz's farm evolution occurs through the media of technology, capital investment and market orientation though the farm unit may commonly (perhaps usually) remain a family concern. Lewis (1955) claimed that 'the present institutional framework is, in most underdeveloped countries (but not all), quite adequate for an enormous advance in productivity by means of the introduction of improved technology'. Others (eg Graham and Floering, 1984) have insisted that the adoption of the managerial, corporate structure that has served the plantation sector so well is essential to tackle the problems of third world agriculture, despite the failure of earlier attempts to apply large-scale methods to agriculture which have been well documented (eg in West Africa, Australia and the former USSR).

By the late 1960s it was generally apparent that only limited success had been achieved in agricultural development in the third world by way of the industrialisation models or of extension programs expected to transform tradition-bound peasants into western-style farmers responding to 'economic incentives'. New perspectives were clearly needed. Some, like the earlier viewpoint of Boeke (1953), were essentially negative in that they saw cultural barriers to economic betterment. Parkinson (1967), for example, attributed the retardation of the Malays to their particular value system which, he claimed, regards success in terms of doing well what is traditionally approved and practised rather than in terms of material progress, and sees only 'a loose connection between reward and effort' (Swift, 1965).

Insightful work by others, however, refuted the notion that peasants in traditional agriculture were economically irrational and poor at resource allocation. In a footnote to their paper on the role of agriculture in economic development, Johnston and Mellor (1961) drew attention to what they saw as a 'growing consensus' that the view, espoused particularly by Boeke and alleging limitations on development attributed to the irrational behaviour of peasant agricultural producers, was not borne out by available evidence. They quote particularly the work of Joosten (1960) on rubber

exports in Indonesia which concluded that '. . a scrutiny of the facts shows that the peasant farms his land as rationally as possible under the social and economic conditions affecting him and within the limit of his opportunities as regards labour, land, markets, capital, knowledge and managerial skill'.

Schultz (1964) insisted that peasants in traditional agriculture were rational, efficient, resource allocators and that they remained poor because in most less developed countries there were only limited technical and economic opportunities to which they could respond. His concept of traditional agriculture was of a system in which routines with respect to all production activities were long-established. As agriculture approached the particular equilibrium of traditional agriculture, the marginal productivity of investment in additional agricultural factors continued to decline until a point was reached at which the rate of return was so low that there was no longer any incentive to save for additional investment in these factors. Schultz identified the economic basis of the slow growth associated with traditional agriculture as the dependence upon a particular set of factors of production whose profitability has been exhausted. Given available technology, most traditional farming systems achieved positions of equilibrium within their specific physical environment and resource endowment, and adapted to population growth by intensification (eg by shortening of fallow—Boserup, 1965, or by 'involution'—Geertz, 1963) or by colonisation of new land (eg Hill, 1977). Hayami and Ruttan (1971) argued that the first step in any attempt to evolve a meaningful perspective on the process of agricultural development was to abandon the view of agriculture in pre-modern or traditional societies as essentially static.

Todaro (1977) emphasised that subsistence agriculture is a highly risky and uncertain activity where human lives are at stake. In regions of small farms and highly variable rainfall, average outputs are low and, in poor years, the danger of starvation is very real. In such circumstances, the principal motivating force in a peasant's strategy is less the maximisation of income and more that of maximising his family's chances of survival. A technology of food production which combines a low mean yield with a low variance, and thus a greater likelihood of a survival-level crop, is rationally preferred to alternative technologies and/or crops which may promise a higher mean yield but also present the risk of a greater variance and perhaps complete failure. As Scott (1976) similarly pointed out, 'in the choice of seeds and techniques of cultivation . . . the cultivator prefers to minimise the probability of having a disaster rather than maximising his average return'.

Given the perspective of these latter writers, the problem of agricultural development becomes less one of transforming a static traditional sector into a modern dynamic sector 'but more one of accelerating the rate of growth of agricultural output and productivity' consistent with the growth

of other sectors of a modernising economy (Hayami and Ruttan, 1971). Schultz's (1964) interpretation requires the traditional farmer to break away from his dependence on the exhausted factors of production by somehow acquiring a profitable new set of factors which he adopts and learns to use effectively. Exhortations pertaining to work or thrift, of the kind that permeate both the pre-war literature and even that of the 1950s, are not likely in themselves to create growth in traditional agriculture unless some such non-traditional factors are available and can be absorbed by the system. The ability of the system to absorb these factors depends upon the extent to which they complement rather than conflict with it. This point was clearly made by Parkinson (1967) who, in seeking to identify 'non-economic' behaviour by rural Malays, argued that they were willing to accept changes and innovations provided they did not represent any fundamental or radical alteration to familiar or traditional ways.

In their concise analysis of approaches to agricultural development that has been cited earlier in this chapter, Hayami and Ruttan described a high-payoff input model which saw investment to make appropriate modern high-payoff inputs available to third world farmers as the key to the transformation of a traditional agricultural sector into a productive source of economic growth. For such a model to prove effective, agricultural experiment stations needed the capacity to identify and produce the appropriate scientific knowledge, local industry the ability to provide the physical inputs, and the farming community the incentive, willingness and skill to put both to use. The skill, and perhaps part of the willingness, may be created by means of education, on which Schultz (1964) put heavy emphasis. The incentive, and more of the willingness, are undoubtedly associated with the extent to which individual households see the adoption of the high-payoff inputs as benefiting themselves. This is affected by a range of variables including the cost of the inputs, the household's access to resources such as land, water and credit, the availability and effectiveness of extension services and advice, and of marketing outlets. Many writers of the 1960s saw the new 'miracle' seeds, in concert with the cheaper fertiliser that new techniques had made available, as providing a high-payoff input that met the needs of the model. Thorbecke (1969) believed that the 1960s 'conceivably . . . may someday be recalled as the beginning of the "green revolution"'.

V

"... a stage of transition and hope ..."?

The achievement of increased agricultural output by the creation and introduction of improved plant and animal strains has been part of western agricultural tradition since the eighteenth century. Outside Europe and the

areas of European settlement in north America and Australasia, however, such creations and introductions were limited until the early 1960s. The principal non-European success had, of course, been accomplished in Japan—where, during the 30 years between 1881–90 and 1911–20, agricultural output was increased by 77 per cent and output per farm worker by 106 per cent. The doubling of labour productivity was attributed to the expanded use of commercial fertilisers and the selective breeding, propagation and distribution of rice strains which responded favourably to heavy fertiliser application. The remarkable increase in agricultural output was achieved with a relatively small direct capital outlay and a minimum of social dislocation but involved considerable government investment in agricultural research and extension services (Nicholls, 1960).

Based on a methodology that involved the collection and hybridisation of crop varieties, work on superior wheat varieties was promoted in Mexico in the 1940s and 50s by the Rockefeller Foundation, and on high yielding rice varieties in the Philippines co-operatively by the Rockefeller and Ford Foundations in the 1960s. By about 1970, this work had produced breakthroughs that held out prospects, especially in India and Southeast Asia, of rescuing farmers from poverty by guaranteeing their subsistence and even yielding surpluses for sale. In 1968, the FAO was sufficiently optimistic about the achievements to be able, in its annual *State of Food and Agriculture* report, to claim that the 'world food and agriculture situation is now in a stage of transition and hope'.

Data on Asian rice production during the 1950s, 60 and 70s summarised by Barker and Herdt (1985) certainly indicate average annual growth rates which, overall, exceeded those of population, though not by particularly large margins (table 1.1). For the period 1946/55–1976/80, the highest regional annual growth rate was recorded by Southeast Asia, thanks to a fairly consistent trend (ranging from 2.11% in Laos to 3.55% in the Philippines) in all the countries of the region. Elsewhere in Asia, individual states (North Korea 4.98%, Pakistan 4.82%) had higher rates of growth in rice production than any within Southeast Asia but were counter-balanced by some poor performers.

The work of Barker and Herdt analyses the factors that contributed to the increases in rice output in Asia in the early decades of the green revolution. Some countries generated most of their growth in production by adding to their rice land, either through the construction of irrigation systems or by opening new land, methods unrelated, *per se*, to green revolution technology though often undertaken in association with the use of new hybrid seed. Others obtained more of their enhanced output by increasing yields, notably by the adoption of high yielding varieties and substantial use of fertilisers. Table 1.2 identifies the relative contributions of area and yield to output growth between 1953 and 1977. Clearly circumstances varied from country to country, and indeed regionally within

countries. Supplementing studies of individual cases with a production function analysis, Barker and Herdt concluded that 44 per cent of the growth in output in countries with extensive irrigated areas was attributable to fertiliser and the associated change from traditional to modern rice varieties. Increases in irrigated area in these countries provided 25 per cent of the growth. In countries with moderate levels of irrigation, growth in rice output was obtained approximately equally from additional irrigation, fertiliser and labour. In both groups of countries they showed that capital (other than in infrastructure such as irrigation schemes) provided a relatively small source of growth in production.

The importance of the contribution to production increases of irrigation systems, both to augment 'normal' wet season water supplies and to permit dry or off season cultivation, and of fertilisers, to exploit the high yield potential of the new seed varieties, is highlighted by this analysis. These 'modern' inputs are crucial to the success of green revolution technology and call into doubt concepts, for example of Lewis (1955) and Metcalf (1969), that innovations, such as 'miracle' seeds, could be absorbed into existing farming systems with minimum societal disruption. Although the development of high yielding varieties apparently fitted well into phase II of the Johnston/Mellor model, especially in the cheap fertiliser days of the 1960s, the 'fit' became less good as the reliance of the new hybrids on a range of inputs—fertiliser, reliable water supplies, pesticides, drying facilities, and in due course the mechanisation of field activities—became increasingly apparent.

The need for institutional adjustment in rice growing societies that adopted 'green revolution' technology started to become apparent almost as soon as the new seeds were sown, though such adjustment rarely ranked very highly in the economic growth models. Perhaps most basic to the changes was the need for money and credit to finance farm operations. Traditionally, the rice farmer needed few productive assets—the most valuable, apart from the land itself, was the water buffalo. Tools and equipment were inexpensive and frequently long-lasting. The main requirement for cash was for consumption purposes. Credit, in the form of goods or small amounts of cash, especially to overcome the problem of seasonality in the receipt of income, was provided by local shopkeepers or pawnbrokers. The new farming system required more cash and credit which often was beyond the resources of the traditional suppliers and difficult for the small farmer or tenant to obtain. As rice production was modernised, farmers came to be increasingly subjected to forces outside their control—world prices for fuel or fertiliser, market prices for their surplus production, the attitudes of officials in credit societies or agricultural banks—and were often forced into a dependency on public sector support and government intervention (Zulkifli, 1988).

Table 1.1 Rice production by region and country, Asia, 1946–80

Region and country	Average production (thousand t padi) 1946–55	1956–65	1966–75	1976–80[1]	Average annual growth rate 1946–55 to 1976–80 (per cent)	Average annual population growth rate 1950–80 (per cent)
East Asia	**82,269**	**107,135**	**137,946**	**164,149**	**2.54**	**2.39**
China	63,643[a]	82,993	110,164	134,400	2.76	2.58
Japan	12,157[b]	15,368	16,090	14,793	0.72	1.15
South Korea	3,514[b]	4,426	5,560	7,135	2.61	2.14
North Korea	1,173[b]	1,712	2,981	4,462	4.98	2.13
Taiwan	1,782	2,636	3,151	3,359c	2.33	2.75
Southeast Asia	**31,223**	**41,711**	**57,445**	**72,545**	**3.11**	**2.66**
Burma	4,995[d]	7,037	8,054	9,579	2.40	2.18
Indonesia	10,180[b]	12,159	18,738	25,695	3.42	2.53
Laos	506[b]	559	844	899	2.11	2.49
Malaysia	743[b]	971	1,679	1,862	3.40	2.88
Philippines	2,768	3,747	5,060	7,221	3.55	3.32
Thailand	6,546	8,177	13,182	16,400	3.40	3.15
Vietnam	5,485[e]	9,061	9,888	10,889	2.52	2.21
South Asia	**50,667**	**67,298**	**84,274**	**101,321**	**2.55**	**2.58**
Bangladesh	11,140[c]	13,735	16,700	19,230	2.01	2.53
India	35,955	49,164	60,773	73,475	2.63	2.08
Nepal	1,752[b]	1,937	2,268	2,306	1.00	2.34
Pakistan	1,258[b]	1,625	3,212	4,589	4.82	3.05
Sri Lanka	562[b]	837	1,321	1,721	4.15	2.25

Sources: *Barker and Herdt (1985); Population Censuses (1950–1980)*

[a] *1949–55 av.* [b] *1950–55 av.* [c] *1976–79 av.* [d] *1946–51 av.* [e] *1947–55 av.*

Table 1.2 Rice production growth rates, and relative contribution of area and yield to output growth, 1953–77[a]

Region and country	1953–67 Output growth rate (per cent)	1953–67 % contributed by Area[b]	1953–67 % contributed by Yield	1967–72 Output growth rate (per cent)	1967–72 % contributed by Area[b]	1967–72 % contributed by Yield	1972–77 Output growth rate (per cent)	1972–77 % contributed by Area[b]	1972–77 % contributed by Yield
East Asia									
China	2.50	19	81	4.00	53	47	2.50	54	46
Japan	2.40	19	81	2.50	-	-	0.90	-	-
South Korea	2.80	52	48	2.40	-	-	5.40	10	90
North Korea	5.60	60	40	5.00	35	65	6.20	23	77
Taiwan	2.90	3	97	0.10	-	-	1.40	23	77
Southeast Asia									
Burma	2.30	69	31	1.10	28	72	2.70	26	74
Indonesia	2.60	49	51	6.40	24	76	3.30	36	54
Laos	3.50	100	0	1.70	-	-	0.70	60	40
W. Malaysia	4.60	59	41	6.90	59	41	0.20	-	-
Philippines	2.60	53	47	3.10	20	80	5.80	27	73
Thailand	3.90	49	51	2.00	75	25	3.80	86	14
Vietnam	3.40	38	62	3.70	21	79	1.10	-	-
South Asia									
Bangladesh	2.80	36	64	0.10	-	-	2.80	27	73
India	2.60	48	52	3.10	23	77	2.90	30	70
Nepal	1.40	62	38	1.40	72	28	0.30	-	-
Pakistan	5.30	62	38	5.90	4	96	5.20	87	13
Sri Lanka	4.80	46	54	5.30	44	56	1.50	13	87

Source: *Barker and Herdt (1985)*

[a]Based on 5-year averages centered on the years shown.

[b]The contribution of increased area relates both to the opening of new land to cultivation and the facilitation of double cropping by construction of irrigation schemes.

As differentials in the ability of farmers to cope with the new forces and benefit from the new technology began to emerge, so did a range of interpretations of its effects. As clearly put by Barker and Herdt (1985) 'It seems fair to say that those who developed the initial Green Revolution technology, principally biological scientists, gave little consideration to the socio-economic implications of their work, although their broad goal was that of increasing food production so as to reduce human misery.' Contrasting views on the appropriateness of the green revolution methodology to achieve that goal have extended from ardent support to severe reservation. Early protagonists were particularly enthusiastic. Brown (1970) saw the new miracle rices as 'literally helping to fill hundreds of millions of rice-bowls once only half full', but later critics drew attention, *inter alia*, to increasing inequalities in rural incomes resulting from the greater ability of larger farmers to adopt the new technology (e.g. Grabowski, 1979).[4] Lipton with Longhurst (1989), identifies sharp changes of direction in opinion concerning the impact of 'modern varieties' which he describes as 'almost swings of fashion'. He recognises four phases. There are, first, the 'green revolution' euphoria of 1967–70; secondly, the period of growing fears that the new varieties were benefiting the richer rural groups at the expense of the poorer; thirdly, the reassessments of the late 1970s which suggested the poor were gaining absolutely but losing relatively; and finally a fourth phase in the 1980s in which optimism re-emerged, though more in the work of economists than of other social scientists and ecologists.

Support for the rapid adoption of green revolution technology by policy-makers and international organisations has been seen by some as linked to the perception that it was an alternative to agrarian reform and permitted an improvement in the economic status of peasant farmers without the necessity of major social or political change. In this, claimed Ghose (1983), the 'strategy was fundamentally misconceived in that it took no account of the vital interconnections between social and technical relations of production'. Those interconnections had been set out, amongst others, by Schutjer and Coward (1971), who noted that 'The spread of the Green Revolution beyond the privileged few . . . will require that traditional institutional patterns adjust, or that new institutional patterns emerge, to assure the access of cultivators with limited resources to the knowledge and physical inputs required for the adoption of the high-yield variety (HYV) production package. These pressures to revise institutional patterns, including the adjustments in the traditional socioeconomic relations required by the increasing productive capacity of the rural sector,

[4] An interesting review of the different perspectives on the green revolution is given by Farmer in his 1984 Kingsley Martin Memorial Lecture (Farmer, 1986).

are sufficiently critical that they will have to be accommodated if the Green Revolution is to be sustained'.

Although, as shown by the Malaysian experiences of the 1960s and 70s, it is possible, through the use of improved technology embodied in imported agricultural inputs, to bring about an initial increase in agricultural productivity within the prevailing social and economic structures (the 1955 Lewis viewpoint), sustained change, it is argued, will require revision of these structures of the nation. This revision need not be in the direction of the western capitalist model, though that is usually assumed by non-socialist theorists. As suggested earlier, the Japanese version, which was based on the family farm (Bray, 1986), offers prospects for the nations of south and south-east Asia. Hallett (1981) makes the point that the application of science to agriculture requires investment in people as well as in material inputs and involves gradual, but far-reaching, changes in organisation. The transformation of traditional agriculture requires its farmers to be motivated to achieve change, to be assured that the change will benefit them and to have access to ancillary services necessary to achieve the change and sufficient knowledge to use them. Those requirements may well involve modifications of existing land tenure and marketing systems.

A fundamental weakness of linear stage models of economic development is their lack of a time frame, so that it is possible, with hindsight, to claim to identify stages of economic growth (as Rostow, 1960, did for the United Kingdom between the 1780s and 1930s) but impossible, in the absence of theory of essential causality between the stages, to establish a general time scale for their appearance.[5] In setting up his stages of farm evolution, Weitz (1971) sought to recognise transition points between traditional subsistence agriculture, diversified semi-commercial agriculture and specialised commercial agriculture in annual per capita income terms. In 1971 U.S. dollar terms, he set these at $200–300 for the first transition and $800–1000 for the second. Even if converted to equalise purchasing powers of currencies in different countries, these figures are very arbitrary and presume that all elements of a household income can be expressed in monetary terms.

In the absence of any specified time line or identifiable transition points, criticism of the limited achievement to date of green revolution technology in the widespread reduction of rural poverty can be countered by its advocates with the, justifiable, claim that it is still in its infancy (Bray, 1979). Rigg (1989) has suggested recently that a number of researchers, and he cites Hayami (1981; 1988) and Lipton (1987), now believe that it is 'the *insufficient* progress of the Green Revolution which explains the

[5] In the Rostow model, of course, for some countries, notably Canada and Australia, certain stages overlap.

widening inequalities visible in rural areas'. This argument is based upon variations in adoption of high yielding varieties between countries and between regions, and related to the non-availability of varieties suited to marginal areas or to spatial variations in the existence of appropriate infrastructure, for example, of water control systems. It cannot, however, explain the observed persistence of rural poverty in districts well served by necessary capital projects and where the new varieties have been generally, or even universally, adopted. It may be suspected that in these instances, it is the socioeconomic system which has not succeeded in permitting the full benefits of technology to be realised by all sections of the rural community. As Barker and Herdt (1985) observe, one consequence of the debates over the extent of the success of the green revolution has been a greater emphasis on understanding individual rice-growing environments and on developing technology suitable for particular, especially the less favourable, agro-climatic regions. The need for a more holistic approach to the farm-family as a decision-making unit within its particular socio-economic and cultural environment is reflected in the development of farming-systems projects throughout the world.

VI

"... a crisis of agriculture ..."

Mainstream agricultural development theory, whether rooted in the German historical school or the Rostovian-type growth stages, has always treated the physical environment as a passive element in the development process, to be modified, adapted and generally exploited at will. Drainage, irrigation, fertilisation, pest-control, genetic modification have all been seen as technological means whereby unfavourable aspects of the natural environment can be ameliorated for the purpose of increasing economic returns. Indeed, the employment of scientific and engineering techniques, as well as production for a commercial market, has commonly been the means of distinguishing 'modern' from 'traditional' agriculture, though Bray (1979) has suggested that this is a 'facile distinction' that tempts field-workers (and no doubt others) to regard the past as essentially static, and 'pre-modern' agriculture as having involved no 'scientific' advances. It has become abundantly clear in recent years, however, that the economic success of 'modern' agriculture has involved substantial costs that have rarely been incorporated in the econometric models or growth theories. The 'success' or 'efficiency' of an agricultural system can be measured in a variety of ways (Bayliss-Smith, 1982) of which net income per unit area is the standard economic measure. This measure almost invariably achieves higher returns for modern, scientifically-based agriculture than it does for so-called traditional farming. Nevertheless there are costs that

commonly are not incorporated amongst the inputs included in agricultural budgets. Some of these are externalities, whereby costs are created for individuals or bodies outside the farm system. Many of these are environmental costs associated with the use of chemical fertilisers and pesticides, or with hydrological modifications created by drainage and/or irrigation activities.

Alternative measures of efficiency, notably energy ratios, draw attention more starkly to the extent to which modern agriculture has become dependent on *energy subsidies*. Modern agriculture has achieved its high levels of productivity primarily through the use of seed selection, agricultural chemicals and mechanised field operations. The last two have relied heavily on the availability of cheap energy, largely in the form of petroleum. Bayliss-Smith (1982) estimated that the energy ratio (i.e. food energy produced/non solar energy consumed) for a contemporary farm in southern England was 2.1/1 and for a Soviet collective near Moscow was only 1.3/1. Citing data collected in south India by Epstein (1973) and a later project of the Ford Foundation, Bayliss-Smith showed that, over a twenty year period (1955–75) when food energy production increased by 57 per cent thanks to green revolution technology, the energy ratio fell from 13.0/1 to 9.7/1 as the use of energy inputs increased disproportionately. Similar trends are likely to have occurred elsewhere in Asia where agriculture has been undergoing modernisation, with lower energy ratios likely in Malaysia where mechanisation is more widespread than in south India and fertiliser use heavily subsidised. As energy costs rise, the basic instability of energy-subsidised modern agriculture is destined to become increasingly apparent, while both the financial and environmental costs of the green revolution technology will necessitate serious reconsideration of the conventional agricultural growth models. It is difficult to argue with Bayliss-Smith's (1982) contention that 'the energy crisis . . . is as much a crisis of agriculture as it is of transport or of manufacturing industry,' and easier every year to sympathise with Sederberg's (1979) belief that modern societies are 'facing a rising curve of unpleasant surprises' in which 'good things are turning out to be bad, and bad things are even worse than feared'.[6]

In its plans for the agricultural sector as a whole, the Sixth Malaysia Plan (Government of Malaysia, 1991) recognises the decade of the nineties as presenting 'greater challenges in the development of the agriculture

[6] Sederberg's 'good things' include the automobile, pesticides and nuclear power, and 'bad things' the long-term consequences of nuclear war and the impact of pollution. It is hard not to be pessimistic when the World Bank (1990) reports that, for many in sub-Saharan Africa and Latin America, incomes fell during the 1980s and the incidence of poverty increased, and at the time of writing (January 1991) a massive, man-produced oil slick was threatening the water supply of Saudi Arabia.

sector'. It identifies the need for 'complementary growth in agriculture to ensure a reliable and sufficient supply of agricultural inputs' to the manufacturing and service sectors which are seen as the economic leaders in the race for developed nation status by 2020. The Plan acknowledges the need to 'preserve the ecological balance and, ensure (the) continuing contribution of agriculture in the future' and for 'improvements in income for those remaining in the agriculture sector'. Growth of the sector is seen to depend 'crucially on a market orientation of policies' to rejuvenate and commercialise it. Since it is believed that the management skills that will be required for this approach will be 'too costly for the public sector to shoulder,' the private sector will be expected to play a greater role. The economic, social and geographical consequences of this decision for the Malaysian rice industry, especially for the 50,000 or more households still in poverty, will depend upon the outcome of conflicting politico-cultural and economic considerations, and on the ability of the national economy and the local physical environment to sustain the costs of the energy-subsidised technological model to which the rice sector has been committed.

2

"... Rice ... Occupies the Wide Valleys and the Coast Plain" — the Environment of Production

'... padi ... cultivation in the Peninsula is at best a risky occupation ...'[1]

.... long prairie-like plains of waving paddy stretch away from either side of the road, till they are broken by a belt of jungle or a range of hills. The fields which compose these plains are seldom more than an acre or two in extent, and are marked off by little mud-dikes a foot or two in height which, though sufficiently marking the boundaries of each plot, do not interrupt the prairie-like appearance of the whole. Dotted here and there over these yellow fields, are little dark green clumps of cocoa-nut trees shading the homesteads of the husbandmen, chiefly Malays. The paddy or rice plant very much resembles corn in its growth and appearance when ripe, but by the Malays, at all events, it is both planted and gathered in a peculiar manner. When completely ripe, the women of the homesteads proceed to the fields with a kind of scissors, and commence to gather it by clipping off the tops or ears of each stalk, the stubble being left standing some eighteen inches high. As soon as the reaper has a handful of these ears, she ties them firmly together and places the bundle down with a heap of others, to be carried to the homestead when the day's work is over. It is singular how exactly similar in weight these little bundles are made by practised reapers; and in disposing of the paddy for husking, it is never weighed out, but sold at so much the hundred bundles. The husking is a very primitive operation in the Straits; the grains are stripped off these bundles into a bowl-like cavity dug in a large log of solid wood, and pounded by a long heavy stick till the husk is gradually loosened, when it is taken out and winnowed, and again pounded till perfectly clean.

[1] The chapter heading is a quotation from Robequain (1954) and the introductory quotation is from Ooi (1976).

After reaping, when the rains come, the fields are dammed up and the water allowed to collect. When a foot or so of the water lies over the surface, bullocks and other cattle are turned in to tread down the stubble, which soon rots under water, and forms a valuable manure for next year's crop. When the rains dry up and the ground is ready for planting, small holes are made about a foot apart, and into each of these a few paddy stalks or seedlings, about forty days old, which have been reared from the seed in a separate part of the field, are planted at the depth of four inches. Though undoubtedly a more laborious method this than sowing, it is more economical and more efficacious.

(*John Cameron "Our Tropical Possessions in Malayan India", 1865*)

I

'... selected for conditions of low fertility and deep flooding ...'

Agriculture, the production of commodities by biological processes for human use, takes place within both a physical and a cultural environment. The interaction of the two environments creates particular agricultural systems, the varied characteristics of which provide constraints and opportunities for economic, social and cultural development. The cultivation of rice, which provides the primary dietary staple for one third of the world's population and which has come to extend over habitats that range from the equatorial tropics to 53°N on the Amur river (Swaminathan, 1984), gives rise to what must be the world's richest diversity of farming systems based on a common crop. Any hope of understanding the status and potential of rice cultivation in any particular region therefore must necessarily rest on a knowledge of the local circumstances under which it takes place.

It is generally agreed that the domestic cultivars of Asian rice (*Oryza sativa*) originated in the flood plains on the margins of tropical Asia in a broad belt extending from the Gangetic plains, across upper Burma and northern Thailand to northern Vietnam and south China (Barker and Herdt, 1985). Since its first domestication, at least as early as the fourth millenium BC (Grigg, 1973), rice has evolved a tolerance for a wide range of environmental conditions and exists in a multitude of varieties adapted to many different circumstances of climate, soil and terrain. Amongst these many varieties two main sub-groups are commonly recognised, the *indicas* and the *japonicas* (Williams, 1975), of which the former, with some exceptions, is a photo-sensitive, short-day, strongly seasonal group that prevails in lower latitudes. Most varieties are adapted to flooded culture, while others are suited to upland culture on drained soils.

The rice plant is an annual grass, grown almost exclusively from seed, either by direct sowing or by transplanting. The *indica* varieties traditionally grown in Southeast Asia are typically tall and leafy with high tillering rates. Their response to nitrogen is to develop foliage rather than grain size and they are susceptible to lodging. These tropical varieties require fairly uniform temperatures in the range 25–30°C and it seems likely that they have been selected for conditions of low fertility and deep flooding. Rice transpires between 600 and 1200 mm of water for each crop, with particular requirements related to rates of evapotranspiration so that, under the wet season conditions of equatorial and monsoon regions, the lower quantity is sufficient. As a grass, however, rice requires dry ripening conditions and is thus better suited to a climatic regime which provides at least a month or two of dry sunny weather. The high incidence of cloudiness, the constant high humidities and shorter periods of daylight that characterise low latitudes have been seen as directly detrimental to rice yields, while the plants are also more prone to disease and pests than in more temperate zones (Lim, 1967). There is little doubt that average yields in Southeast and other parts of tropical Asia (eg India) have always been and remain substantially lower than in temperate Asia and that environmental conditions contribute to the differences. 'While admitting that yields may be affected by local secular factors, it seems inescapable that padi is in fact better suited to the sub-tropical and warm temperate zones than to the full tropics' (Grist, 1975).

In the monsoonal regions, where rainfall is distinctly seasonal, cultivation is synchronised with rains. In order to ensure that the young rice plants will have reached a height sufficient to survive the deep flooding when it occurs, planting begins as soon as the first falls have softened the soil and made ploughing possible. Such early planting, without supplementary irrigation, however, involves the alternative risk of crop loss should the main rains be delayed. The two risks, each of which hinges upon the timing of the monsoon rains, contribute to the great fluctuations that arise from year to year in rice production in all monsoonal areas. The optimum soil moisture point for 'wet' rice plant growth is that of field saturation (Williams, 1975); deeper flooding is simply an insurance against drying out or the loss of water through downward or lateral seepage. However, five to seven centimetres of standing water helps maintain even soil temperatures and gives better weed control, a greater availability and uptake of nutrients, a more efficient use of fertilisers and consequently higher yields (Webster and Wilson, 1980). Considerations of water movement from field to field and the unevenness of the soil surface make it necessary for more water to be available than is required solely for transpiration and plant growth.

Rice is grown on a wide variety of soils, with those developed on fluvial or coastal alluvial deposits most common. There are, however, few clear

relationships between soil type and yield and the preference for alluvials is more associated with their frequency on the level sites required for water control than with their inherent qualities. The 'puddling' of the top 25 centimetres or so during field preparation for rice cultivation commonly forms an impermeable layer, just below the worked horizon, which impedes the downward movement of water. The rice plant possesses large air spaces in the leaf sheaths and root cortex which, at least up to the tillering stage, enable oxygen to be transferred from the air to the roots thus permitting it to grow in waterlogged soils. Some degree of drainage, or at least of lateral movement of water, is nevertheless desirable to prevent excessive chemical reduction of the soil. Most flooded rice fields, except those on acid sulphate soils which have pH values of three or less, soon reach a pH value approaching neutrality which is near optimum for the availability of most nutrients.

The conditions that obtain in flooded ricefields are, in general, more conducive to the maintenance of fertility than are those of dry-land cultivation. Soil losses by erosion from the level, bunded fields are minimal—on the contrary they receive influxes of soil and nutrients in irrigation water or by wash from higher land. In some places these sources may be adequate to supply the major elements needed for an annual rice crop and, often, at least a large proportion of some nutrients (Grist, 1975). The ploughing in of crop residues, weeds and animal manure provides additional organic matter. The anaerobic decomposition of such material results in the production of ammonium ions which either are held as exchangeable ions on the clay complex or pass into the soil solution and provide much of the nitrogen required by the rice crop. In the reduced areas of waterlogged soils, cation exchange involving ferrous, manganous and ammonium ions displaces appreciable quantities of calcium, magnesium and potassium ions into the soil solution, thus increasing their availability to the crop.

Additional nitrogen is fixed from the atmosphere by several agents, notably free-living blue-green algae, nitrogen-fixing bacteria, and a symbiotic relation between the blue-green alga *Anabaena azolla* and the water fern *azolla*. The last can fix as much as three kilograms of atmospheric nitrogen per hectare per day (Swaminathan, 1984). According to Webster and Wilson (1966), the supply of nutrients, especially nitrogen, on good rice soils with traditional management, appears to be adequate to maintain moderate rice yields, of one to two tonnes per hectare, almost indefinitely without fertilisers. Since nitrates can be lost by denitrification during the process of reduction, however, better yields are obtained when transplanting is carried out as soon as the soil is flooded (Williams and Joseph, 1981).

II

'Southwards . . . conditions . . . become progressively less favourable . . .'

The origins of rice cultivation in the Malay peninsula are obscure, with evidence almost exclusively textual and burdened with problems of identification (Wheatley, 1961; Hill, 1977). There are hints at the existence of the crop in Trengganu and Kedah towards the end of the first millenium AD and further south in the peninsula in the early centuries of the second. Hill (1977) claims that, by the beginning of the sixteenth century, 'several rice-growing traditions may be dimly discerned'. Malay tradition places the introduction of the techniques of ploughing and field flooding into the northern states from Thailand[2] and into the valleys of the central west coast by immigrants from Sumatra during the fifteenth century. In earlier times, rice was grown in the peninsula as a dry-land crop. The general adoption of wet rice methods dates mainly from the beginning of the nineteenth century and they had not become fully dominant until the early years of the twentieth. It has been suggested that this comparative recentness of adoption may account, in some parts of the peninsula, for a certain lack of adjustment of planting techniques to the physical environment. Hill (1977), for example, notes that in the 1890s there was still doubt amongst the people of Negri Sembilan as to the correct season in which to begin the agricultural cycle.

Physical conditions in the northern districts of the Malay peninsula were in some respects favourable to wet rice cultivation, but also presented some problems and difficulties. In the northwestern states of Kedah and Perlis, a plain of marine and riverine sediments, rarely more than three metres above sea level, stretches inland from the coast for about 20 kilometres and extends some 65 kilometres southwards from the Thai border. The surface is low and uniform and natural run-off is difficult. Short streams from surrounding foothills discharge from small catchment basins and, before human efforts at its control, spread their waters in sheet floods over the lightly modelled landscape (Dobby, 1951a). The soils of the plain are derived almost exclusively from marine or fluvial alluvia. The marine alluvial soils are predominantly clayey and have substantial nutrient reserves, though are poorly drained. The fluvials are sandier, poorer in nutrients and free draining (Joseph, 1965; Wong, 1970).

The physical process of pioneering for wet rice cultivation in the northwest, which took place on an increasing scale during the nineteenth

[2] Hill (1977) claims that the balance of probabilities indicates a Mon rather than a Thai origin for flooded field rice culture in the north and surmises a much earlier date than the fifteenth century.

and early twentieth centuries, was an arduous one. According to Dobby (1951a) it occurred 'very much within the traditionally self-contained farming systems indigenous to Malaya', though Hill (1977) has offered evidence that suggests it was, at least partially, stimulated by an export trade that was the 'child of imperial interests' emanating from the colonial settlement of Penang. Bunding was necessary not only to retain water in the fields but also to prevent marine inundation during high tides. Earth banks, ditches, and perhaps even some streams, were created by settlers, often working under a corvée system *(kerah)*. Manipulation of the drainage system occurred by repeated but sporadic trenching by local groups. Surface relief, such as it is on the Kedah/Perlis plain, is of human rather than natural derivation.

Rice cultivation in the northeastern state of Kelantan adjusted to a rather different physiography. The Kelantan river delta has a complicated relief produced by abandoned distributaries of the river and consists of series of low ridges and hollows which affect the availability of water. Abandoned river courses, distributaries and occasional channels of run-off are favoured sites for rice fields. Levelling and bunding have been undertaken to retain rainfall which, as a result of the incised nature of the Kelantan river with its banks well above low-water level, is the mainstay of cultivation. Devices, such as water wheels, used to raise water in other parts of the peninsula were absent in Kelantan before the development of modern irrigation systems (Dobby, 1951b) and the principal wet-rice crop had to be timed to take advantage of the cycle of rainfall. As much as 20 to 25 percent of Kelantan's rice land, nevertheless, was cultivated 'dry' until as recently as the 1950s. Slightly sloping fields were flooded at their lower ends, cultivated dry over most of their area but with a narrow, intermediate strip that varied between the two systems according to seasonal water availability. The isolation of Kelantan from the colonial economy of the west coast for at least the first half of the twentieth century left the agriculture of the region self-contained, though population increases meant that rice imports were needed by the 1930s, their cost met by income from some commercial cropping, mainly of rubber.

Although physiographic conditions, once modified by bunding, levelling or draining, were suitable for rice cultivation in the north of the peninsula, climatic circumstances were less than ideal. The need for adequate water to ensure successful cultivation determined that the growing season should correspond with the main wet season which occurs in the second half of the year—October to December in the northwest, November to January in the northeast—with planting timed so that the crop was sufficiently advanced to benefit from the heaviest rains. The photosensitive *indica* varieties require sufficient short days for flowering and maturation, which also occur towards the end of the year, and are followed by the critical period, between young ear formation and ripening,

for the achievement of high yields. This is the time of maximum photosynthesis and when the synthesised products are utilised for grain formation. At this period of the year, rainy days and overcast skies are still common. Daily sunshine hours in the peninsula average only 4.92 between September and January, compared with 6.37 between April and August (Van, 1974). Sunshine figures compiled by Dale (1964) show that, on average, the number of hours of bright sunshine on a peninsula-wide basis is fewest in November, December and October (in that order). Large numbers of rainy days and often unduly high humidities depress yields.

The principal wet season in the north, however, is also less than fully reliable. Working with rainfall data from the northwest, Chan (1981) has shown that many parts of the Kedah plain have *expected rainfalls* with a probability of less than 70 percent which is too risky for rice growing since 'the hardiest of farmers can tolerate drought not more than once in three years'. A dominant characteristic of rainfall in the region (fig. 2.1) is its annual division into two well-marked seasons, so that what appears to be an adequate annual total may in fact, when divided, be insufficient in the main growing season. He concludes that there are few areas in the region suitable for the planting of medium to long term rice varieties without a supplementary water supply. Nieuwolt (1965), using average rainfall data, shows that there is a moisture deficit at Alor Setar, the centre of the Kedah rice plain, between December and March and little more than a 50 millimetre margin between rainfall and evaporation in June and July. In the northeast (fig. 2.1), where the highest rainfalls occur in early November and December, rice must be sown in July and transplanted in late August or September in order to be ready for maximum growth in the wet and a February harvest. Low monthly average falls between June and October impose severe limitations at the beginning of the agricultural cycle.

Southwards from these northern states, environmental conditions tend to become progressively less favourable for productive wet rice cultivation, especially by traditional methods. Not only are tracts of level deltaic and riverine country scarce—and where they exist were heavily vegetated and sparsely populated until colonial times—but the annual rainfall distribution becomes more even and there is a high frequency of cloudiness. Dale's (1964) figures clearly reveal a general southward decrease in the number of hours of bright sunshine in all months. Only in the Malacca[3] and Mersing districts do local variations in annual rainfall and associated cloudiness break this pattern (fig. 2.3).

There is also a greater uniformity in the number of daylight hours

[3] The higher incidence of sunlight in Malacca than in most other parts of the south of the peninsula may well contribute to the relatively high yields recorded by Jack (1923) in the settlement.

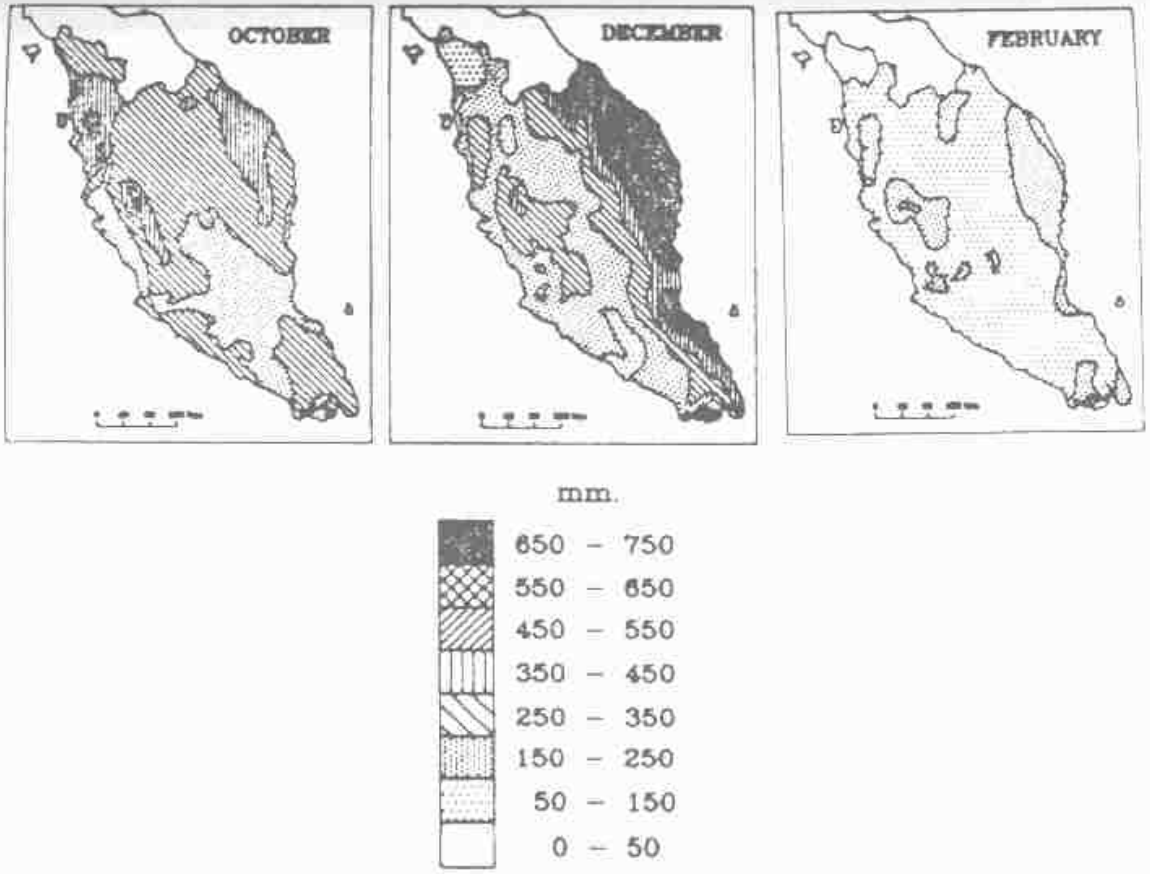

Figure 2.1 The Malay peninsula—seasonal rainfall (based on Dale, 1959)

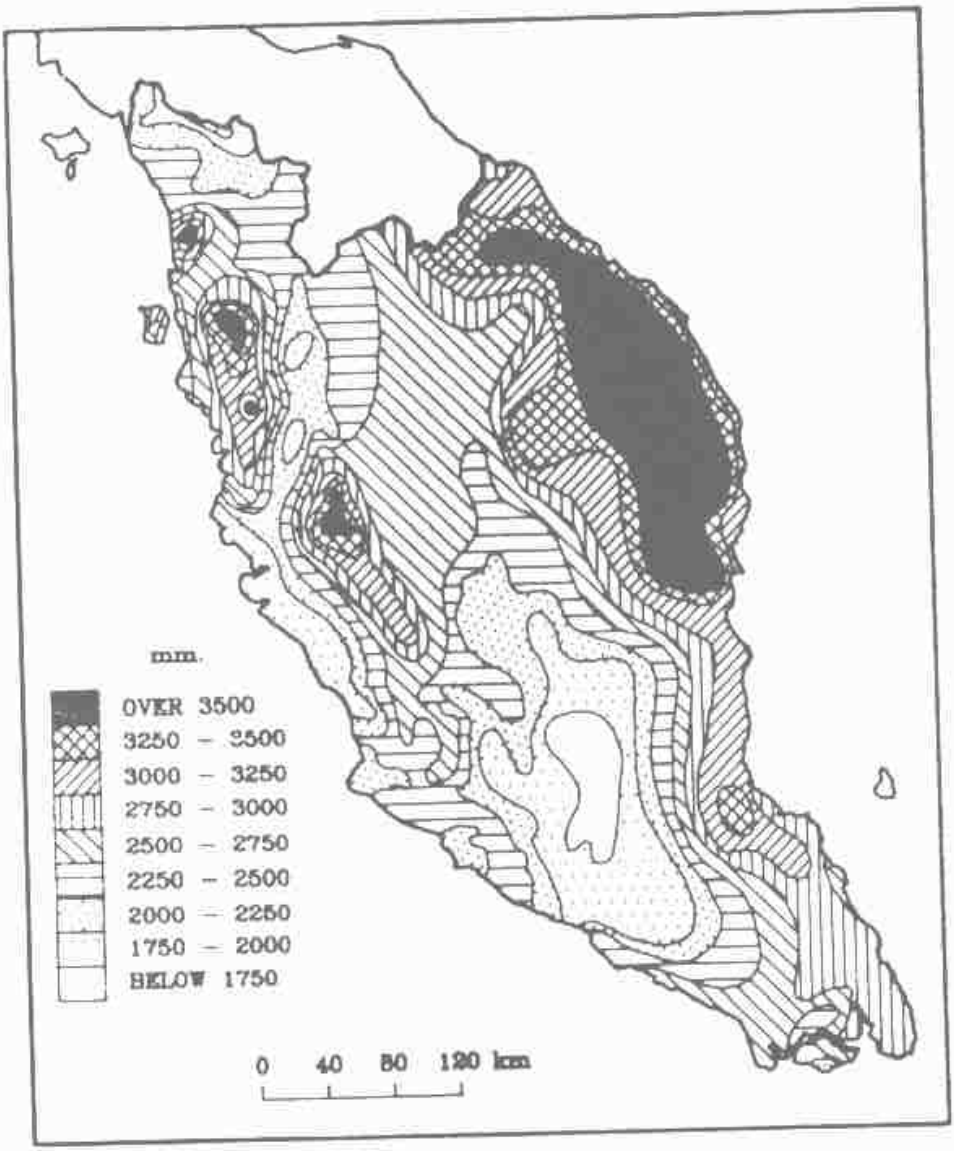

Figure 2.2 The Malay peninsula—mean annual rainfall (based on Dale, 1959)

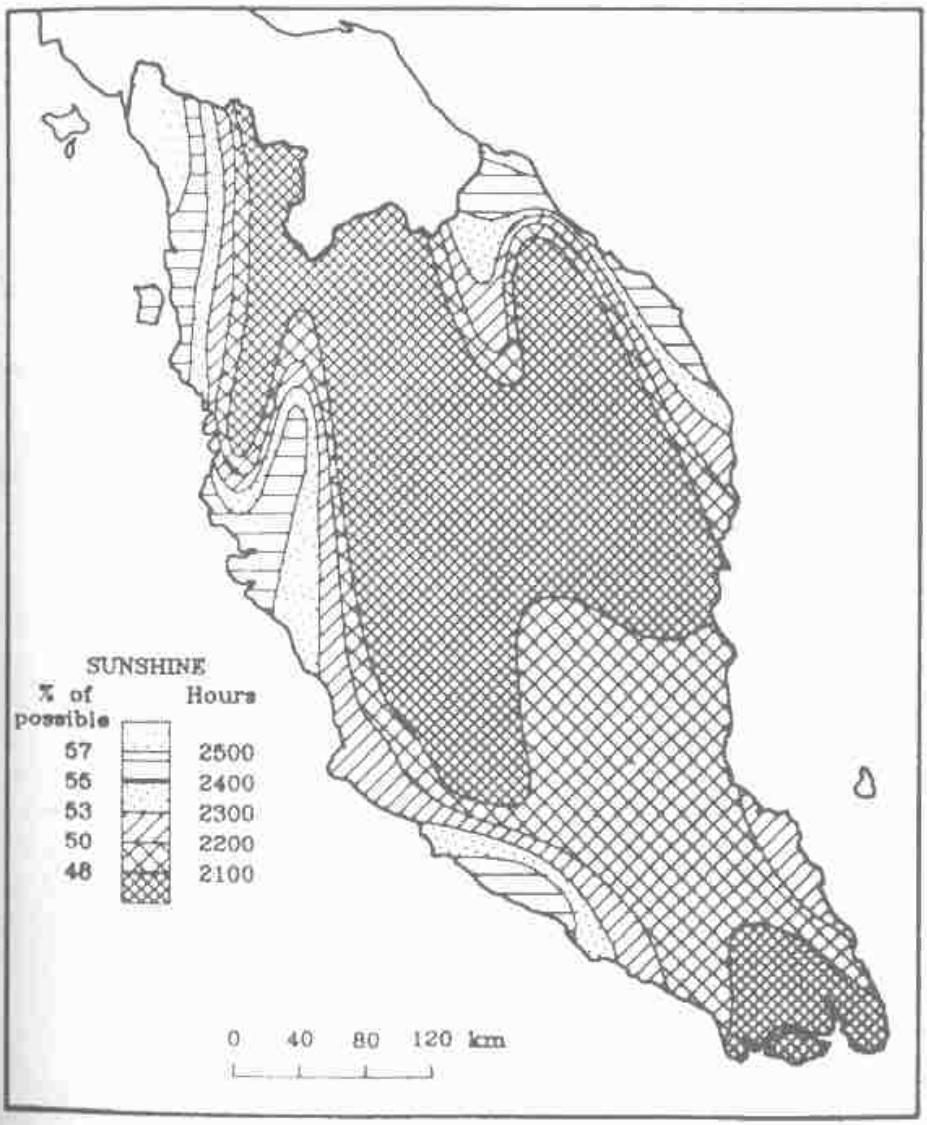

Figure 2.3 The Malay peninsula—mean annual hours of bright sunshine (based on Dale, 1964)

throughout the year in the more southern latitudes and fewer short days to induce flowering in the *indica* variety of the rice plant. The significance of this difference (Dore, 1960) lies in the fact that in the north a plant sown in December will receive sufficient short days to induce flowering between December and February whilst a plant sown in the south in the same month will receive not only longer short days but fewer of them. It will therefore need to be planted earlier if rapid flowering and prompt ear emergence are sought. Crop losses, from the depredations of pigs, rats and birds, are also substantially higher in the narrow valleys of much of the south. In Negri Sembilan, interior Malacca, Johore and Pahang, extenuated strips of rice land and more isolated patches of *sawah* offer readier access for pests than do the more extensive plains of monoculture especially in the northwest.

Hill (1977) has addressed the problem of determining the peninsula-wide pattern of rice production in any reliable, quantitative way before the 1920s. Except for the Straits Settlements of Singapore, Malacca, and Penang and Province Wellesley, statistical data are almost non-existent before that date. Such data as do exist are summarised by Hill and indicate that the northern districts of the peninsula accounted for 83 per cent of the area under rice in the second decade of the twentieth century with about one third of the total area on the Kedah/Perlis plain alone (table 2.1).

Table 2.1 Malay peninsula-estimated rice area (in hectares) by state, 1911–12

	ha	%		ha	%
Kedah	75006	29	Selangor	3189	1
Perlis	6582	3	Negri Sembilan	10749	4
Penang	2481	1	Malacca	16360	6
Province Wellesley	18300	7	Pahang	12196	5
Perak (inc. Dindings)	52072	20	Johore	2701	1
Northwest	154441	60	Central/South	45195	17
Kelantan	53092	21			
Trengganu	4391	2			
Northeast	57483	23			
			TOTAL PENINSULA	257120	100

Source: Hill, 1977

More telling than the area cultivated, which was strongly affected by the availability of suitable terrain, were the yields obtained. In 1923, Jack published figures for average yields based on a 10 year period for the Federated Malay States and on at least a 3 year period for the rest of the peninsula. His figures referred to years between 1912 and 1922 and,

Table 2.2 Malay Peninsula-Wet padi yields (in kg per ha) for years between 1912 and 1922

Kedah(a)	1562	Selangor(b)	895
Perlis(a)	1186	Negri Sembilan(b)	988
Province Wellesley	1741	Pahang(b)	1007
Penang Island	2285	Malacca	1519
Dindings	834	Trengganu	1235
Perak(b)	1488	Kelantan(d)	1192
Krian(b)(c)	1649	Johore	988

Source of original data: Jack, 1923

(a) based on 3 years only (b) based on 10 years.
(c) the existence of the irrigation system affected yields.
(d) Jack suggested that the low yields in Kelantan were partly caused by the vagaries of the river due to the location of the padi fields along its banks and considerable exposure to pests because of the scattered nature of the fields.

in some cases at least, included the 1920–21 season which he described as 'bad beyond all precedent from the rainfall point of view'. While the obvious weaknesses in the data cannot be ignored, they clearly demonstrate that productivity was generally higher in the north (table 2.2).

Hill (1977) believes that physical reasons for the northern dominance are only partial explanations and that others, related to the mainland origin of rice to the north, 'lie deeply embedded in history'. Except for the likely introduction of the wet rice system to the central west coast from the Menangkabau lands across the straits, there is no argument that the crop originated from the north and was therefore first cultivated in northern districts. Nevertheless there can be little doubt that the early and continuing dominance of the northern plains in rice cultivation (Kedah/Perlis alone accounted for 51 percent of the total area and 56 percent of production in 1990) rests upon their least unfavourable combination of physiographic, meteorological and day-length characteristics. These have been reinforced by political and economic policies, by technological developments and infrastructural investments during both the colonial and post-colonial periods.

III

"the right to ownership of the land"

The physical availability of land for agricultural use is determined particularly by those factors examined in the previous section. These relate especially to the characteristics of its geological base and soil mantle, to the nature of the terrain and to the climatic circumstances of the particular location in which it occurs. While these physical attributes do not provide absolute constraints to the agricultural use of land, they do nevertheless

place fairly measurable limits to farming potential. Whatever the physical qualities of the land, however, its role, at least in a pre-industrial society, as a necessary pre-requisite for human survival depends upon access to it. The nature of such access is culturally determined.

In the context of the Malaysian rice industry, the rights of access to land are complicated, and an understanding of their complexities is essential background to an understanding of many problems associated with developments in the industry. Land tenure, which was defined by Penn (1971) in the International Bank's agricultural sector mission to Malaysia, as 'the system of rules and procedures which grants access to and use of land resources and the legal processes which enforce these rules', has three component parts in the peninsula (Hooker, 1972). These consist of a basic traditional system of land tenure *(adat)*, Islamic religious law governing family relationships and inheritance *(hukum syarak)*, and an overlying judicial, legislative and executive system founded in British colonial law and extended since Malaysian independence.

Despite the obscurity of the origins of cultivation in the Malay peninsula, it seems clear that rights to land evolved from the early agricultural system of shifting cultivation. Original Malay customary law recognised only usufructuary rights of a cultivator by virtue of his having cleared and cropped the land. Such rights were absolute so long as cultivation continued or the land bore signs of appropriation.[4] Customary rights of this kind were appropriate and suitable in a subsistence economy where physical reclamation and the establishment of permanent irrigated fields *(bendang* or *sawah)*[5] were difficult and land was plentiful. Three years came to be accepted as the term within which wet ricefields, if left uncultivated, remained subject to proprietary right. Abandoned orchards, however, could be successfully claimed and resumed by the proprietor, or by an heir, for as long as any of the trees survived.

It has been accepted by most writers on the history of Malay tenure systems, basing their assessments particularly on the work of Maxwell (1884), that full proprietary rights evolved with the establishment of regional monarchies. Cultivators became subjects of the local raja whose rights included the ownership of abandoned land, thus leading to a doctrine whereby absolute rights to the soil were vested in the raja. This inter-

[4] The Malacca code, as described in the basic work on the pre-colonial land tenure system in Malaya (Maxwell, 1884), distinguishes between 'dead land' *(tanah mati)* 'on which there is no sign or token that it has been appropriated by any one' and 'live land' *(tanah hidup)* 'which is appropriated by someone, either by living on it or by planting timber or fruit trees or by laying out a garden or enclosure'. No one had any right to dispute the action of a cultivator moving onto *tanah mati* whereas *tanah hidup* pertained clearly to its operator.

[5] *Bendang* is generally used in the northern states and *sawah* in the south. *Sawah is* a Javanese term most probably introduced by Palembang Malays whose culture had been influenced by the old Hindu civilisation of Java.

pretation has been questioned by Wong (1975), however, who suggests that it was a rationalisation by early colonial rulers to vest power in the sultan, that is in the British Resident. The transfer of rights to land upon the death of the cultivator (inheritance) has traditionally been governed by the practices of *adat*, overlain by Islamic inheritance law. Two named systems of *adat* are recognised (Hooker, 1972)—*adat perpateh* and *adat temenggong*. *Adat perpateh is* restricted to the state of Negri Sembilan and to parts of Malacca, having been brought to this limited area no earlier than the middle of the seventeenth century by bands of people from the Menangkabau district of Sumatra. *Adat perpateh* assumes a kinship principle of matriliny in which ancestral property, that is property which has been inherited, is vested in the female members of the clan. *Adat temenggong*, a term used to describe any *adat* which is not *adat perpateh*, implies the existence of a bilateral kinship system.[6] *Adat temenggong* originated in the Hinduised kingdom of Palembang from which colonists and fugitives reached the peninsula in the first half of the second millenium AD. There are no particular geographic limits to *adat temenggong* and it does not constitute a system in the same sense as *adat perpateh*. At the very least, land ownership and possession are distributed equally amongst males and females, although it is likely that females' shares of household goods are greater than those of males. Adoption confers rights to inheritance.

The adoption of Islamic law and inheritance principles, following the spread of that religion from India and the Middle East by way of Aceh and Malacca from the fourteenth century onwards, introduced, by theocratic fiat, a system of land transmission that conflicted in a significant way with traditional *adat*. Of particular significance is the strongly patrilineal emphasis of Islamic inheritance and its detailed rules for property sharing that originated in a society where possessions, particularly in the form of livestock, were more readily divisible and reproduceable than ricefields. Senftleben (1978) summarises these rules which specify shares to sons twice as great as to daughters and which allocate proportions to widows and other relatives. The Malay landowner might freely dispose of his property during his lifetime, and often would do so "for love and affection," by means of trust deeds, or by sale, but upon his death distribution of his property was subject either to the unanimous wishes of his heirs or to the Muslim rules of inheritance.

British rule in the Malay states, especially as land was alienated for plantation development, sought to formalise proprietorship. Developing the doctrine that rights in the soil were vested in the raja, the state came to be acknowledged as the holder of all land rights which were transferred

[6] Other terms used in this sense include *adat kampung*, *adat Melayu*, *adat ketua* and *adat mukim* (Hooker, 1970).

to individuals in several forms ranging from temporary occupation licences to title with full rights in perpetuity. British land administration adopted the Torrens system designed and established in South Australia in 1858, whereby each tract was surveyed and clearly marked, a title made out and formally registered. In the case of new alienation of previously unoccupied jungle land, whether for coffee, rubber or rice growing, payment of a premium and an annual quit rent were necessary to obtain title. Customary rights, which applied mainly to rice land, were considered rights in perpetuity with no land premiums payable. Details of land ownership, not exceeding 4 ha (10 acres), and supposedly of all transfers, were entered in a *mukim* register, extracts from which were issued as documents of title commonly known as EMRs (entries in mukim register).[7] The colonial land system was first introduced in Selangor in 1891 and legally established by land enactments in the other Federated Malay States in 1897. These were followed by various repeals and re-enactments until the adoption of the Federated Malay States Land Code in 1926. This was repealed and replaced by the Malaysian National Land Code in 1965 which is the basis of modern land rights and which largely retains the principles of the earlier system. Various restrictions on the transfer and use of customary land were introduced by the colonial administration from 1913 onwards and are discussed in chapter three.

IV

"... no delusions about the charm of following the plough ..."

The picture that emerges from material published early in the twentieth century suggests that rice cultivation was far from being an idyllic way of life. Land preparation on heavy wet soils was slow and arduous. Transplanting and harvesting were tedious and made heavy demands on labour, with outside help often required on family holdings. Threshing and winnowing were time consuming. The area a family could cultivate, even with the assistance of draught animals, was small and determined essentially by the demands of transplanting. Constant concern over drought, flood, diseased crops or pest infestation emphasised the fact that rice cultivation in the peninsula was, at best, a risky occupation. The possibility of losses of a third, or even more, of the crop was not uncommon, and even in a 'good' year returns were small.

Within the technological constraints of their society, Malay cultivators acted to overcome, or at least moderate, some of the deficiencies of the

[7] Entries in the *mukim* register applied mainly, if not entirely, to land owned by Malays. European applicants for rural land not exceeding 4 ha (10 acres) were normally given Grants or Leases (Cowgill, 1928).

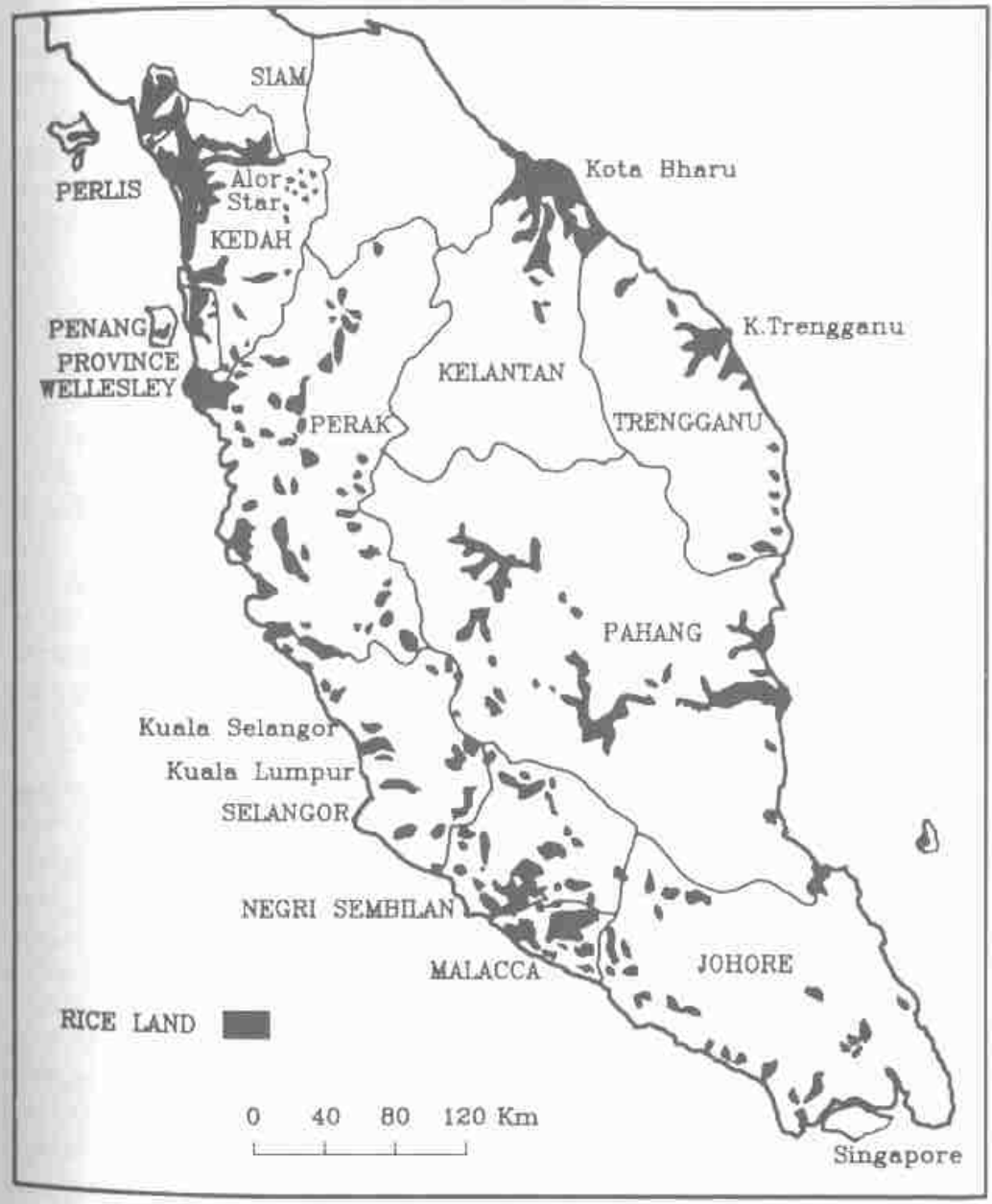

Figure 2.4 The Malay peninsula—distribution of rice land about 1920 (This map, based on Jack, 1923, and Hill, 1977, appears to include both wet and dry rice land)

physical environment of production. Some minor water control, at the cost of immense annual labour inputs, was achieved. Temporary weirs of logs, bamboos, matted sticks, boulders and earth were constructed to divert water from rivers and streams onto the fields . . . and would often break at critical periods. Small irrigation channels would be dug,* flat areas bunded, and wooden water wheels and even miniature aqueducts of bamboo, split coconut or *nibung* stems constructed. Water *storage*, however, was not practicable and cultivation remained entirely dependent on seasonal rainfall. Some fertilisation techniques were employed. Seedling roots were dipped before transplanting into a slurry of wet clay with either bat guano or calcined bones *(perkerjaan mencelup)*. Nurseries and even the transplanted fields were sometimes fertilised with bat guano which, although containing little nitrogen, was a useful source of phosphorus (Jack, 1923). Practices varied regionally, however, and fertilisation was far from universal (Jackson, 1972).

The traditional *(adat)* and Muslim inheritance systems alike sought to ensure means of livelihood to all former dependants of a deceased breadwinner—and in the absence of alternative means of subsistence this meant access to land. Given the limited availability in the Malay peninsula of land suitable for wet-rice cultivation under the existing technology, however, both systems inevitably led to the diminution of land holdings as population grew. The scale of such diminution became greater as mortality rates declined in the twentieth century and potential rice land was largely developed. Subdivision (the parcellation of a holding into smaller portions), fragmentation (the process whereby the individual lots that make up a farm become more and more scattered) and co-ownership (the sharing of rights to farm or to individual lots) were the inevitable results as the equilibrium between population and land was increasingly upset.

Where possible, land-owners attempted to reduce the rate of subdivision or fragmentation to permit cultivation in more manageable units. This might entail transfer before death, which could be undertaken free of the rules of inheritance, the renunciation of shares by a beneficiary in favour of all remaining or of specified co-heirs, or by the exchange of shares. Following the introduction of colonial land legislation it became more common to partition land by sharing than by subdivision into separate, officially surveyed lots which was an expensive procedure. Although formally undivided, such shares were often identified by agreed internal boundaries and worked in practice as if they possessed separate title. The extent of subdivision was therefore greater than revealed by the *mukim* register. Fragmentation was worsened when beneficiaries sought to share

* In some cases, eg the Wan Mat Saman canal in Kedah begun in 1885 and which ran for 32 km south from Alor Setar to Kedah Peak, quite substantial engineering feats were achieved (Chang, 1969; Sharom, 1970).

on an equitable basis lots that were perceived as differing in value—owing, perhaps, to variations in their soil quality, their accessibility to canals, drains or roads, or in the value of sources of secondary income such as fishponds.

The earliest detailed analysis of the effects of population growth and of the land inheritance system in the peninsula was carried out by Wilson in the Kerian irrigation area of northern Perak in the 1950s (Wilson, 1954; 1955). The Kerian area was the first to benefit from modern methods of water control with the completion of a 23,000 ha irrigation scheme in 1906 (see chapter 3), though rice had been cultivated in its more fertile parts for many decades earlier. Wilson's analysis of a single *mukim* of 4032 ha covered the period 1900–1954 during which the number of registered lots had increased, on the same area of land, by 15 per cent and the average lot size decreased from 2.8 ha to 2.5 ha. Much more significant, however, was the growth of co-ownership and of informal subdivision which had reduced the average size of shares to 1 ha. Whereas, in 1900, only 2 per cent of shares had been smaller than 2 ha, by 1954 53 per cent were less than that size, while the proportion smaller than 0.4 ha had increased from zero to 24 per cent over the period. Similar figures were reported by Ho (1969) from the Saiong *mukim* in the Kuala Kangsar district of Perak where the registered rice lot had apparently remained static at about 0.5 ha between 1900 and 1930 (though most were undoubtedly informally subdivided) and then had fallen rapidly to 0.33 ha by 1960. Evidence from both areas revealed substantial declines in sole ownership during the first half of the twentieth century.

It was Wilson's opinion (1954) that, in Kerian at least, the forces which tended towards subdivision, most notably population growth and the laws of inheritance, had overcome economic forces which might have stabilised holdings at the most efficient size under customary methods of cultivation. He did not see the average size of the individual share (1 ha) as sufficient to permit the full-time owner-cultivator to obtain a tolerable standard of living. A partial solution to the inadequate size of the average holding was to rent in additional land, assuming it was available, and often the area *owned* bore little relationship to the area *cultivated*. Ho (1969) reported rent levels as modest, with returns from riceland at the most being 7.7 per cent per annum, but land scarcity clearly limited renting as a solution to the inadequate size of holdings. It is interesting to note that, when the Sungei Manik irrigation scheme was developed in the 1930s, 1.6 ha was first seen as a viable unit to permit a family to make a livelihood but was later raised to 2.4 ha for rice, with a further 0.8 ha of *kampung* land for house site, vegetables and fruit trees (Ferguson, 1954).

While rice cultivation, augmented where possible by fishing or the collection of jungle produce, was the predominant or sole means of subsistence, the Malay farmer was locked into the system. He and his

family were forced to cope as best they could with the low fertility of much of the land, the vagaries of seasonal rainfall, frequent pest infestations and/or outbreaks of plant disease in the crop and a farm size usually below the optimum they were capable of working. 'Profitability' of rice cultivation was a meaningless concept in this context except in terms of an energy ratio measure. For so long as the crops were adequate to maintain the farmer and his family at a tolerable level of nutrition, energy ratios may be presumed to have been positive, though perhaps in some seasons and for some households only just. Once alternative sources of income began to appear, however, and household labour acquired an opportunity cost, the poor returns obtainable from traditional rice growing were revealed. Malay interest in sources of income alternative to those in the traditional sector became apparent almost as soon as commercial agriculture was established in the peninsula.

Gullick (1955) reports that small holders were growing coffee and other export crops in the vicinity of Kuala Lumpur as early as the 1880s, some Malays were showing interest in rubber planting in the 1890s (Ding, 1963) and by 1910 it was abundantly clear that they were participating in the rubber boom (Drabble, 1973).

While some commentators (eg. Brown, 1913) deplored the trend—'I think the Malay would be far better off if he were encouraged to retain the old form of cultivation in his kampong instead of going in for Para rubber as many of them are now doing'—many clearly saw the rice farmer's point of view. Barritt (1912) writing, in one of the earliest issues of the *Agricultural Bulletin of the Federated Malay States*, on the steady decline in rice cultivation that was occurring at the time had no doubt in attributing it to 'the uncertainty of the harvest and the existence of better employment elsewhere.' The Malay, he noted,

> 'entertains no delusions about the charm of following the plough or swinging the *changkul*. He prefers rather a more reliable source of income than that to be obtained by the cultivation of a precarious crop of rice. . . . Not until the Malay has been assured of a certain profit from *padi* cultivation and one that compares favourably with that to be derived from other occupations, is it reasonable to expect that he will be induced to show more enthusiasm for the cultivation of his *bendang*?'

An adequately controlled water supply, a means of maintaining soil fertility, protection of the crop against wild pigs and rats, and the prevention of losses due to insect and fungoid pests were seen as necessary to make rice cultivation more productive. Jack (1923) reiterated the argument a decade later claiming that 'unless increases of population and the consequent struggle for existence exercise the necessary compulsion, all but the most fertile rice lands are liable to be abandoned as long as the rubber industry continues to prosper'. Using data from the Kerian area, and

imputing contract labour costs to family labour, he concluded that rice production was profitable on first class land, barely profitable (returning Straits $7.00 per acre/$17.29 per ha) on second class, and unprofitable on third class land.

In a suggested four stage typology of the Malayan peasant economy, Lim (1977) describes its form during the first 25 years of colonial rule in the Federated Malay States as a 'modified traditional economy' that was accommodating to new forces but within the boundaries set down by tradition. Irregular cash incomes were earned, perhaps by the sale of occasional rice surpluses or of some limited cash crops (coffee, gambier, tapioca) or from short-term wage contracts such as helping clear forest for new colonial plantations. Some manufactured goods were beginning to penetrate village communities. By about 1910, however, and notably in the Federated States where the plantation development of rubber had proceeded most rapidly, the rice-based economy had already partially moved into Lim's third form, that of a 'mixed subsistence commercial type' with part of its resources, mainly land, allocated to commercial production, and was beginning seriously to attract the attention of colonial legislators.

3

"... Advantageous to Concentrate on the Most Profitable Crops ..." — the Colonial Experience

'The subsistence farmer makes for stability and continuity'[1]

The Malays are certainly not industrious; they have no need to be so, and their cultivation is rude. They plough the rice-land with a plough consisting of a pole eight feet long, with a fork protruding from one end to act as coulter, and a bar of wood inserted over this at an oblique angle forms a guiding handle. This plough is drawn by the great water buffalo. After ploughing, the clods are broken by dragging a heavy beam over them, and are harrowed by means of a beam set with iron spikes. The women do the sowing and planting. The harvest succeeds the planting in four months. The rice ears are cut short off, sometimes by a small sickle, and sometimes by an instrument which produces the effect of shears. Threshing consists in beating the ears with thick sticks to loosen the husks, after which the padi is carried in baskets to platforms ten feet above the ground, and is allowed to fall on mats, when the chaff is driven away by the wind. It is husked by a pestle, and it requires some skill to avoid crushing the grain. All these operations are performed by women.

The Perak Malays don't like working for other people, but some of them cultivate sugar-cane and maize for sale; even for clearing jungle-land foreign labour has to be resorted to.

(Isabella L. Bird, "The Golden Chersonese and the Way Thither," 1883)

[1] The chapter heading is a quotation from Lim (1977) and the introductory quotation is from Dobby (1949).

I

'Towards modern agriculture in Malaysia'

In its rural development sector policy paper of 1975, the World Bank included Malaysia in a group of countries 'with pockets of rural poverty, varying in extent and intensity, but with resources adequate to deal with the problem, provided the political commitment is made'. At the time of its achievement of internal self-government in 1948, the then Federation of Malaya inherited an economy in which agriculture contributed about 40 percent of gross domestic product and provided about 65 percent of total employment. The population of the peninsula totalled 4,908,086 of whom 73.5 percent were classified as rural (Fell, 1949). Agriculture was patterned according to policies and objectives that had been moulded by nearly three quarters of a century of colonial rule. Since the spread of coffee, then of rubber, in the western states from about 1870 (Jackson, 1968; Courtenay, 1972; Drabble, 1973), foreign (mainly British) owned plantations had come to dominate 'modern' agriculture, though a substantial but officially discouraged and under-acknowledged rubber smallholding industry had developed vigorously alongside them. Outside this commercial sector, though partially intertwined with its smallholding component, padi[2] cultivation proceeded, by methods largely unchanged for a century or more, in a 'custodial' situation (Rudner, 1979) insulated by colonial officials and the Malay aristocracy from the more open international economy in which the rubber industry operated. Notably in the vicinity of the major west coast cities and the mining centres, but also in a few hill areas such as the Cameron Highlands, vegetable growing for urban markets was a well-developed, though little studied, Chinese industry.

The agricultural policy of the British colonial administration, from the establishment of political control over the Malay states in the later nineteenth and early twentieth centuries until the Japanese occupation in 1942, generally had two principal objectives, with the emphasis given to each varying from time to time according to local economic circumstances and/or the influence of particular senior administrators. In the words of a Malaysian Department of Agriculture summary of 1980 ('Towards Modern Agriculture in Malaysia') these objectives were, first, the encouragement and development of plantation agriculture and, secondly, the maintenance of a sufficiently large area of the country under padi to safeguard the subsistence needs of the indigenous people. In a 1930 memorandum,

[2] From this point onwards, current English-language Malaysian terminology is used, in that 'padi' refers to the crop in the field and up to milling, whilst 'rice' refers to the milled grain.

Tempany, then Director of Agriculture, identified two schools of opinion, one of which favoured concentration on the production of export staples while providing for a reasonable encouragement to padi cultivation, while the other believed that domestic padi production should be encouraged by every possible means (see Lim, 1977). Proponents of the first opinion argued from the standpoint of comparative advantage which, in world market terms, Malaya had in perennial tree crops but not in grain, whilst concern that the colony should be dependent for its food staple on overseas suppliers prompted the second. From an economic point of view, it was certainly advantageous for the peninsula to concentrate on the most profitable crops and risk a degree of vulnerability in its food supplies. Given the market orientation of the British imperial system, it was inevitable that this viewpoint should dominate official agricultural policy, though not to the complete neglect of the padi industry.

The British 'forward movement' into the Malayan peninsula from the entrepots of the Straits Settlements began formally following the 1874 Treaty of Pangkor (Andaya and Andaya, 1982). Whereas they had previously been concerned primarily with the commercial benefits to be derived from trade passing through their ports, the British acquisition of political responsibility for more extensive territory now provided them with an opportunity for direct resource development. Colonial interest in the mining of tin, the principal resource of the peninsula in the 1870s and which was exported from shallow Chinese-operated alluvial workings, awaited the development of more capitalised dredging which was to give British investors a competitive edge over the Chinese. Until this occurred after 1910, it was agricultural development that attracted colonial investment.

Britain had had experience of commercially oriented agriculture in its tropical colonies since the establishment of the West Indian tobacco and sugar plantations in the mid-seventeenth century and, in more recent decades, tea and coffee plantations had been opened in India and Ceylon. The competitive basis of the plantation system, as it was developing in the post-slavery environment of the nineteenth century, was its ability to employ productively the labour intensive methods required in agriculture for as long a period of the year as possible by concentrating on tree or shrub crops with extended harvests (Courtenay, 1980). In 1879, Ceylon planters opened two estates for coffee, cocoa and cinchona in Negri Sembilan, and in 1881 European planting of coffee, tea and pepper began in Selangor. Rubber, first interplanted on some estates in 1896, was quickly seen as an ideal crop, environmentally, operationally and economically, and, from 1900 onwards, it dominated both the European estates and the colonial government's agricultural attention.

There was never any real question of interest in padi as a commercial crop, neither by colonial planters nor by the Malay farmers themselves. Hill (1977) writes of padi production in the north-west of the peninsula

as becoming market oriented in the nineteenth century, particularly following the development of the Penang and other urban markets, though towards the end of the century net imports into Penang were on a scale that suggests local padi production yielded little commercial surplus for urban consumption. Padi yields in Malaya (for the reasons examined in chapter two) traditionally have been very low and the subsistence farmer had little ability, and less incentive, to produce a surplus. According to Sharom (1970), in Kedah at least, limited labour and shortages of draught animals restricted output even if there was access to adequate land. The system of compulsory labour *(hasil kerah)* meant uncertainty regarding the availability even of the farmer's own time while the fear of seizure of surplus grain by local chiefs was a distinct disincentive to its production under difficult circumstances. The growing population in plantation agriculture, mining, and the urban centres was fed on rice imported from Thailand and Burma where surplus production was increasingly available from the recently settled delta lands. In Malaya, in Lim's (1977) words, 'during the first 25 years of colonial rule when the capitalist economy was still in its formative stage. . . . peasant agriculture had not changed much from its traditional form of subsistence padi and *kampung* cultivation'.

In contrast to this traditional padi cultivation, which at least in the early decades of British rule was considered to have little to contribute to the colonial economy, the plantation industry was seen by the British colonial administration as providing a permanent form of commercial agriculture which would lead to the 'opening up' of the extensive undeveloped regions of the peninsula and, at the same time, provide an important source of revenue.[3] 'Permanent' agriculture was perceived as much to be preferred to the forms of Chinese commercial shifting cultivation, of pepper, gambier and tapioca, which had left in their wake devastated landscapes of *Imperata* grass and scrub (Jackson, 1968), or to the subsistence form of 'slash and burn' agriculture, practised by indigenous peoples over extensive areas of forest land which was seen as a problem since 'in a decade, a few thousand individuals can lay waste an area of forest out of all proportion to the advantages they may gain therefrom . . .' (Strong, 1931–2). Relatively light rates of premium and rent were charged on commercial holdings, especially during their early, non-productive years and substantial specific inducements, such as leases in perpetuity or premiums but no subsequent rent, were sometimes offered.

It is perhaps attractive to seek to identify a clear agricultural dichotomy, and indisputable example of the dual economy, between the plantation rubber sector, which was commercially oriented, colonial controlled and

[3] Drabble (1973) gives a detailed account of the early development of the plantation system and of the colonial governments' policies to attract commercial planters.

part of the imperial economic system, and the padi sector, subsistence, traditional and technologically static. Such an economic duality was apparent, in essence, in the early years of widespread plantation development in the first decade of the twentieth century. It undoubtedly had an identifiable spatial dimension, with the plantation sector concentrated in the better drained and accessible foothill country notably of Malacca, Negri Sembilan and Selangor (the core area of British interest in the peninsula), and padi on the low-lying alluvial plains, notably of Perlis, Kedah, Province Wellesley, northern Perak and Kelantan, and in narrow strips along valley bottoms elsewhere. This distinct geographical pattern soon began to lose its crispness, however, as did the apparent economic dualism. As already noted in chapter two, Malays had been planting coffee and other export crops in the 1880s and, like the European estates, turned to rubber at the end of the century. With its simple tapping techniques, readily undertaken by men, women and older children alike, basic processing with a mangle and primitive smokehouse, and the ability to be used as a private 'savings bank' to be harvested as and when required, rubber fitted smoothly into the traditional economy. It was the increasing participation of Malays in the rubber boom and especially the disposal of *kampung* land to rubber companies and immigrant smallholders, that drew the colonial administration into its first major legislative involvement with the padi sector.

II

'. . . a sturdy and thrifty peasantry. . . .'

Colonial government legislation relating to padi land was first drawn up in 1891 when the Selangor Land Code, at the instigation of W.E. Maxwell, contained provisions to permit the transmission of customary lands to Muslims only. These protective clauses were repealed in the same year, but are the first hint that government was prepared to modify the workings of the market system when it seemed to impinge upon aspects of the traditional subsistence culture.

The involvement of the Malays in the rubber boom of 1901–1910 had two aspects that raised concerns of rather different types—the planting of rubber on their own land, and the sale of *kampung* land to planting companies and immigrant settlers. The distinction has not always been made, though Clayton, district officer for Ulu Langat, Selangor, in 1910, differentiated between the planting up and perhaps selling, of *kebun* (orchard) land, to which he saw no objection, and the disposal of *kampung* (village) land, which he believed threatened the existence of permanent settlement (Drabble, 1973; Lim, 1977).

Although conditions varied geographically, and some more inland patches

of padi that suffered from water shortages were probably better suited to a dry-land crop, much, especially low-lying, wet padi land was ecologically unsuitable for rubber growing. Those padi farmers who took up the crop mainly did so on land traditionally used for fruit trees, on newly opened land or on old tapioca or gambier plantings.[4] In view of the 6–7 year maturation period of the rubber tree, any strategy that sacrificed the annual food crop would have been suicidal anyway. In this situation, any threat to padi production was medium to long term rather than immediate, and due more to the transfer of *labour* than of *land* resources from padi to rubber and likely to persist for as long as imported rice was cheap and rubber paid well. There can be few better examples in agriculture of the ability of the price system to move productive resources quickly from one crop to another.

While some observers saw the rubber tree *per se* as an unsuitable addition to the Malay orchard—Brown (1913), for example, thought the excessive shade it created and its many and extensive lateral roots made it a poor *kampung* tree—more feared that effects of bad husbandry, such as *lalang* infestation and crop diseases would spread to neighbouring plantations.[5] The imposition of 'no rubber' conditions, first introduced in Selangor in 1910, was more likely related to this fear than to any motive of protecting the plantation industry from economic competition in those early highly profitable days for rubber. Sale of *kampung* land (surely rarely of *sawah* itself) for rubber growing was likely to disrupt the integrated economy of the traditional settlements rather than replace padi with a market dependent crop. It was this effect of the rubber boom that was halted by official action. It is interesting to note that the generally unsympathetic attitude towards the padi farmer growing his own rubber was rather different from that expressed towards his unwillingness to provide his labour for the plantations, where he would have been removed from padi cultivation on a much more permanent and regular basis. In this context he was often categorised as 'indolent', as expressed in extreme terms (and revealing a deep and long-standing ignorance of realities) by Ladejinsky (1941) who claimed that it had been 'almost impossible to lure the Malays from their own easy-going agricultural pursuits into the more arduous tasks of daily wage earners on the estates'.

Whatever the original motives, which were undoubtedly mixed, and

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[4] The Annual Report for Negri Sembilan for 1910 reported a total of 30,813 rubber smallholdings in the state that year. 42% were in the district of Kuala Pilah alone (quoted in Lim, 1977).

[5] This attitude could well have been influenced by the experience of coffee planters in the 1870s and 1880s in Ceylon, where the plantation coffee industry had been drastically damaged by pest infestations from abandoned smallholdings (see Courtenay, 1980). Many former Ceylon coffee planters had moved to Malaya where they took up rubber when coffee became uneconomic in the 1890s.

although there was no evidence that substantial sales of traditional land had been made, legislation was passed in November, 1913, that provided for the gazetted designation of Malay Reservations throughout the Federated Malay States. Rights and interests in such lands could not be transferred to non-Malays, except as leases for up to three years. The legislation became operative from 1 January 1914 but no definite steps to implement it were made until 1915. Limited as it was to the Federated Malay States, and effectively only to Perak and Selangor,[6] the legislation did not cover the major Malay padi areas of Kedah/Perlis and Kelantan, which were under Siamese (Thai) sovereignty until 1909 when they became British protectorates, nor the sultanates of Trengganu and Johore. Separate, but similar, enactments were introduced in these unfederated states but not until the economically difficult years of the 1930s—in Kelantan in 1930, Kedah 1931, Perlis 1935, Johore 1936 and Trengganu 1941. Comparable ordinances had provided for Malay Customary Rights in the Straits Settlements territories of Penang and Malacca since 1886. Cultivation restrictions, enforced mainly in Selangor, required that Malays intending to plant rubber should do so on alienated lands other than in reservations or proposed reservations. Many applied for such non-reservation land, though others violated the cultivation conditions.

Following serious shortages of rice caused by the limited availability of shipping in the later years of the First World War, the fears of those who believed that Malaya should seek to produce a larger proportion of its staple food seemed vindicated. Restrictions were imposed in the Federated Malay States by the Rice Lands Enactment of 1917 which prohibited the cultivation of crops other than padi on Malay-held land that was suitable for it, and a further extension amended the 1911 Land Enactment so that no state land suitable for wet padi cultivation—or capable of being made so by irrigation—could be alienated for any other purpose. Drastic reductions in exports of grain from Burma and Siam in 1919 and 1920, and consequently much higher prices in Malaya for rice, did temporarily attract the opening, or re-opening, of padi land. This was aided by some official inducements, such as rent concessions and seed distribution schemes, and production reached a record in 1920 with many new padi fields especially in Lower Perak and Kuala Kangsar. Once the crisis was passed, however, and prices fell again, the padi area shrank rapidly and had fallen back to its pre-1918 level by 1922.

Concern for inadequate food production arose again in the 1930s, especially as the export economy faltered on all fronts during the world depression. As rubber prices fell to unprecedented low levels in the early

[6] Negri Sembilan had had, since 1909, legislation in the form of a Customary Tenure Enactment which protected traditional peasant lands, especially the *adat perpateh* system. There was little concern or interest in Pahang where very little rubber had been planted, neither estate nor smallholding.

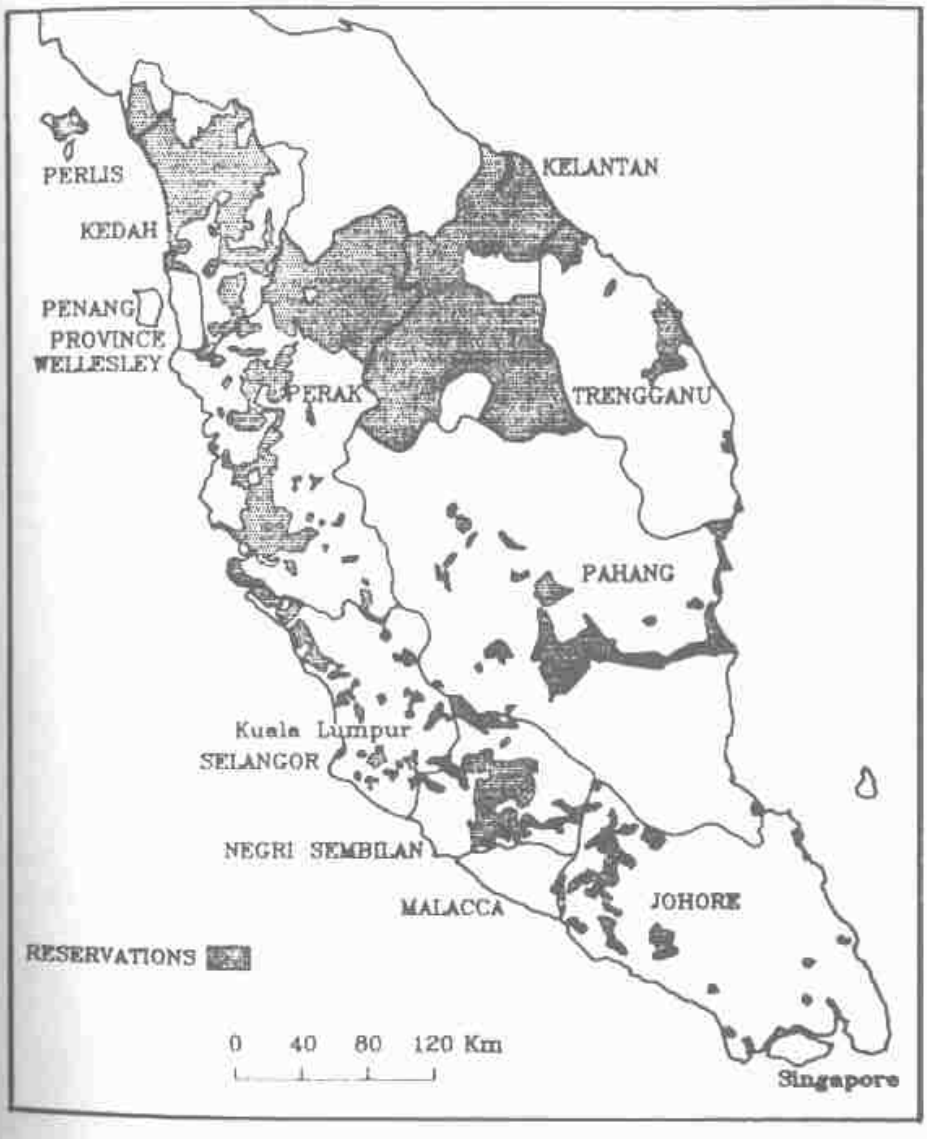

Figure 3.1 Malay Reservations, 1954

1930s[7] and the cost of imported rice became relatively much more expensive, the padi sector received two major forms of attention. There was greatly increased direct public investment to expand the area and productivity of padi land, notably by drainage and irrigation activities but also by research into new seed selection and by some limited price guarantees (section III below), and further legislative action to strengthen the Malay community's hold on padi land. This included further amendments in 1933 to the 1913 Malay Reservations Enactment that placed new curbs on non-Malay dealings in reservation lands. The earlier legislation had prevented the sale of land to non-Malays in the reservations but did not prohibit its being pledged as security, a loop-hole which had allowed control often to pass to non-Malay money lenders and shopkeepers leaving the Malay as owner in name only.

The new government concern over the padi sector in the 1930s was stimulated by the direct interest of the newly arrived High Commissioner, Sir Cecil Clementi, and policies were based upon the Report of the Rice Cultivation Committee (Federated Malay States, 1931). It is clear, however, that although that report placed particular emphasis on technological developments, especially water control, to augment padi production, the reservation policy was being seen in terms beyond the mere need to ensure continuing padi production. The 1931 Report of the Malay Reservation Committee, which preceded the 1933 amendment, had stated that:-

> 'We do not hold that the protection of a backward peasantry is the sole or the chief object of the policy of reservation. The policy is territorial, and whatever the competitive capacity of the Malay may be, he cannot as a race compete with the far more populous peoples of the other races (Chinese and Indians) who are attracted to Malaya. It is a question of numbers. If the future of the Malay is to be assured, he must have room for expansion, and that requires land to be reserved'.

Haynes (1933) saw a need to discourage the further commitment of Malays to the export sector to protect them from the danger of becoming dependent upon the price of a commodity—rubber—which was subject to wild fluctuations. He believed there was a need for a policy that would build up 'a sturdy and thrifty peasantry living on the food they grow rather than by causing them to forsake the life of their fathers for the glamour of new ways . . . to abandon their rice fields for new crops which they cannot themselves utilise and the market for which depends on outside world conditions beyond their orbit'.

Given such highminded statements, however much they may have denigrated the ability of the Malay people to survive economically (or

[7] Even ignoring the fall in the value of money over the 20 year period, the 1932 rubber price per pound of 2 (old) pence was only 1.85% of the 1910 peak price.

even genetically!) without growing padi, it seems almost crass to suggest (Rudner, 1976) that once the early boom was over, the reservation policies were strongly to the advantage of the rubber plantations for which the smallholder was a growing competitor and low prices a greater threat than they were to the flexible peasant producer. The unfavourable treatment received by smallholders in the allocation of export entitlements under the provisions of rubber regulation in the 1930s (Bauer, 1948) nevertheless strengthens the suspicion that there was a wish on the part of the British to reinforce duality in the economy.

III

'... more attention should be paid to rice cultivation ...'

Even in those areas of the peninsula, such as the Kedah/Perlis plain, where physical conditions are most favourable to padi cultivation, it has always been a matter of concern whether water will be available in sufficient quantities in the right place at the right time. Attempts to improve its availability on the local scale have already been noted (p. 38) but more 'regional' efforts were also made. Sharom (1970) refers to canals north of Alor Setar in Kedah as early as the mid 17th century, and a fairly extensive system permitted the opening of land for padi south of Alor Setar in the 1880s. Ditching between the Kerian River and Bagan Tiong in Perak was undertaken on local initiative before colonial involvement (Chang, 1969).

Colonial officials quite early showed some interest in the question of improving the supply of water for the padi areas under their jurisdiction. In Perak, efforts were made to upgrade the existing ditch and improve drainage by the construction of small canals and floodgates in the late 1870s, and exploratory works were carried out in the Tanjong Karang district of Selangor in 1895. In 1891, the Perak Resident, Sir Frank Swettenham, called for measures to make the country self-sufficient in rice production. A 'Report on the Rice Supply of the Colony and Native States' was published in the Proceedings of the Straits Settlements Legislative Council in 1893 which, although it did not offer any comprehensive policy for improving padi cultivation, did indicate official interest and enabled local officers to locate and record areas of potential padi land (Short and Jackson, 1971). In 1898, Birch, the Negri Sembilan Resident, prepared a widely circulated memorandum on irrigation in which he argued that works were necessary to stimulate the immigration and settlement of padi farmers since the future prosperity of the country would depend on a stable peasantry once tin deposits had been exhausted (Kratoska, 1982).

The first major colonial irrigation scheme—indeed the only one for over

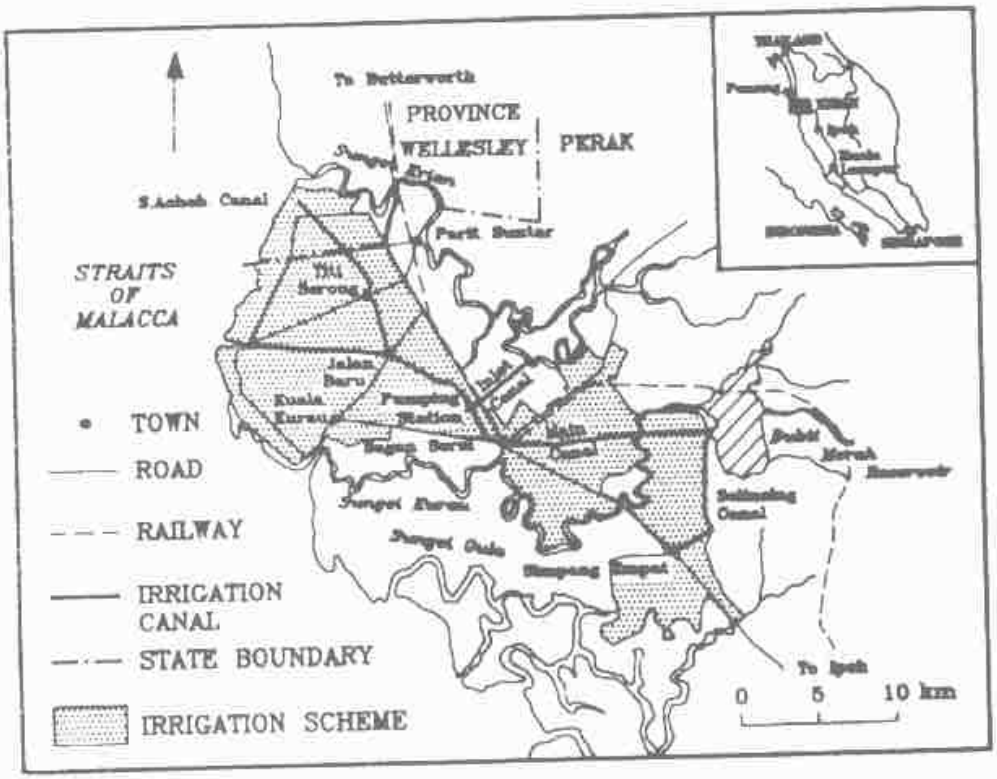

Figure 3.2 The Kerian Irrigation Scheme

30 years—was constructed in the Kerian district of northern Perak between 1899 and 1906. A plan for a scheme, drawn up in 1894 by an engineer from the Indian Public Works Department, was accepted and money was set aside in 1895 for the work. As a consequence of professional disagreement amongst the engineers involved, construction, of what proved to be a less-than-adequate scheme, did not commence until 1899 and was completed seven years later after long delays and huge cost over-runs.

The original Kerian Scheme introduced irrigation to some 20,000 ha of land on the north-west coast of Perak between the Kerian and Kurau rivers (figure 3.2).[8] Resulting from the selection of a low-cost option by the state (which however proved to be far from cheap), the scheme consisted

[8] Under the 'Kerian Extension Scheme' between 1960 and 1974 the levels of the Bukit Merah reservoir and of the main canal were raised, the irrigation network and bunds were improved and a pumping station was constructed on the Kerian River to augment the water supply. These measures permitted double cropping for the first time in the 1969 off-season. The continuing inadequacy of the drainage system, however, led finally to the decision of the Malaysian Federal Government to begin, in 1978, a complete re-organisation of the Kerian irrigation area as an Integrated Agricultural Development Project (I.A.D.P.).

of a storage reservoir at Bukit Merah, 58 kilometres of main canals and over 200 kilometres of distribution canals which were mainly improved pre-existing ditches and which meandered across the lower part of the scheme. These were inadequate to control the flow of water from field to field and the area was inundated rather than irrigated. Slow movement of water along gradual slopes left some padi fields waterlogged for long periods. Between 1910 and 1917, improvements to water control were undertaken by the construction of new distributaries and drainage channels but there was no further serious work on the scheme until the addition of 4,000 ha during the 1930s, of which 1850 ha (the *mukim* of Sungei Aceh) were in Province Wellesley.

Padi had been cultivated in the more fertile parts of the Kerian district and good crops obtained in favourable seasons long before the irrigation scheme was built. Wilson (1954) estimated that between 1882 and 1892 the padi area averaged 13,000 ha. Once completed, however, the irrigation scheme attracted additional settlers from neighbouring states and also large numbers of Banjarese from the Banjarmasin district of Borneo. Not all the irrigated land proved suitable for padi, and Bateson (1912) reported that 'most of the natives who took this (unsuitable) land held it for a short time and then ran away, and those who . . . remained in occupation of it (had) the utmost difficulty in making a living'. From about 1910 onwards, annual padi production for the Kerian area was between about 30,000 and 40,000 tonnes per annum, according to seasonal conditions, and contributed perhaps 7 percent of total Malayan production (including that from the northern padi areas of Kedah/Perlis and Kelantan).

The Kerian scheme represented the only significant investment in the padi sector by the colonial government for nearly 30 years, during which its agricultural attention was almost entirely taken up, especially after 1918, with the problems of the rubber industry. The Kerian area did, however, serve as a focus for some research and extension work by a small number of devoted agricultural officers. As early as 1912, Bateson reported on efforts to improve methods of cultivation, with the possibility of learning from Siamese experience, and thought the use of motor ploughs, as in Siam, might be feasible in Kerian. In the event, conditions proved far too wet for the use of machinery, sometimes even for buffalo. Barritt (1912) reported that experiments in Kerian had shown the possibility of obtaining five-fold yield increases on the poorer land by proper cultivation. Jack began seed selections in 1915 and this work continued until the Japanese occupation when most selected pure lines were lost (Van, 1960). Work on pest destruction was undertaken and some agricultural credit was provided. The government built some rice mills to offer good, stable prices in competition with, mainly Chinese, private millers.

As noted above, (section II), official interest in increasing padi production revived in the economically difficult years of the 1930s. Soon after

his arrival in the peninsula, Clementi expressed the opinion that '. . . the time (had) now come when more attention should be paid to rice cultivation as well as to pastoral industries in order that the staple food of the people may be made available locally' (*Malayan Agricultural Journal*, 21, 1933). The 1931 Report of the Rice Cultivation Committee, convinced that the climate and land in Malaya 'were naturally as well adapted to rice cultivation as any in the world', strongly advocated substantial investment in improvements to the irrigation and drainage of padi lands—'It is clear that the most important question involved in stabilising and increasing the cultivation of padi in Malaya is the provision of better control in relation to water supplies' (Federated Malay States, 1931).

The findings of the Rice Cultivation Committee were translated into action with great promptness. In particular, the creation of the separate Drainage and Irrigation Department[9] in 1932, as recommended by the Committee, provided a major stimulus for the upgrading of existing drainage and irrigation schemes (e.g. Kerian) and for the initiation of a number of new ones. By 1933, 13 schemes—ranging from minor improvements to tidal gates, bunds and drains in Province Wellesley to the first stage of the major Sungei Manik Scheme in Perak were in progress in the Federated Malay States and the Straits Settlements, and a further six schemes—including the extension of the Kerian Scheme—were projected.[10]

The major schemes initiated during this period of renewed interest in the expansion of padi lands were in Perak and Selangor, though the Second World War and the Japanese occupation intervened before they were completed. Padi had been cultivated along the banks of the Sungei Manik in Perak since 1916, and in 1922 some Banjarese had settled and reclaimed 200 ha but further development was halted by local physical conditions (Ferguson, 1954). In 1931, as its first major project, the Drainage and Irrigation Department commenced a survey of swamp jungle between the Kinta and Batang Padang rivers above Telok Anson. The jungle was located on clay beneath a layer of peat and was considered developable provided the peat was no thicker than 1.5 metres and drainage was possible. Construction work began on the first stage in 1932 though final survey work for the whole scheme was not completed until 1936. The Sungei Manik Irrigation Scheme, of 8,000 ha, was finally developed and colonised by 1954.

Far more ambitious than the Sungei Manik Scheme was a project to convert 100,000 ha of similar swamp jungle into quality padi land along the Selangor coast between Kuala Selangor and Sungei Besar. This project

[9] Previous water control work had been carried out by the Hydraulics Branch of the Public Works Department.

[10] The schemes, as listed in the 1933 volume of the *Malayan Agricultural Journal*, were as follows:

involved the protection of the area from the sea by construction of an earth bund along the Malacca Straits shore and the development behind it of a controlled drainage and irrigation system. The Drainage and Irrigation Department prepared a comprehensive scheme in 1937 but the project was scaled down when soil investigations determined that only about 20,000 ha along the coastal strip were suitable for agriculture. Inland, the peat thickened to 7–8 metres. The original plan to provide Malay settlers with 1.2 ha of padi and 0.4 ha of *kampung* land was impracticable owing to inadequate higher land suitable for *kampung* cultivation and most settlers, largely landless labourers, were confined to padi land. As the prospects of war increased in the later 1930s, work on the scheme—known as the Tanjong Karang Irrigation Scheme—was accelerated and, a major break with former practice, two portions were set aside for non-Malays. These were the Sekinchan section, of about 2,040 ha, for Chinese

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Schemes in progress

Federated Malay States

Perak	1. Sungei Manik Irrigation Scheme—first stage (2,000ha). 2. Pumping scheme to irrigate service areas of Perak River below Parit.
Selangor	1. Sabak Bernam Peninsula Drainage Scheme—drainage and bunding, not exclusively for padi, but would improve adjoining potential padi areas of Panchang, Bedina and Sungei Tinggi. 2. Panchang Bedina controlled drainage scheme (6,000 ha). 3. Sungei Buloh Padi Scheme—irrigation of 280 ha.
Pahang	1. Sungei Blat Irrigation Scheme—drainage and irrigation of 1,400 ha. 2. Kubang Kanak Irrigation Scheme—irrigation of 32 ha of existing and 80 ha of potential padi land. 3. Minor padi areas to be made to existing padi areas.
Negri Sembilan	Dams to be erected to increase the irrigated area.

Straits Settlements

Malacca	1. Irrigation scheme at Chohong—269 ha. 2. Bachang—Tanjong Minyah Scheme—original proposals dated back to 1880s; about 1200 ha of swamp to be made cultivable. 3. Minor schemes.
Province Wellesley	Minor improvements to tidal gates, bunds, and drains.
Dindings	Bunding of 160 ha of padi area at Sungei Tuntong.

Projected Schemes

Perak	Extension of Kerian Scheme—4190 ha to be irrigated, 2370 ha in Perak, 1820 in Province Wellesley.
Negri Sembilan and Pahang	Surveys and investigations to be carried out in Trian River valley.
Malacca	1. Dayong Scheme—controlled drainage of 1760 ha. 2. Sungei Putat Scheme—to supplement rainfall and protect from flooding. 3. Kesang-Sebatu Scheme—tentative. 1800 ha of padi cultivation expected. Improvements to Kesang river could benefit 8,000 ha in Johore.
Penang	Bunding to protect 443 ha at Balik Pulau.

padi cultivation, and the Sungei Burong section, of 880 ha, for Indian cultivation (Narkswasdi and Selvadurai, 1968; Selvadurai, 1972). Some Javanese also had settled in the scheme area in the later 1920s and the 1930s and became established padi farmers. The irrigation, drainage and flood control systems were not completed until 1952, and later improved in 1961–62 to permit double cropping (Agarwal, 1964).

IV

'. . . higher returns from other activities . . .'

The period between the establishment of British colonial rule in the Malay peninsula in 1874 and the occupation of Malaya by the Japanese in 1942 was one in which the geographical, economic and social characteristics of the padi industry were modified in ways that strongly affected the nature and direction of developments that took place after 1946. Although the economic policies of the British colonial government were largely influenced by the laissez-faire school of capitalism, that government was always ready—as proved *inter alia* by the various commodity restriction schemes of the 1920s and 30s—to intervene in the working of the system when it seemed to the advantage of the colonial economy to do so. In the early decades of British rule, despite the interest shown by some individual officials, padi cultivation largely lay beyond the boundaries of the imperial economic enclaves. It provided few inputs to these enclaves either in terms of labour or goods, and its consequential minimal cash earnings made it of very little significance as a market for imported manufactures.

As the colonial economy developed in the 1890s and in the early decades of the twentieth century, especially as rubber became increasingly established as a major plantation crop, the question of padi production began to assume growing relevance. The colonial government was faced with an inherent contradiction in its attitudes towards the padi growing sector. As the population in the export sector grew, so did the demand for rice. Immigrants from both China and India provided most of the labour for the tin mines, the rubber plantations and the urban services. These migrant peoples, few if any of whom grew their own food, numbered 360,000 in 1901 (Straits Settlements Blue Book, 1901) in the Federated Malay States alone. Net imports of foodstuffs, mainly rice, through the Straits ports was already valued at Straits dollars 26.7 million (3.1 million pounds sterling at the contemporary exchange rate) by 1911 when rubber planting had just taken off. Imports on this, and an increasing greater, scale had obvious disadvantages which became particularly apparent when shortages emerged in the later years of the First World War. Prices rose and became burdensome, to the planting and mining companies who purchased

rice for their workers, to the poorer urban consumers, and to the public sector whose currency reserves were more heavily committed to food imports. Awareness of this situation clearly prompted the calls for increased padi production in the peninsula that have been described above—calls which at certain periods were translated into positive action. This action, however, was almost invariably technological. The need to keep food prices low, particularly to satisfy mine and plantation owners but also to minimise the government's own food bill, precluded any policies to increase production that would have raised prices to the consumer. In Overton's (1989c) words 'British Malaya wanted its food, but was not prepared to pay for it to be grown locally'.

The lack of enthusiasm of the Malays to expand the production of padi to supply often neighbouring plantations, mines and cities, was ascribed to their ignorance and obstinacy (Lim, 1977), their unwillingness to respond to a potential market as evidence of excessively conservative cultural values. Yet, presumably because of the unwillingness of businesses to pay more for their rice on a regular basis rather than merely in periods of shortage, the potential economic incentive to greater domestic production was never offered. The government was prepared to invest large sums in irrigation schemes (Kerian had cost Straits $1,600,000 by its completion in 1906), construct rice mills to cut out middlemen; support some research into seed selection and pest control and even provide some agricultural credit, but rarely did it subsidise producers or put levies on imports to raise the price of locally grown padi.

There certainly is plentiful evidence of the ability of the Malay farmer to react to market signals. This is most apparent, of course, in the extent to which rubber was taken up early in the century, but there is little doubt that the expansions of padi production in 1919 and 1920 (see p. 48) were in response to the local price rises that resulted from the fall in exports from Burma and Siam. Commercial padi production at ruling prices, which in 1913 were 3.2–4 cents per kg (compared with 12–20 cents per kg for polished rice—Barritt, 1913), was a viable proposition only when rubber prices slumped and once more 'compelled the Malay to attend to his rice fields' (Jack, 1923). A wage labourer in 1920 could earn substantially more than a padi farmer, and the employment of contract labour to grow padi where land was available (e.g. in Kerian) was feasible only if that land was of the best quality (Kratoska, 1982). Contrary to Jack's expectations (see p. 40), even population pressure and falling rubber prices were inadequate incentives to attract settlers to new padi areas such as Kerian and, later, Sungei Manik. The Malay population increased by 36% between 1911 and 1931, and rubber prices collapsed in the 1930s, but relatively few peninsular Malays showed interest in the new padi lands. The Director of the Drainage and Irrigation Department admitted in 1950 that 'the problem of finding colonists for new padi areas is by no means

new. It has in fact been the main factor in retarding the progress of increased rice production' (Drainage and Irrigation Department, 1950). 'Despite official blandishments', wrote Rudner in 1976, 'few Malay peasants were prepared to embark on new padi planting when rice earnings lagged behind alternative crops'.

For reasons that can only be hypothesised, the colonial government chose to ignore the market signals that were surely recognisable within its own economic philosophy, and selected instead the policy of land reservation as a means of guaranteeing padi production. While it is likely that individual officials had the best interests of the traditional Malay lifestyle in mind (even if their perceptions of that lifestyle were rather romanticised), other considerations were more pertinent. It seems very probable that years of the effects of poor husbandry by, and competition from, rubber smallholders and the desire to consolidate a custodial relationship with traditional Malay society and its hereditary leadership, which had much to lose from rapid commercialisation of the rural economy, were strong influences on the government's decisions relating to the padi sector.

The nature and distribution of padi production in the Malay peninsula about the time of the First World War, however difficult it might be to illustrate it with reliable statistical data (see pp. 59–60), had evolved in association with the local physical environment and cultural traditions inherited from both pre-Islamic and Islamic sources. Population growth had been accommodated mainly through the clearing and development of new land, in some cases, (e.g. in Kedah) aided by some local, indigenous, engineering works. Kedah, Perlis and Kelantan, in keeping with the existence in those states of the largest areas of land suitable for the construction of *bendang*, were the principal regions of padi cultivation, together accounting for about 53 percent of the padi land in British Malaya (see table 2.1).

The period 1910–1940 was one in which the traditional padi economy was subjected to a number of influences which, collectively but differentially in the various parts of the peninsula, modified both the character and the spatial distribution of padi cultivation. These influences included the natural growth of the rural Malay population which, given the limited amount of new land in the traditional areas suitable for wet padi, was beginning to press hard on that resource by 1930, the reservations policy of the colonial government, and the development of relatively extensive new areas for cultivation by drainage and irrigation. The effects of the interactions of these influences were complex, with those of British colonial policies reflecting the inconsistencies within them, and remain to be fully researched. In economic terms, new areas were opened up for padi cultivation, often in previously swampy terrain, by the employment of modern engineering techniques. Improved water control in existing padi

areas increased the reliability of cropping and contributed to higher average yields. In spatial terms, the development of the Kerian, Sungei Manik and Tanjong Karang schemes shifted the focus of padi cultivation in the Federated States from the traditional Malay areas in the river valleys to newly colonised coastal plains which came to be populated mainly by immigrants from the archipelago (Lim, 1977).

In socio-cultural terms, however, those traditional areas were to a degree 'locked out' of the economic changes that were occurring elsewhere in the economy, and which most agricultural development theory would have postulated. Restrictions on the cultivation of alternative crops on padi land in the reservations kept the farmer chained to the production of a commodity for which environmental conditions, especially in the south, were far from ideal and which could not compete with imports at ruling free market prices. The limitation of land rights to Malays in the reservations had the effect of reducing credit sources available to them since land could not be used as security for loans from non-Malays, the group most likely to have funds available.[11] Penn (1971) suggested that comparable land in an unrestricted zone might be worth twice as much as land in a reservation.[12] The relative cheapness of reservation land made it particularly attractive to those Malays who could afford to buy it and thus provided strong motivation for landlords to expand their holdings.

A quantitative analysis of the changes in area cultivated and production of padi that took place between about 1910 and 1930 would require data difficult, and perhaps impossible, to assemble in full and is certainly beyond the capacity and purpose of this chapter. Nevertheless, as a preliminary, and in many ways suggestive, attempt to present a broad summary of those changes, table 3.1 has been constructed. As noted in the comments on Malayan/Malaysian padi data on p. 151, statistical information relating to the industry has its weaknesses, a statement that is particularly true for the earlier periods and the more remote districts. The selection of any one year for comparative purposes, as in table 3.1, can also create a misleading impression since circumstances such as poor rains may mean areas normally cultivated may be left without a crop in any one particular year. In some areas, especially in Kelantan, some land may change from wet to dry padi according to water availability. The area of dry padi, particularly can fluctuate very considerably. For the period 1915–16 to 1921–22, for example, Jack's (1923) figures for lower Perak suggest an

[11] In the current period (1970s, 80s) only a limited number of agencies eg. Bank Bumiputra, Bank Pertanian, can hold Malay reservation land as collateral (Wong, 1975).

[12] The differential is far greater if reservation land is urban or near-urban. A report in the "*Star*" newspaper (29 December 1989) suggested that 84 ha of Malay reservation land in Kampung Baru, Kuala Lumpur, was worth only one-tenth of the value of equivalent surrounding property.

average annual dry padi area of 2622 ha with a standard deviation of 1406 ha. Dry padi land is especially sensitive to rainfall conditions, and can also react more quickly to price changes. Production figures, commonly calculated by applying information on yields to estimated areas, are particularly liable to considerable error. Data on dry, or upland, padi are likely to be even more unreliable. Subject, therefore, to these serious reservations and to the specific points made in the footnotes to the table, the following very broad trends are identified from table 3.1.

In summary, the broad regional pattern of padi cultivation in the peninsula appeared to change relatively little between 1911–12 and 1940–41—the proportion of the total area located in each of the northwest, northeast and centre/south regions was remarkably constant over the period. This in itself is an interesting observation since it implies a similar rate of expansion in each of the three regions, so different in their physical attributes and in the degrees to which they were subject to colonial influence. On a peninsula-wide basis, the figures suggest an increase in the area of padi cultivation of some 29 per cent (over 70,000 ha according to the table). This was approximately five times as great as the total new padi area that the drainage and irrigation schemes of the 1930s expected to create and therefore must have represented a substantial increase in the area of 'traditional' padi. It is clear from table 3.1 that this increase was a net figure resulting from a gross increase of nearly 90,000 ha—of which about 80 percent occurred in the northern, unfederated, states of Kedah, Perlis, Kelantan and Trengganu—and a decline of over 15,000 ha concentrated in Penang/Province Wellesley, Perak and Malacca.

It is particularly noteworthy that, except for Selangor, where the effect of the Tanjong Karang scheme is apparent, and in Negri Sembilan and Pahang where there were some increases, the area devoted to padi cultivation in the districts under direct British administration was less in 1940–41 than it had been in 1911–12. In fact, despite the best efforts of the Drainage and Irrigation Department, there appears to have been a decline of about 3.5 percent (or some 4,000 ha) in the area of padi land in the Federated Malay States and the Straits Settlements. The districts where this decline was largest—Perak outside Kerian and Sungei Manik, Malacca and Province Wellesley—were the very ones where alternative economic opportunities, in export crops or urban activities, were most readily available. In Perak particularly, it seems probably that much dry, or upland, padi land was lost to rubber.

The most impressive changes suggested by the figures are those that apparently took place in Kedah, Perlis, Kelantan and Trengganu, where reservation policies were not introduced until the 1930s (1941 in the case of Trengganu) and where the Drainage and Irrigation Department did not operate. Equally, these were states where alternative economic opportunities were fewer and where, clearly, there was land available for devel-

opment. A comparison of figures for the early 1920s presented by Jack (1923) and Hill (1977) with those for the early 1930s (Lim, 1967) suggests strongly that a surge of padi land development took place in those four states in the 1920s and is a topic that is worthy of further investigation.

No attempt is made here to examine changes in production over the period in question. Preliminary analysis of existing sources (Jack, 1923; *Malayan Agricultural Journal*, various years; Lim, 1967; Hill, 1977) suggests that there was probably an increase of about 32 percent between 1911–12 and 1940–41, but this estimate could be subject to considerable error. This percentage is comparable to the estimated increase in total area and, if approaching accuracy, suggests there was little in the way of general yield improvements over the 30 year period. Figures published each year in the *Malayan Agricultural Journal* throughout the 1920s and 1930s suggest this may indeed have been the case. Average yield figures for Kerian compiled by Overton (unpublished) were however consistently higher than those published in the *Malayan Agricultural Journal* for the peninsula as a whole, so it may be concluded that the more reliable water control achieved in the irrigation areas contributed to production increases, and it would have been surprising had it not done so.

If any conclusions can be drawn from the events in the padi sector between about 1910 and 1940, they tend to confirm the situation that was already clear at the beginning of the period, namely that the Malay peninsula is not particularly well endowed for padi production, even in the least unfavourable environment of the north-west, and that, when alternative economic opportunities are available, the padi farmer is likely to prefer them to the, always uncertain, returns from his traditional activity. The British Secretary of State for the Colonies, reported in *Hansard* (25 July 1946), summarised the situation succinctly, 'The production of rice was low in Malaya before the war . . . because it was a non-productive crop, and because it could be produced as cheaply in other parts more favoured by climatic or other circumstances' (quoted in Rudner, 1976). Lim (1977) similarly ascribed the lack of enthusiasm of the rural Malay to move into commercial production (eg. in Kerian or the other newly opened areas) to the 'cheapness of imported rice, the higher returns from other activities and the relatively low yields obtained from the Malayan padi fields'. Only where the higher returns from other activities were absent, eg. in Kedah, Kelantan and Trengganu in the 1920s, did padi cultivation show signs of expansion, but largely for subsistence purposes. Many of the post-war developments, with which the remainder of this book deals, have nevertheless been based on a continuing belief in the potential of padi production both to feed the country and to provide an adequate livelihood for its farming households.

Table 3.1 Malay Peninsula—padi area in hectares[a] by state[b] 1911–1912[c] and 1940–41

	1911–1912		1940–1941				1911/12–1940/41
	Wet & Dry ha	%	Wet ha	Estimated Dry[d] ha	Total ha	%	ha
Kedah	75006	29	107287	2400	109687	33	+ 34681
Perlis	6582	3	17004	–	17004	5	+ 10422
Penang	2481	1 }	14980	– }	15330	5	– 5451
Prov. Wellesley	18300	7 }		350 }			
Perak	52072	20	42105	4500	46605	14	– 5467
(of which Kerian)	(20205[e]	8)	(19820	–	19820	6)	(– 385)
NORTHWEST	154441	60	181376	7250	188626	57	+ 34185
Kelantan	53092	21	53846	13800	67646	20	+ 14554
Trengganu	4391	2	13765	4500	18265	6	+ 13874
NORTHWEST	57483	23	67611	18300	85911	26	+ 28428
Selangor	3189	1	9312	800	10112	3	+ 6923
Negri Sembilan	10749	4	13360	100	13460	4	+ 2711
Malacca	16360	6	11741	–	11741	4	– 4619
Pahang	12196	5	12955	1200	14155	4	+ 1959
Johore	2701	1	4453	2300	6753	2	+ 4052
CENTRE/SOUTH	45195	17	51821	4400	56221	17	+ 11026
TOTAL PENINSULA	257119	100	300808	29950[f]	330759[g]	100	+ 73639

Notes to Table 3.1

(a) These data were compiled by Lim (1967) from a range of official sources and summarised, to the nearest thousand acres, in his appendix 6.3. These rounded figures have been converted to hectares for this table but, to avoid compounding inaccuracies by re-rounding, have been left as direct conversions to the nearest whole number. The impression of accuracy thereby created is false.

(b) To permit comparison with the earlier figures, the states have been grouped as in table 2.1.

(c) The 1911–12 areas and percentages have been taken from table 2.1 and are repeated here for convenience of comparison.

(d) Lim's (1967) state figures were for wet padi only. To enable comparison with Hill's (1977) earlier figures, which included dry (hill) padi, estimates have been made for dry padi for 1940–41. These have been estimated on the basis of figures for 1932–33 published in the M.A.J., 1933, and by Lim (1967) for 1949–50. In the cases of Kedah, Perlis, Penang and Province Wellesley, Kelantan and Trengganu, the figures were very similar in each year and have therefore been used, in a rounded form, for 1940–41. In the case of Perak, Selangor, Pahang and Johore, the areas of dry padi revealed substantial declines between 1932–33 and 1949–50. An approximate mid-point has therefore been used as the 'estimate' for 1940–41. Dry padi areas were negligible in Malacca and Negri Sembilan in both years.

(e) The figures for Kerian have been drawn from an as yet unpublished compilation by Overton (1986b) and refer to 1912 and 1939 respectively.

(f) This corresponds tolerably well with Lim's (1967) total figure for planted dry padi of 31579 ha.

(g) In order that meaningful percentages may be calculated, this figure is the sum of the state figures. Lim's (1967) total figure, when converted, was equal to 300405 ha. The difference is partly due to Lim's rounding.

4

"... To Improve the Living Standards of the Padi Growing Population" — Post-independence Policies towards the Rice Sector

'Padi boleh jadi,
Kelapa t'apa apa,
Getah entah entah'[1]

Semaun was forced to oppose this. Pa Senik's suggestion was the suggestion of someone who wanted to get rich quick by unlawful means. There would be bad luck for seven generations if it was accepted. Semaun was firm. He did not want any of it, not even a grain of rice. He was not prepared to violate time-hallowed customs. Violating the customs of one's ancestors was the same as defying one's own parents in their house. Defying one's parents meant defiling the grave and spirits of one's ancestors. And the man who dared to defile the customs and traditions of the ancestors would find that his ribs and his breast-bone would be caught tight at the entrance to the grave when they lowered him in. Semaun wasn't prepared to risk the tortures of the grave. Nor was he prepared to burden the household with the consequences. He did not want the ribs and the breast-bones of the family to be squeezed by the red earth. He wanted to live in peace. He wanted to die in peace.

(Shahnon Ahmad, "Rentong", 1965)

[1] The chapter heading is a quotation from Selvadurai (1972) and the introductory quotation ("If the padi will grow it does not matter then about either the coconuts or the rubber") is an early 20th century Malay saying, cited in Cooke (1961).

I

'The biggest cause of poverty . . .'

The 1947 census of the Federation of Malaya (del Tufo, 1947) recorded 470,562 persons employed in padi cultivation, or 40 per cent of all who made their living from agriculture. Most of these were concentrated in the three northern states of Kedah (24 per cent), Kelantan (21 per cent) and Perak (16 per cent), and by far the majority (82 per cent) were Malays. Padi farming was still close to subsistence level (Dobby, 1949). In few areas was more than one crop cultivated per year, the total annual production of less than half a million tonnes was largely consumed by the growers themselves and little entered the trading system. While subsistence farming probably contributed to stability and continuity, and the relative isolation of the sector from the world economic system shielded it from the price fluctuations that affected the rubber smallholder, it provided only a minimal and declining standard of living. Most of the 360,000 or so hectares of alluvial land that was suitable for settlement and cultivation by traditional wet rice methods appears to have been fully developed by about 1930 and new households could be accommodated thereafter only by continuing subdivision of the existing land. Evidence, such as that provided by Wilson (1954; 1955) and Ho (1969) and described in chapter two, suggested that the average size of rice farms decreased rapidly after about 1930.

Whilst population growth and traditional inheritance practices reduced the size of the land base of each household's subsistence, the productivity of the land remained static or even declined. There was no doubt in Aziz's mind in 1956 that padi farming and Malay poverty were causally linked—'It is my personal opinion that the biggest cause of poverty amongst Malays in the Federation is that such a large proportion of them—about one and half million people—are dependent on padi farming as their main source of livelihood'. The features of the system that Aziz saw as contributing to poverty were fragmentation (in which term he presumably included excessive subdivision), high rents, marketing problems and what he perceived as the pro-urban biases of the government. His basic solution to the problem of Malay rural poverty was the creation of larger farms, to be made possible by resettling many households on newly developed, non-rice land. 'Those farmers who are removed from the present padi areas, so that those who are left can have larger farms, should be introduced into new areas where they can grow new crops like cocoa or oil palms or pineapples' (Aziz, 1956).

The argument that inadequate farm size was the basis cause of poverty amongst padi farmers, especially given the single cropping routines and the low yields that were common, was unchallengeable, and the notion

of resettlement was one that was beginning seriously to occupy the thoughts of government policy-makers. Nevertheless, the scale of such a conceptually simple operation was huge, particularly in the contexts of a population growth rate that exceeded 3 per cent per annum, of the need of other impoverished groups (eg rubber smallholders) for land, and of the necessity to ensure that padi land 'freed' by the resettlement of its former owner-operator or tenant should be made available to the most needy of those remaining. Resettlement was, of course, to become one major prong of rural development strategy, but more direct methods were undertaken to improve the productivity—and thereby, it was assumed, the prosperity—of padi farming.

II

'startling new techniques . . .'

It is clear that, as recently as 1949, the revolution that was to transform many aspects of padi cultivation in Malaysia was quite unforeseen. Writing in that year on questions concerning Malayan agriculture, Dobby acknowledged that the country needed to look for 'startling new techniques to cheapen its (agricultural) production' but believed that there were 'many technical doubts whether Malaya can treble its rice production . . . by new strains, higher yields or expanded acreages' (Dobby, 1949). The trebling of padi production was the achievement necessary if the country was to become self-sufficient in its major food crop. The interruption in the immediate post-war years of rice supplies from Malaya's traditional sources, Burma, Thailand and Indo-China, made rice rationing necessary and raised the question of self-sufficiency. The pre-war colonisation schemes in Perak (Kerian) and Selangor (Tanjong Karang) were revived though, despite the provision of considerable inducements, it was still difficult to attract settlers.[2]

Rural development, as distinct from the increased production of export or food crops, became a basic tenet of Malayan economic and social

[2] After 1945, when increased padi production was crucial, inducements to settle on the Tanjong Karang scheme were expanded to include:-

1. free transport to the area;
2. provision of temporary accommodation on arrival;
3. a grant of $150 per settler;
4. provision of farm tools;
5. free seed for two years;
6. adjacent land for *kampung* development;
7. provision of developed padi land with facilities for drainage and irrigation at no cost to the settler.

In addition, subsidies per pikul (60 kg) produced were paid to padi farmers from the 1947–1948 season and a guaranteed minimum price scheme was introduced in the 1950s.

development in the Draft Development Plan of 1950 following the promise by the British High Commissioner, Sir Henry Gurney, at the opening of the new Legislative Council in 1948, that the government would attend to the needs of rural people (Ness, 1967). Rural development, of course, involved a wider range of activities than rice production alone. Nevertheless, the conviction that it would be an important element in reducing the relative economic imbalance between Malays and non-Malays, since 80–90 per cent of the former lived in rural areas, meant that the padi sector would inevitably receive major emphasis. Political pressure for special consideration to be given to the rural sector was particularly strong following the establishment of the fully elected Legislature of 1948 that gave rural voters a disproportionately powerful electoral voice and made it impossible for a government to continue long in office by democratic means unless its policies in the main pleased the rural people. Rural development was never formally defined, though it seems clear from the Alliance Party manifestoes for the elections of 1955 and 1959, which promised more for rural areas, more for the previously neglected Malays and land for the landless, that consumption values (Colebatch, 1977) were seen as dominant—at least for political purposes. Nevertheless, most of the policy strategies that were developed after 1950 were based on production values.

The Draft Development Plan of 1950 identified amongst its 'long term' objectives the production of more of the food that was consumed in Malaya, though it still reflected a strong belief in comparative advantage seeking, *inter alia*, to promote those types of economic activity in which the country was 'best fitted to engage' (Federation of Malaya, 1950), and expressed some doubts regarding the potential of the padi sector stating that 'even on the longest view, therefore, the total foreseeable yield from padi cultivation in Malaya is 771,500 tons (784,102t) of rice'. This figure was, in fact, achieved by the 1967–68 season and then exceeded, by 50 per cent, in the record season of 1979–80. In 1952, a Rice Production Committee was established 'to consider ways and means whereby the acreage planted under padi in the Federation and the yield per acre can be materially increased within the next three years' (Doering, 1973). This committee reflected an official concern with the decline in the planted area, which had fallen by 21 per cent between 1950 and 1951 and was to drop further in 1952, especially since so short a time had passed since the post-war rice crisis and the need for rationing. As had occurred so often in the past, alternative sources of income were found to be attracting labour out of rice growing—into commercial crops stimulated by Korean war boom prices, into the police and armed services and, increasingly, to the cities. Traditional concern over food security continued to dominate official thinking, however, and self-sufficiency in rice was announced as a national goal in 1955, though the target was later reduced to 80–90 per cent of requirements.

The methods adopted to achieve the substantial increase in padi production that would be necessary to meet the object of near self-sufficiency were essentially technocratic and, in Rudner's (1976) words, the advocacy of rice autarky was 'in no way tied to a strategy for rural development'. They were in general keeping both with the broad development philosophy of the government and with the output goals of the rice policy. Improvements in farmer welfare were expected to follow, more or less automatically, especially as investment was increased in rural infrastructure though, as Aziz (1964) observed, 'it still remains to be demonstrated objectively and rationally as to how such amenities and facilities can directly reduce rural poverty'. The breeding and adoption of superior varieties of grain and the construction of engineering works to increase the irrigated area and to promote double cropping were the backbone of the strategy, to be backed up by agricultural extension, subsidised chemical inputs and the guaranteed minimum price scheme first introduced in 1949.

Efforts to improve padi cultivation methods and yields date back to the early years of the colonial agricultural department, with work on varietal selection begun in 1915 (see chapter three), but average yields in the peninsula about 1950 still fluctuated around two tonnes per hectare, representing little more than a 30 per cent increase over those reported by Jack in 1923 (chapter two). Malaya's adoption of a policy of near self-sufficiency occurred at a time when the opportunities for its achievement were better than they had ever been, thanks primarily to the breeding of new, high yielding varieties (HYVs) of rice. In 1962, the Ford Foundation, the Rockefeller Foundation and the Philippine government had jointly established the International Rice Research Institute (IRRI) at Los Baños, just outside Manila. The primary aim of the Institute was to discover and develop strains of padi which would yield more abundantly than tropical Asia's traditional varieties. As in Malaya, these traditional varieties, whose yields had been stagnant for centuries, were giving the farmers of Southeast Asia between one and two tonnes of grain per hectare. Thanks to the techniques of wet rice production outlined in chapter two, such yields were maintainable in the absence of supplementary mineral fertiliser but represented only 20 to 40 per cent of those obtained in Japan.

The researchers at Los Baños were successful in developing the IR-8, so-called 'miracle rice', variety from a high yielding, nitrogen-responsive, semi-dwarf, Chinese variety *(dee-geo-woo-gen)*, and a tall, disease-resistant Southeast Asian strain *(peta)*. IR-8 was released by IRRI in 1966 with the capacity, under good management, to yield 4–5 tonnes per hectare in the wet, monsoon season and 6–7 tonnes per hectare in the dry sunny season. It was adopted in Malaysia, as *Ria*, following the use of earlier, short term, high yielding varieties (*Malinja*, 1964 and *Mahsuri*, 1965) which had been developed by the Department of Agriculture for double

cropping. Other high-yielding, semi-dwarfs followed, with progressively shorter growing periods and a better response to good management. These were bred both by the IRRI and by the Department of Agriculture, and later by the Malaysian Agricultural Research and Development Institute (MARDI) which took over the Department's research activities in 1969. In 1968 the Department of Agriculture released *Bahagia*, the Malaysian selection of IR5, which, although giving less spectacular yields than *Ria*, had superior eating qualities and became the major approved variety notably in the new Muda Irrigation Project area. The release of an increasing number of further varieties in subsequent years provided alternative qualities, often for specific conditions and areas.[1]

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[1] The major varieties of padi grown in Malaysia since 1965 and their principal properties are as follows:

Malinja – bred and released by the Department of Agriculture in 1964, it is moderately tall and relatively early maturing though sensitive to photoperiod. It is highly susceptible to disease.

Mahsuri – released by the Department of Agriculture in 1965, is an intermediate variety, relatively insensitive to photoperiod and prized for its excellent grain.

Ria (IR8) – a semi-dwarf variety, relatively insensitive to photoperiod, with an outstanding response to nitrogen, released in Malaysia in 1966. It has a poor quality grain and is susceptible to bacterial blight, tungro virus, brown plant-hopper and grassy stunt virus.

Bahagia – the Malaysian selection of IR5, released in 1968, is intermediate in height and weakly sensitive to photoperiod. It has poor quality grain but is more resistant to adverse weather than other semi-dwarf varieties. It lacks resistance to tungro, brown plant-hopper, grassy stunt and the stem borers.

Jaya – developed by University of the Philippines, Los Baños, and released in 1973 by MADA. It is relatively insensitive to photoperiod and of good grain quality but very susceptible to blast. It should not be confused with the Indian Jaya variety which is quite different.

Seri Malaysia I – a high yielding variety of poor grain quality. It was encouraged in Malaysia during the world rice shortage of 1973–74 but has been used on only a minor scale since.

Seri Malaysia II – an improvement on Ria, released in 1974. It has better grain quality than Ria and is resistant to blast. It can yield up to 5t/ ha under good management but has met with some consumer resistance.

Seribu gantang – bred by MARDI but never officially released since it is susceptible to bacterial blight and very susceptible to tungro. However, it yields well, can stand wide varieties of soil and poor management. It has consequently been popular and grown nationally since 1974. The grain resembles Mahsuri and is sometimes marketed as such.

Setanjung – released by MARDI in 1979. This is the highest yielding variety available at present. The potential yield is similar to that of Ria but achievement is closer to potential at 5.5–6.5t/ha. Some farmers achieve nearly 7t/ha. Grain quality is average, though better than Ria. It is resistant to blast and bacterial blight and, under field

The new varieties essentially provided the tropical rice grower with cultivars that incorporated many of the qualities of the more temperate, *japonica*, varieties. These included the ability to make better use of nutrients, irrespective of source, and hence normally to develop fuller ears, reduced sensitivity to day length, and generally shorter maturing times. The more effective absorption of nutrients by the high yielding varieties depletes soil reserves quickly and tempts farmers to abandon traditional methods of restoring soil nitrogen (Lipton with Longhurst, 1989). Their successful adoption thus made the high yields of which they were capable dependent upon the use of nitrogen fertiliser. During the 1950s and 1960s, changes in the technology of fertiliser production reduced the cost of fertiliser thus making it possible for the increasingly scarce factor (land) to be 'saved' by use of the increasingly cheap factor (fertiliser). After 1973 this situation was changed by the rapid price rises affecting petroleum, the principal raw material used in the manufacture of nitrogen fertilisers. Subsidies made the continuing use of fertiliser possible, however, and consumption per unit area rose throughout the 1970s in most parts of south and southeast Asia.

The modern, semi-dwarf varieties of rice spread rapidly to many of the developing countries of Asia. Steady growth in the area planted to modern varieties occurred in most countries of south and southeast Asia, despite occasional local downturns, between about 1965 and 1985 (table 4.1)

By the mid-1960s, Malaysia had a significant fraction of its area devoted to modern varieties developed from its own research. By 1976, these and other hybrids covered over half of the country's rice area. The Philippines and Indonesia adopted the new, high yielding varieties at an even more rapid pace. They were in use in more than 50 per cent of the Philippines rice area by 1970, and had been planted in half of Indonesia's rice lands by 1976. Adoption in Thailand and Burma was slower than elsewhere in the region, with only 10 per cent of their total rice areas planted with modern varieties by 1979, though Burma's special production programme accelerated their use in subsequent years (Barker and Herdt, 1985).

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conditions, seems resistant to tungro. It is hard to thresh and requires machinery. It is grown mainly in Tanjong Karang, Seberang Perai and the Muda areas.

Sekencang – an improvement of Jaya, more resistant to blast. It has a short maturation period. Released in 1979.

Sekembang – has most of the qualities of Seribu gantang. Released in 1979, it matures late and is particularly suitable for double nursery cultivation. It is grown mainly in Kerian, Tanjong Karang and on the east coast.

Kadaria – released by KADA in 1981 and widely planted in the KADA area. It is susceptible to force smut which makes it less suitable for the west coast. Yields are comparable to Sekembang but it matures early.

Table 4.1 Southeast Asia—Average annual increases (%) in areas planted to modern rice varieties between mid-1960s and late 1970s

Country	Crop years and areas ('000 ha)				average annual % age growth
Peninsular Malaysia	1965/66	43	1977/78	316	18
Thailand	1970/71	30	1979/80	800	44
Philippines	1966/67	83	1980-81	2678	28
Indonesia	1968/69	198	1980/81	5416	32
Burma	1968/69	167	1980/81	1502	20

Source: Barker and Herdt, 1985

As has been noted earlier (chapter two), despite claims made to the contrary during the post-war arguments for self-sufficiency, Malaysia is not as well endowed physically for rice cultivation as the mainland states to the north nor as the less equatorial islands of Indonesia and the Philippines. Although the new varieties provided the opportunity substantially to increase yields from the existing rice areas, nowhere did production under field conditions approach the tonnages potentially attainable. Average main season yields rose from about 2 tonnes per hectare in 1950 to just over 3 tonnes per hectare by 1980, though with considerable regional variation that bore strong, but not exclusive, relationships to local physical conditions (table 4.2) and were generally greater in the northwest. Increases in main season yields also undoubtedly benefited from the better water control associated with the engineering works noted below, from better management associated with extension services and more general pest control. Increases in output sufficient to approach the national target could be achieved, however, only if the limited area of land suited to wet padi cultivation (perhaps 400,000 ha) could be used more intensively. The shorter maturing period required by the new rice varieties and their emancipation from photosensitivity made double cropping theoretically possible; the provision of water in the dry (off) season was necessary to make it a reality.

Small-scale attempts to grow off-season crops were made in the Kemumin district of Kelantan (Ashby, 1954) and in Perak in the 1930s but failed, partly because of a high incidence of pests and diseases often associated with the small and scattered nature of the rice areas (Rutherford, 1966). During the Japanese occupation, efforts were made to develop double cropping as one remedy for critical food shortages. Following the failure of initial trials in the Sungei Manik and Kerian irrigation areas of Perak, attention was given to the Sungei Kulim irrigation area of Province Wellesley (Seberang Perai), making use of the water control scheme that had been constructed in the mid-1930s. The local rice farmers were introduced to 'Taiwan' rice, a variety that matured in 120 days and which

Table 4.2 Peninsular Malaysia—Main season padi yields 1950–1980 (tonnes per hectare) in principal padi-growing states*

Crop year	Kedah	Perlis	Mada+	Kelantan	Penang	Perak	Selangor	Peninsular Malaysia
1950–51	2.587	2.432	–	1.735	1.661	1.778	1.932	2.111
1955–56	2.340	1.389	–	1.679	2.124	1.827	2.747	2.025
1960–61	3.118	2.778	–	1.778	2.556	2.605	3.488	2.636
1965–66	3.254	3.229	–	1.167	2.667	2.161	3.309	2.519
1970–71	3.334	2.988	–	2.315	3.136	2.402	3.353	2.747
1975–76	3.365	3.297	–	1.864	3.285	2.679	3.124	2.729
1980–81	2.559	3.311	4.654	2.465	2.872	2.696	3.731	3.265

Sources of raw data: Department of Agriculture, Rice Statistics

**The high yielding of padi began to come into general use by about the mid-1960s. Earlier increases in yields appear to habe been related to greater use of fertiliser. High yielding varieties developed in the 1960s and 1970s were best suited to west coast conditions and did not yield so well in Kelantan. A variety (Kadaria) specifically developed for the Kemubu irrigation area in Kelantan was released in 1981 (see note 4). Main season yields remain susceptible to climatic conditions and the incidence of pests, despite control measures, and show variability from year to year. The average annual increase in main season yields for Peninsular Malaysia between 1970 and 1980 was about 2%, for Kedah about 1% and for Kelantan about 0.5%.*

+Muda Agricultural Development Authority area. From 1980 padi data for the MADA area, which includes those districts of Kedah and Perlis which are included in the Muda irrigation area, have been provided separately from those for the rest of each of the two states. Data reported as for those states therefore refer only to those padi areas outside the scheme.

Table 4.3 Peninsular Malaysia—Off season padi yields 1970–1980 (tonnes per hectare) in principal padi-growing states

Crop year	Kedah	Perlis	Mada*	Kelantan	Penang	Perak	Selangor	Peninsular Malaysia
1970–71	3.328	3.556	–	2.747	3.315	2.605	3.735	3.124
1971–72	3.353	3.087	–	2.791	3.396	2.531	3.624	3.056
1972–73	3.618	3.075	–	2.365	3.488	2.661	3.532	3.149
1973–74	3.692	3.118	–	2.451	3.618	2.815	3.501	3.241
1974–75	3.562	3.211	–	2.636	2.951	2.704	3.451	3.155
1975–76	4.161	4.143	–	2.327	3.161	2.593	3.118	3.390
1976–77	3.945	4.018	–	2.741	2.804	2.979	2.829	3.368
1977–78+	3.931	Nil	–	2.446	3.342	3.010	3.356	2.954
1978–79	3.914	3.593	–	2.998	2.753	2.528	2.766	3.374
1979–80	2.270	3.828	4.535	3.381	2.408	2.647	2.722	3.541

Source of raw data: Department of Agriculture, Rice Statistics

* *See footnote to table 4.2*

\+ *1977 was a bad drought year in the Muda area. In Kedah only 8 percent of the previous year's off-season area was planted in 1978. There was no off-season crop at all in Perlis that year.*

was planted as an off-season crop in 1944 and 1945. Interest in double cropping declined immediately following the war, but the practice later spread to be adopted on almost all the rice land in both the Sungei Kulim and the neighbouring Sungei Muda irrigation areas of Province Wellesley.

The early adoption of double cropping was essentially spontaneous and, apparently, regarded with concern at first by the authorities who feared that the continual cultivation would leave inadequate time for the maintenance of the engineering works or for the regeneration of the land. By the 1965–66 crop year, some 42,000 hectares were planted in the off-season, mostly in the irrigation areas of Province Wellesley and Selangor, where double cropping had become universal in the Tanjong Karang district by 1968–69 (Huang, 1972). The new *Malinja* variety, which matured in 140 days and which was more palatable than Taiwan, was officially recommended for both seasons.

The major expansion in double cropping (table 4.3) occurred in the 1970s, however, mainly as a consequence of the completion of the 98,000 hectare Muda Irrigation Project in Kedah and Perlis. The alluvial plain of northwest Peninsular Malaysia, which occupies about 1300 square kilometres of the coast stretching from the Gunong Jerai massif almost to the Thai border, was producing nearly one half of the country's total rice output in the 1950s and 1960s and had a substantial marketable surplus even before the introduction of the new varieties or of the Muda scheme. The heavy marine clays of the coastal plain are generally well suited to padi cultivation which was undertaken traditionally on a single crop basis in the months of May to November when 85 per cent of the annual rainfall occurs. A drainage scheme undertaken in the 1950s in the Kubang Pasu district made available an additional 8000 ha (Courtenay, 1959) but only for single cropping. An investigation of a major engineering scheme, based upon storage in the upper Muda river catchment and its distribution throughout the rice area in the dry season, reported in 1963 and indicated very favourable benefit/cost ratios under a variety of alternative assumptions. Project works began, with World Bank assistance, in 1966. The scheme included two storage dams with an interconnecting tunnel, headworks, main and distributory channels and drainage canals (fig. 4.1). Off-season cropping, though accompanied by some inevitable teething problems,[4] began in the 1970–71 season. Some rice varieties released for the double cropping regime were not favoured by farmers, because of low

[4] 'Teething problems' included the less than universal adoption of short-term varieties in the main season so that not all main season crops had been harvested when the fields were flooded for the first off-season crop; slower flooding than anticipated owing to gentle slopes and the limited capacity of lateral canals; the inadequacy of narrow unmetalled roads and bridges to carry the heavy agricultural equipment introduced; and the need for drying equipment that was revealed by a wet season harvest.

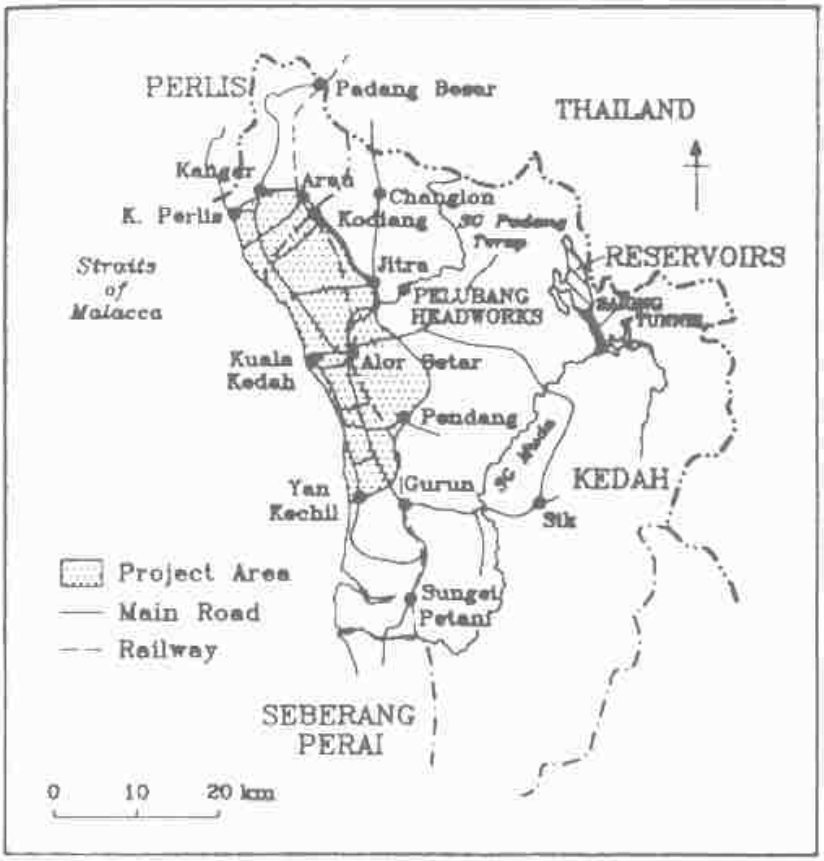

Figure 4.1 The Muda Irrigation Area

consumer demand and harvesting difficulties created by relatively short plant height, but resistance to change was difficult in the face of regional water control where fields were flooded irrespective of individual choice.

Physical conditions in Kelantan, Malaysia's second largest padi growing state, are less favourable to the extensive development of irrigation than in the level alluvial plain of the northwest (see chapter two). The delta lands, interrupted by levees and depressions, are more irregular than those of Kedah, while the rainfall regime, influenced by the powerful northeast monsoon off the South China Sea, often makes flooding a major problem in December-January. Three irrigation schemes, using water from the Kelantan river, were constructed during the 1950s and 1960s. The Salor scheme (1,660 ha), completed in 1951, receives water from a pumping station on the right bank of the Kelantan river; the Pasir Mas scheme (2,000 ha), completed in 1958, and the Lemal scheme (9,900 ha), completed in 1968, are both on the left bank and gravity-fed. Construction of a larger drainage and irrigation system, the Kemubu scheme, was undertaken, partly with World Bank finance, in 1969–71. This Kemubu Irrigation Project made double cropping possible on a further 19,000

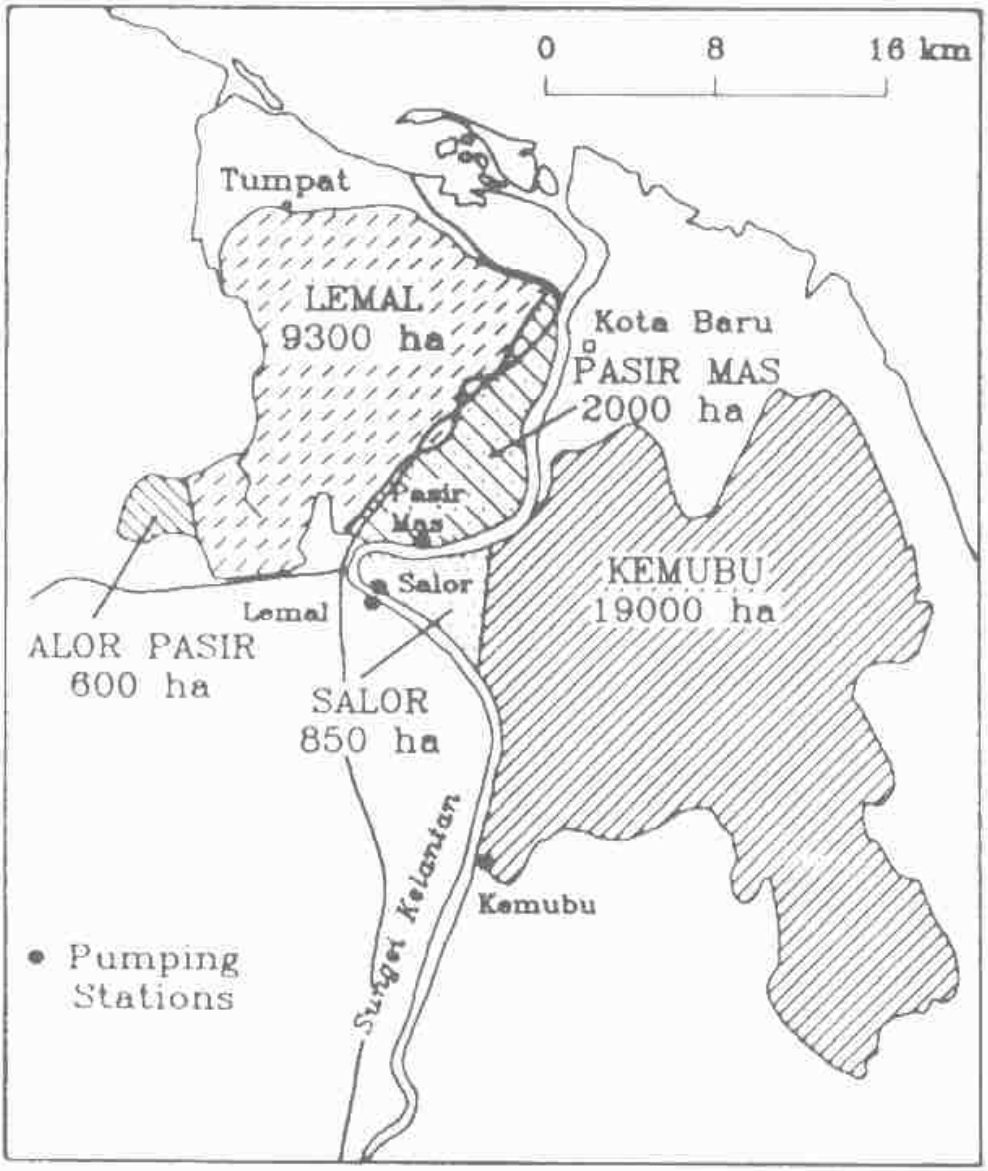

Figure 4.2 The Kada Irrigation Area

hectares of the Kelantan delta (figure 4.2). In 1973 all the irrigation areas were placed under a unified Kemubu Agricultural Development Authority (KADA).

As noted on page 71, some double cropping had taken place in the Kemumin district of Kelantan before the Second World War, and experiments with a dry-season crop were made in the Salor irrigation area in 1953 and for two subsequent years. Although technically successful, the Salor experiment failed to capture the interest of the local farmers who had no experience of wet nurseries and were reluctant to transplant twice in a year (Ashby, 1954). Double cropping was also instituted on a limited scale in the Pasir Mas scheme in 1962, but the introduction of regular dry-season production in Kelantan did not occur until 1972 and followed the completion of the Kemubu scheme. The adoption of double cropping in Kelantan was accompanied, as elsewhere, by the rapid expansion of mechanical land preparation. New padi varieties were accepted only slowly, however. Those developed for the west coast were less well suited to the lighter, nutrient-deficient soils of Kelantan. More fertiliser was needed, but fertiliser costs were 15–30 per cent higher than in the west (Nik Hassani, 1979). Throughout the 1970s, off-season yields in Kelantan grew more slowly than in Kedah and, over the decade, averaged about only 70 per cent of those achieved in the Muda Irrigation Area (table 4.4).

Although their impact varied from region to region, the padi programs of the 1960s and 1970s had undoubted success in raising both total production and productivity, per hectare and per worker, in major and minor growing areas. As is quite apparent from appendix table 1(b), total padi production trebled between 1950 and 1980, as did average production per economically active person in padi growing. In terms of output goals, Malaysia had come close to the objective which, in 1950, had seemed unattainable to many and had gone far towards vindicating the views of the protagonists of self-sufficiency, though not without criticism from some (eg Kasper, 1975) who saw as unjustifiably large the amount of capital that had been channelled into the rice sector to reach this conclusion.

III

'... the real motive of development. . . .'

During the twenty years or so of the output achievement, the aims of the padi policy slowly changed. Although rural development had been a major concern of Malayan/Malaysian governments since 1948 (Ness, 1967), the 'New Economic Policy' expounded in the Second Malaysia Plan (Government of Malaysia, 1971) placed particular emphasis on the, predominantly Malay, padi growing sector. This was perhaps an overt acknowledgement of what had been an increasing, but latent, objective. In 1972

Selvadurai claimed that whereas past policy had been described as a concerted attempt to reach self-sufficiency, the real motive of development in the padi areas had been to improve the living standards of the rice-growing population. A major policy shift from the objective of self-sufficiency to one of enhancing the incomes and welfare of farmers was similarly identified by Doering (1973). Once the Muda scheme had been implemented, previously undefined aspirations became major goals that were forced into prominence after the Kuala Lumpur riots of May, 1969. Unfortunately for Malaysia, it was becoming apparent that the technocratic approach that was proving so effective in increasing production in the padi sector was, alone, clearly inadequate as a means of abolishing poverty. As Aziz (1964) and others (Rudner, 1971) had foreseen, the raising of productivity was not, *per se*, a solution to the problem of low incomes amongst the majority of padi farmers.

The Second Malaysia Plan, 1971–75, represented a major turning point in national planning, though to some extent its thrusts had been anticipated by the First Malaysia Plan of 1965–70 which had been more socially oriented than its predecessors and had allocated 24 per cent of all expenditure to agricultural development, of which more than one third was spent on irrigation works for double cropping (Ho, 1969; Tempelman, 1981). Shaken by the 1969 riots, which were officially interpreted as arising from Malays' dissatisfaction with their living standards and economic opportunities (though did not involve rural protestors), the Malaysian government formulated the New Economic Policy (NEP). The Second and Third Malaysia Plans (1971–75 and 1976–80) were the first and second 5-year phases of an Outline Perspective Plan, 1971–90, whose over-all objective was to bring about a marked reduction in poverty. The New Economic Policy embraced a strategy which aimed, first, at reducing and eventually eradicating poverty by raising incomes and increasing employment for all Malaysians irrespective of race and, secondly, at restructuring Malaysian society to reduce and eventually eliminate the identification of race with economic function and geographical location.

In operational terms, the New Economic Policy aimed to raise the income levels of all in the poorest 40 per cent of the population, and to reduce inequalities in the over-all distribution of incomes and wealth, but particularly the inequalities that existed between the 'races' or ethnic groups. The correlation between race and level of income was far from absolute, of course, but there was sufficient overlap to make positive discrimination in favour of Malays (or *humiputera*),[5] a major plank of the policy. Although

[5] The literal meaning of *humiputera* is sons of the soil i.e. the native inhabitants as distinct from more recent arrivals, though in fact relatively recent migrants from Indonesia are quickly absorbed into the *humiputera* population thanks to their ethnic similarity and common language and religion.

the New Economic Policy involved increasing the Malay share of the business and corporate sector and expanding the number of *bumiputera* at shopfloor, managerial and executive levels in manufacturing industry, the association of the Malay community with the rural sector inevitably implied that there would be an emphasis on rural development. The goal of modernisation of agriculture was to make incomes in modern agricultural occupations comparable with those in urban areas and to integrate agriculture with modern activities in commerce and industry. To this end, the Second Malaysia Plan aimed to increase employment opportunities, raise worker incomes by increasing productivity and the scale of operation, expand the range and quantity and improve the quality of agricultural products, and strengthen institutions which promoted fuller participation of rural residents in the economic and social life of the nation. Land development, especially through schemes of the Federal Land Development Authority (FELDA), was expanded and siphoned off selected families from the padi areas, but the major emphasis in the rural sector was put on the intensification of production within those areas by means of green revolution technology. The Third Malaysia Plan continued the emphasis of the Second with the agricultural sector receiving 25.5 per cent of the total allocations.

As Shamsul (1979a) suggests, the approach to development espoused by the New Economic Policy was based intrinsically upon a perception of dualism in the economy, and the belief that, following Lewis (1955) (see chapter one), the institutional framework of the traditional sector was adequate for enormous advances in productivity by means of the introduction of new technology. The strategy necessarily implied a much enhanced active government involvement in the rural economy through the promotion of a more modern and scientifically based mode of production. Major investment continued to be put into the expansion and intensification of irrigation but government also intervened directly into the purchasing, milling and marketing of the crop.

Publicly owned processing began in the early 1970s to ensure the availability of adequate drying facilities to handle the off-season crop in the Muda and Kemubu schemes which was harvested under wet season conditions. In 1971, the *Lembaga Padi dan Beras Negara* (LPN—the National Padi and Rice Authority) was established and charged with the responsibilities of ensuring fair prices for farmers and consumers. The Authority's purchases rose during the 1970s to reach a market share of about 24 per cent by the end of the decade. The international rice shortage of 1973–74 led to its being given complete control over prices and imports, with formal monopoly rights granted in 1976. Control over retail rice prices was introduced in 1974. The rice shortage was also responsible for re-affirmation of a commitment to full self-sufficiency and for the reintroduction of a subsidy on fertiliser—previously available in the 1950s and

60s—to encourage more general usage. The subsidy was discontinued in 1976, when fertiliser prices eased, but it was introduced again, in the form of a free grant of fertiliser sufficient for up to 2.4 ha (6 acres), in 1979 following further rises in petroleum prices and their flow on into fertiliser production costs. Fertiliser use per hectare of arable land more than doubled between 1970 and 1982 (World Bank, 1985) and undoubtedly contributed to the continuing increases in yield that occurred over that period. In 1980, growers' incomes were augmented by payment of a cash grant when grain was delivered to a registered mill.[6]

The policies adopted towards the padi sector by the Malaysian government, most notably after 1970, undoubtedly further shifted resources towards that sector from other sectors of the economy. On economic criteria alone, as Baldwin (1986) showed, it can be argued that the resources devoted to supporting output prices and to input subsidisation have been misallocated for most areas of Peninsular Malaysia. The goals of equity and distribution and the saving of foreign exchange have clearly been viewed by the Malaysian government as justification for such 'misallocation'. Baldwin's (1985) analysis of domestic resource costs suggests that only limited producing areas, specifically Kedah and Selangor, have a comparative advantage in padi production, and then only in some years. An important element in the support provided to the industry has been the guaranteed minimum price. First introduced in 1949, the guaranteed minimum price was intended to act both as an incentive to production by guaranteeing a floor price and as a means of raising farm incomes. Until the world rice shortage of 1973, the practice had been to price rice in line with border prices but, for most of the 1970s and 1980s, the guaranteed minimum price has been set above border prices.[7]

Mokhtar and Sabathawan (1988) have undertaken an evaluation of the rice market intervention system in Malaysia and conclude that the price distortions created by the minimum price policy have introduced a wedge between domestic prices and world (or border) prices. For most of the period they considered, approximately 1974–1986, consumers appeared to have lost due to output price intervention, with the gain 'to an extent' transferred to the producers (Mokhtar and Sabathawan, 1988).

An examination of the data in appendix table 1 indicates the extent to which the policies pursued after 1950 resulted in substantial increases

[6] The original intention had been to introduce a padi subsidy of M$2 per pikul (M$3.31 per 100 kg) in the form of investable coupons which would have created sizeable farmer savings for investment. Farmer reactions against the scheme, at least partially caused by the deduction by some millers and traders of the M$2 from the purchase price they offered, forced the government to make the coupons cashable and to raise the subsidy to M$10 per pikul (M$16.57 per 100 kg).

[7] The border price is the average import price of Thai milled rice at the official exchange rate (see Mokhtar and Sabathawan, 1988).

in the area, production and yields of padi. The success in production terms is incontrovertible. Between 1950 and 1980, the area under all types of padi (main and off season, wet and dry) increased by 78 per cent, production by 196 per cent (practically a three-fold increase) and average yields by 68 per cent (table 4.4). Some of the increase, most notably in yields and production, occurred in the main season crop, but the most startling expansion was in off-season cultivation, made possible by the developments in irrigation and the adoption of the new rapidly maturing varieties. From a total area of 2117 ha and production of 3315 t in the 1950–51 season (mainly in Province Wellesley), off-season cultivation had expanded to nearly 200,000 ha producing over 700,000 t by 1980–81, percentage increases of 9297 per cent and 21,186 per cent respectively. Substantial increases in yields resulted from the planting of the new varieties, greater use of agricultural chemicals, especially fertilisers, and improvements in water control.

A more detailed analysis of the padi statistics, however, both on a regional basis and in terms of disaggregated time periods, reveals a number of trends that raise severe doubts about the long-run efficacy of the technocratic strategies themselves, as well as of the New Economic Policy's approaches to the padi sector, and which clearly influenced the formulation of the National Agricultural Policy of 1984 (see section IV below). The peninsula-wide growth rates summarised in table 4.4 are strongly affected by the figures for Kedah/Perlis, which accounted for nearly half the total area and over half the total production throughout the period. In those parts of the peninsula that are less well endowed for padi production, both naturally and in terms of engineering infrastructure, the growth was less dramatic than in the northwest. In the case of Negri Sembilan, for example, whose double cropping began only in the mid-1960s, reached a peak in the 1972–73 season at the time of the world rice shortage and then declined rapidly over the rest of that decade, both area and production were considerably less in 1980 than they had been in 1950. A similar pattern occurred in Pahang. Main season plantings were less in 1980 than they had been in 1950 in Johore, Penang, and Selangor, though off-season plantings in each case prevented the overall area from declining in these states, while considerable improvements in yields led to enhanced production even from the reduced main season areas.

Particularly significant are the comparisons between 1950–1970 and 1970–1980, this latter decade corresponding with the first ten years of the New Economic Policy. It is apparent from table 4.4, and especially from figure 4.3, where more frequent time series data are graphed, that the major increases in area planted, production and yields were achieved before 1970. Indeed, in the peninsula as a whole, the total area planted declined by 5 per cent between 1970 and 1980, following an 88 per cent

Table 4.4 Percentage Changes in Area, Production and Yields of Padi Peninsular Malaysia, Kedah/Perlis and Negri Sembilan, 1950–1980

	1950–1980			1950–1970			1970–1980			1975–1980		
	PM	K/P	NS	PM	K/P	NS	PM	K/P	NS	PM	K/P	NS
Total Area	+ 78	+ 104	– 47	+ 88	+ 72	+ 52	– 5	+ 19	– 65	– 8	– 0.1	– 51
Total Production	+ 196	+ 221	– 20	+ 157	+ 122	+ 100	+ 15	+ 69	– 60	+ 2	+ 9	– 4.9
Average Yield	+ 68	+ 60	+ 50	+ 40	+ 29	+ 36	+ 20	+ 24	+ 10	+ 14	+ 10	+ 2
Main Season Area	+ 15	+ 19	– 64	+ 35	+ 17	+ 7	– 15	+ 2	– 66	– 9	+ 2	– 54
Main Season Production	+ 80	+ 74	– 43	+ 74	+ 49	+ 34	+ 3	+ 17	– 57	+ 9	+ 14	– 52
Main Season Yield	+ 55	+ 46	+ 56	+ 30	+ 27	+ 23	+ 19	+ 15	+ 27	+ 20	+ 18	+ 6
Off Season Area	+ 9297	+ 56805	.. (a)	+ 7430	+ 36691	.. (a)	+ 25	+ 55	– 62	– 11	– 1.9	– 4.1
Off Season Production	+ 21186	+133751	..	+ 14886	+ 71067	..	+ 42	+ 88	– 65	– 5	– 3.5	– 40
Off Season Yield	+ 125	+ 143	..	+ 98	+ 93	..	+ 14	+ 26	–10(b)	+ 5	+ 2	– 6(b)

Sources of raw data: Department of Agriculture, Rice Statistics

PM—Peninsular Malaysia K/P —Kedah/Perlis NS—Negri Sembilan

(a) There were no off-season crops in Negri Sembilan before the mid-1960s

(b) Yields in Negri Sembilan in the off-season of 1980–81 were particularly low. Percentage increases in yields of +4 (1970–1980) and +7 (1975–1980) would be a better reflection of the change.

increase between 1950 and 1970. This decline occurred largely in main season plantings, but between 1975 and 1980 the area cropped in the off-season also fell. Production increments continued through the 1970s, though at a much reduced rate compared with 1950–1970, thanks to continuing increases in yields. These production increments were achieved entirely in the northern regions of Kedah/Perlis, Kelantan and Trengganu. Elsewhere in the peninsula, total production fell during the 1970s—in some states catastrophically, as illustrated by the figures for Negri Sembilan.

There is little doubt that the principal achievements, in production terms, of the padi growing industry occurred in the second half of the 1960s as the new varieties were released (see footnote 3), as off-season planting began on a large scale especially in Kedah/Perlis and Kelantan, but also in Perak, Selangor and Trengganu, and as fertiliser usage expanded. It is not unreasonable to expect the very high growth rates of the 1960s to have slowed down as irrigation schemes were completed, high yielding varieties almost universally adopted, and fertiliser and pesticide usages had become the norm. Given the objectives of the New Economic Policy, a greater positive emphasis on improving rural living standards rather than merely on the achievement of further production increments during the 1970s would also have been a reasonable expectation. In the event, the Fourth Malaysia Plan (Government of Malaysia, 1981) was able to report a fall, from 88.1 per cent in 1970 to 55.1 per cent in 1980, in the incidence of poverty amongst padi farmers, but padi households still represented 12.5 per cent of all poor households and their income level was improving more slowly than that of the nation as a whole. Bhati (1976), for example, in a study undertaken of a village in northern Province Wellesley, reported an improvement in income levels between 1952 and 1970 but noted that the increase, especially from padi, was not great and certainly not uniform amongst the farmers. In fact, despite all efforts, the relative position of padi farmers as a group was actually worsening at the same time as the technological achievements of the previous twenty years were beginning to falter.

IV

'Emphasis . . . on the commercialisation of agriculture . . .'

Among the countries of the less developed world Malaysia is relatively fortunate. The World Bank (1993) classes the nation, in company with countries such as Chile, Algeria and former Czechoslovakia, as 'lower middle income', though, with a 1991 GNP per capita of US$2520, right at the top of the list. The Mid-Term Review of the Fourth Malaysia Plan (Government of Malaysia, 1984) recognised that, in Malaysia, manifestations of poverty involving widespread and severe shortages of food,

(a) Area Planted

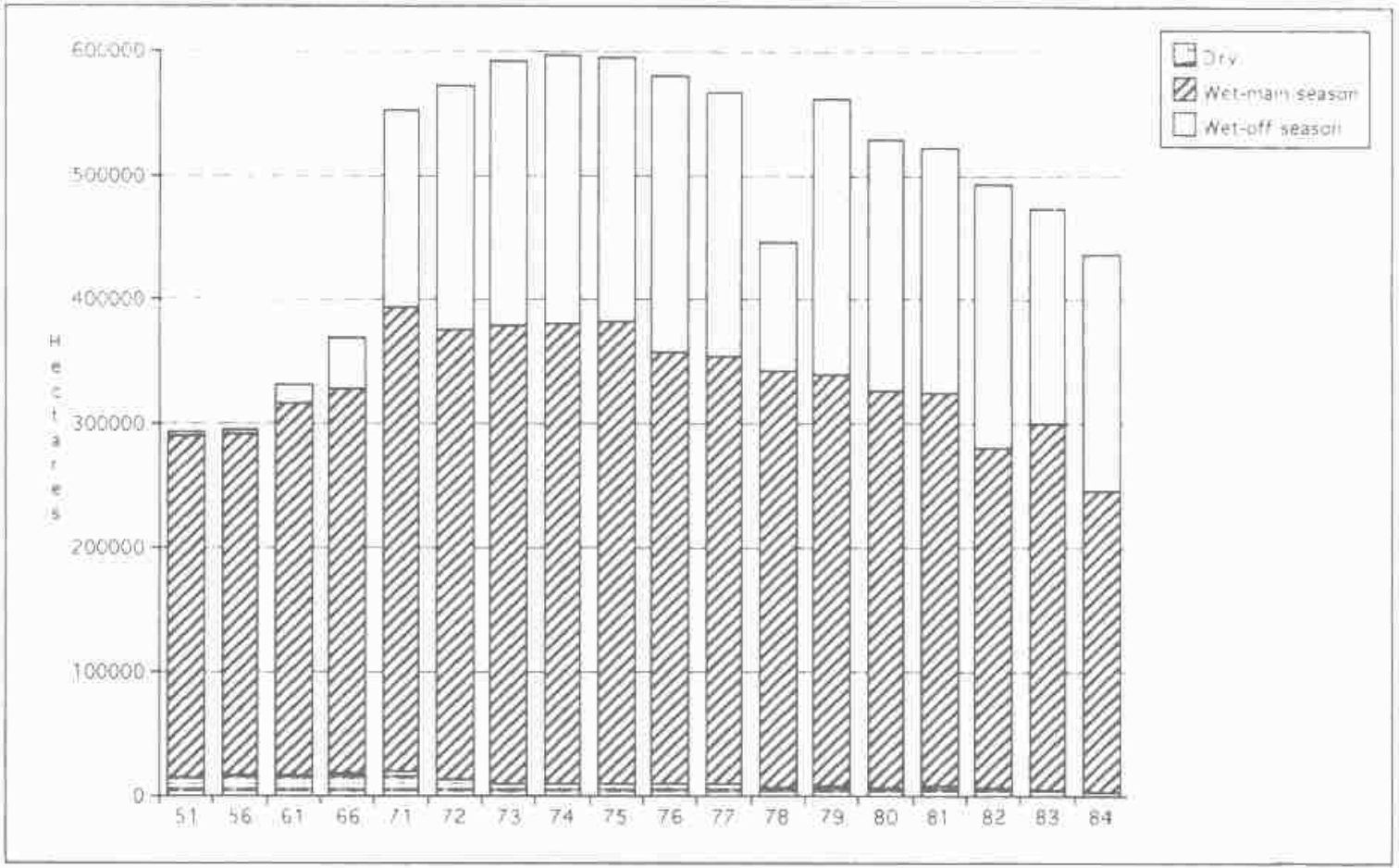

Figure 4.3 Peninsular Malaysia—padi data, 1950–1984

(b) Production

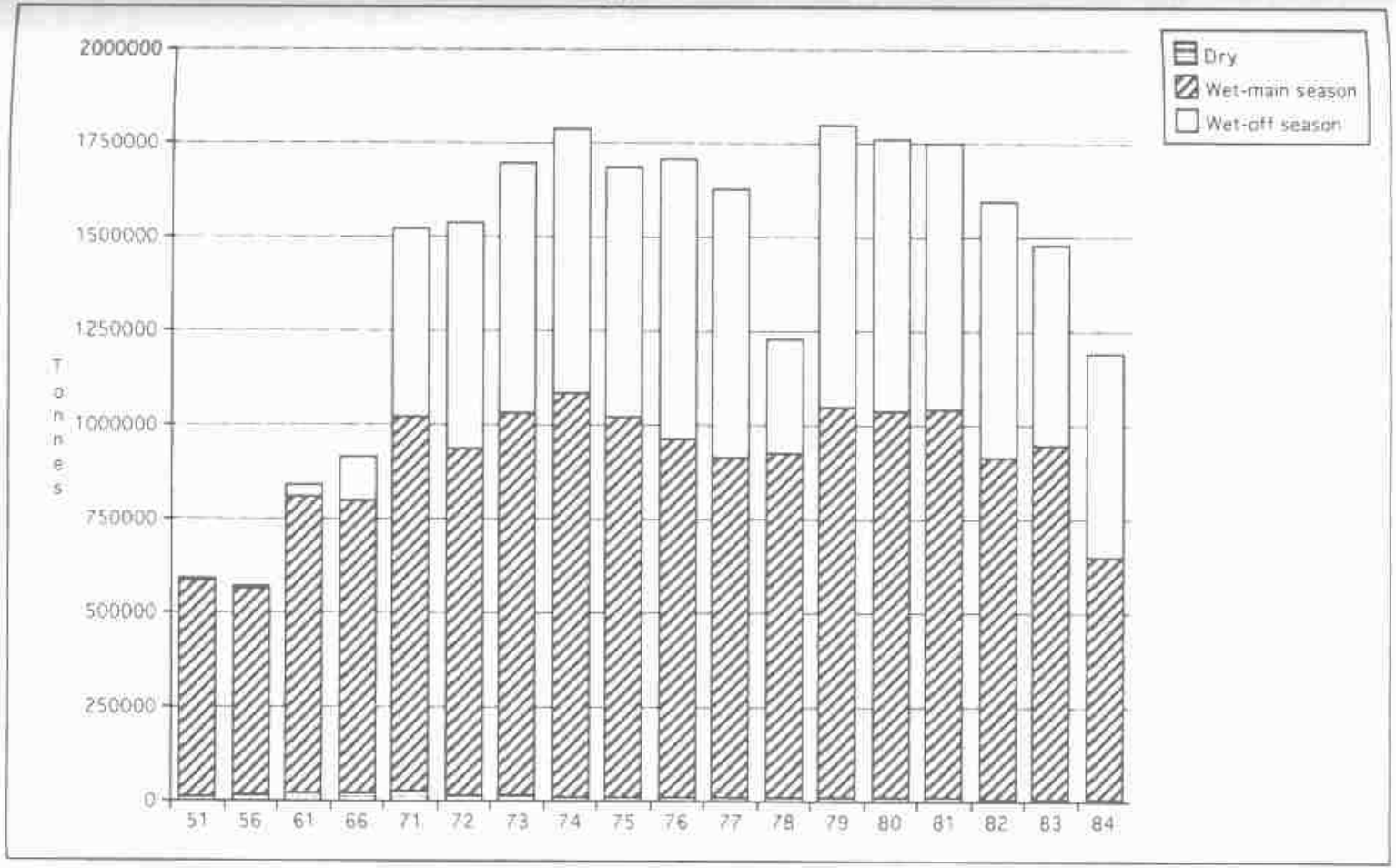

Figure 4.3 Peninsular Malaysia—padi data, 1950–1984

(c) Yields

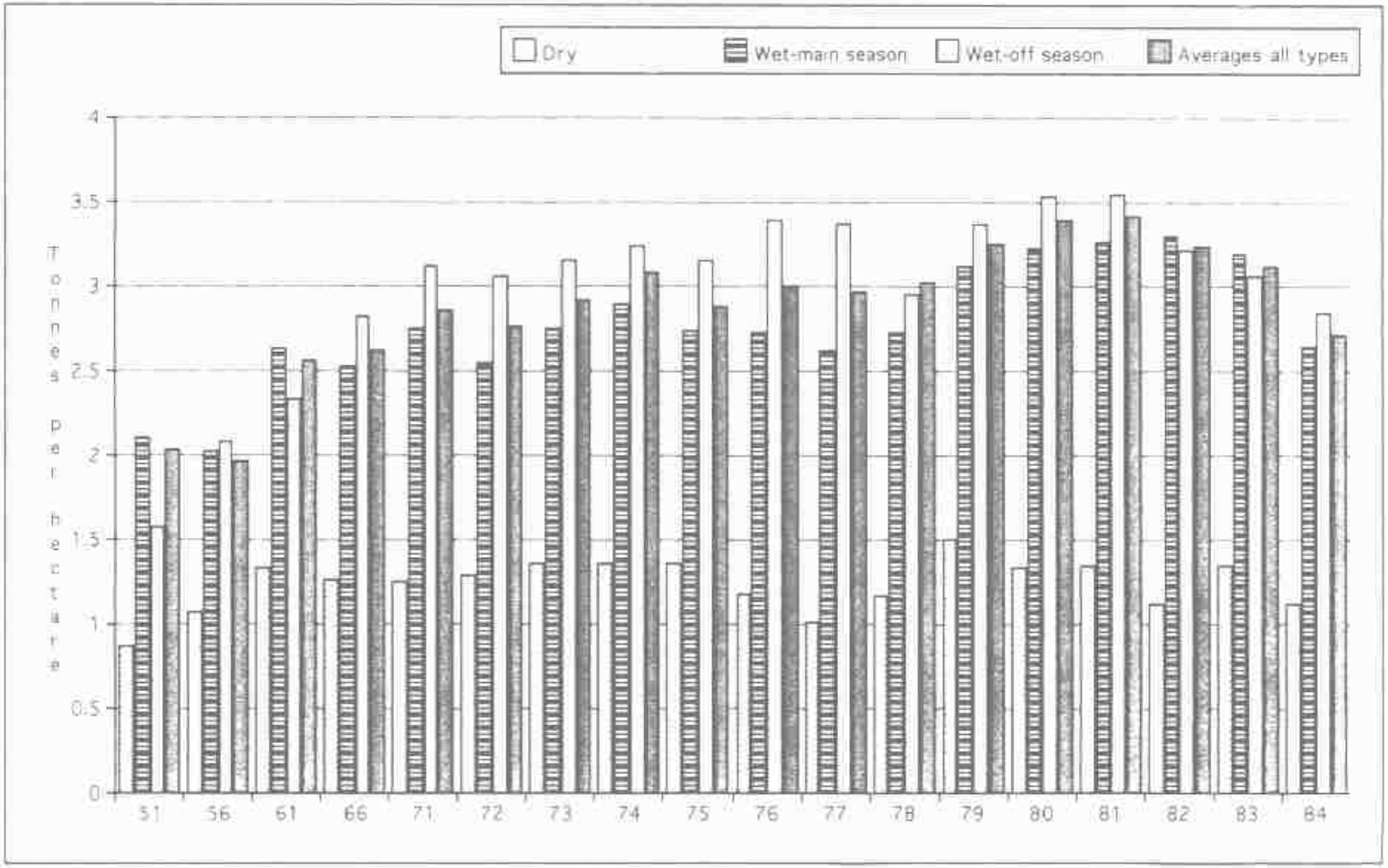

Figure 4.3 Peninsular Malaysia—padi data, 1950–1984

persistent hunger, diseases and death were absent but, at the same time, estimated that in the early 1980s 24 per cent of all households in Peninsular Malaysia would receive incomes below the poverty line. In the agricultural sector, the incidence of poverty was reported as high as 43 per cent with rubber smallholders, fishermen and padi farmers particularly poor.

Table 4.5 The incidence of poverty in the agricultural sector, 1970–85(%)

	1970	1975	1980	1983	1985
Rubber smallholders	64.7	59.0	41.3	61.1	39.2
Oil palm smallholders	30.3	9.1	7.7	6.5	5.7
Coconut smallholders	52.8	50.9	38.9	32.7	31.1
Padi farmers	88.1	77.0	52.7	54.0	58.3
Other agriculture	91.8	78.8	64.2	54.0	47.5
Fisherman	73.2	63.0	45.3	44.7	43.5
Estate workers	40.0	47.0	35.1	54.6	39.0
Agriculture	68.3	63.0	45.7	54.9	42.6
National	49.3	43.9	29.2	30.3	24.1
Ratio padi/national	1.79	1.75	1.80	1.78	2.42

Although the incidence of poverty in rural Malaysia undoubtedly fell during the 1970s (see table 4.5), its persistence amongst half the padi households and between 30 per cent and 40 per cent of most other rural families, despite the 30 years of government efforts aimed at its eradication, forced a review of policies and options. The situation of the 140,000 padi households as the only group whose income levels had actually deteriorated after 1980, following a decade of improvement, was of particular concern. The resurgence of poverty in the padi section in the 1980s was paralleled by an intensification of the declines in area and production that had begun in the later years of the 1970s. The area cropped reached a peak of 597,521 ha in 1973–74 and thereafter declined at an average rate of over 2 per cent per year, notably in main season plantings, to reach 431,861 ha in 1985–86—the lowest since the late 1960s not excluding the drought year of 1977–78. Production, thanks to continuing yield increases, grew until 1978–79 when it peaked at 1,799,065 tonnes but then fell to reach a low of 1,302,564 tonnes by 1983–84. Evidence from the 1980 census (Khoo, 1982) and repeated by the 1991 census (Department of Statistics, 1992), showed a marked population movement away from all the padi areas and implied the existence of a deeply seated structural problem with which the New Economic Policy had entirely failed to cope.

In 1984 Malaysia adopted a National Agricultural Policy (NAP) as an attempt to provide guidelines to help unify and direct the efforts of all those involved in agricultural development. The objective of the NAP specifically was 'to maximise income from agriculture through efficient utilisation of the country's resources and the revitalisation of the sector's

contribution to the overall economic development of the country.' The formulation of the policy followed World Bank concern over farm efficiency and income equity that was voiced both in a country paper on Malaysia, and in a further confidential paper in which the Bank argued for more government attention to, and resources for, agriculture. The authors of the country report identified various constraints and bottlenecks, including uneconomic cropping patterns, lack of consolidated landholdings, duplication of effort by government agencies and a lack of interagency co-ordination generally. The Bank urged Malaysia to seek higher productivity based on the concept of the maximisation of net farm income, an approach which would concentrate on increasing the value of farm products rather than on output itself.

The objectives and strategies of the National Agricultural Policy were broadly in line with these recommendations. Paragraph 11 of the policy document stated:

> 11. The NAP seeks to maximise farm income by raising productivity. This serves not only to alleviate rural poverty and improve the quality of life but also facilitate (sic) the retention of productive labour in agriculture. The process of maximising farm income is to be achieved through the expanded production of traditional export crops, the development and promotion of potential export crops and the development and expanded production of food and industrial crops. The production of all agricultural commodities, except rice, would be based on technical including agro-climatic considerations as well as economic returns. In respect of rice, the country's staple food, its production will be based on national food security consideration (sic).

The Mid-Term Review of the Fourth Malaysia Plan, also published in 1984, incorporated the policies of the National Agricultural Policy and expanded on some of them. In paragraph 33 it stated:

> 33. It is in the rural sector that substantial readjustments need to be made to the current strategy for agricultural development, if further progress is to be made in alleviating poverty and raising the standard of living of the rural households. The broad thrust of the changing directions in the strategy for agricultural development will include an emphasis on the maximisation of farm income by raising the productivity of the farmers. The role of subsidies in agricultural development will be progressively reduced and this will assist in eroding the subsidy mentality among farmers. However, wherever necessary, subsidies will be provided on a selective basis. The role of the private sector in agricultural development is expected to be expanded. The urbanisation of the rural areas through the regrouping of villages will form part of the new strategy for the alleviation of poverty.

and in paragraphs 34 and 36 it indicated some of the structural changes that had been identified in rural areas and some proposed strategies:

> 34. The emphasis on a system of co-operative farming will be an important element in the new strategy for agricultural and rural development in the coming years. In view of the structural changes, there is a need to promote co-operative farming by consolidating farm holdings and managing them on an estate basis. The major structural changes include the emergence of a shortage of labour in certain areas, idle land, ageing of the labour force in agricultural occupations, constraints imposed by the small size of agricultural holdings and the shortage of good agricultural land for the benefit of the participating farmers.
>
> 36. Emphasis will be put on the commercialisation of agriculture rather than maintaining a subsistence system. Co-operative farming will also be the basis for further accelerating the monetisation of the rural economy which emphasises the commercialisation of the resources and wealth of the rural sector rather than perpetuating a subsistence and traditional livelihood which has been the characteristic of a large section of the agriculture sector.

The Fifth Malaysia Plan (Government of Malaysia, 1986) reiterated the policies of the previous statements, and the Prime Minister, Dato Seri Dr-Mahathir bin Mohamad, confirmed in his foreword that 'rural development [would] continue to be given emphasis with a view to raising the standard of living in the rural areas'. In the extensive cut-backs in government expenditure made in the 1986 budget, agricultural development was treated relatively mildly and thus maintained its 'privileged' position.

The approach of the National Agricultural Policy was overtly technocratic. It aimed to maximise farm income through the expanded production of traditional export crops (principally rubber and oil palm), the development and promotion of potential export crops (of which cocoa particularly was seen as having sound prospects), and the increased production of food crops. The production of all agricultural commodities—except rice—was to be based on technical, including agro-climatic, considerations as well as economic returns. With respect to rice, the country's staple food, production was to be based on considerations of national food security. The Policy explained these considerations as meaning the achievement of between 80 per cent and 85 per cent of the national requirement (since 'in times of emergency, the consumption of rice is not as much as during normal times'). This target was accepted in the Fifth Plan. Essentially, emphasis was on the commercialisation of agriculture rather than on the maintenance of the subsistence system which had characterised a large part of the agricultural sector.

Undoubtedly the greatest challenge faced by the 'modernisation' policies of the National Agricultural Policy and the Fifth Plan was in the padi

sector. During the Fourth Plan period (1981–85), padi production had absorbed M$430 million on fertiliser subsidies alone while recording a twelve per cent fall in both output and cultivated area as increasing numbers of farmers abandoned their land. The underlying causes of the failure of thirty years of rural development to eliminate poverty and produce a stable and prosperous padi growing community are examined in the following chapter.

5

". . . Immiserising Growth . . .?" — Some Consequences of the Technocratic Approach

'Technological innovations cannot be expected to correct serious inequalities in access to and benefits from resources.'[1]

Ramli bin Awang sits crosslegged on the floor dressed in nothing but a torn sarung. His arm rests on the 'window', a gap where a board has been left out of the wall. He is a big, tough-looking man with a scar at the side of his mouth, but it is clear as the afternoon wears on that Ramli is a frightened man.

Not all the poor are heroes. Ramli, who is both landless and illiterate, is at the bottom of the rural heap. His father was poor; he is mired in even worse poverty; his children's prospects seem hopeless. And although he is only thirty-five, there is no fight in him; he seems unable to do anything to change his fate.

Ramli never went to school because he was the eldest of seven brothers and his father wanted his help in the fields. His father operated eight relong—but all the fields were rented, so Ramli could inherit nothing. There are still four younger brothers living at home. Two of them, like Ramli, never went to school and the youngest at thirteen has just dropped out to work in the fields.

When Ramli married Lijah nine years ago he moved into her father's house at Kampung Sungai Dedap. His father-in-law allowed him to operate one relong of land that the family had been renting for over thirty years. When the old man died shortly afterwards, Lijah, along with her three brothers, inherited three penjuru or three quarters of a relong.

[1] The chapter heading is a quotation from Schuh and Barghouti (1988) and the introductory quotation is from Barker and Anden (1975).

Even for padi land this was too small to be split, so the four of them operated the land on rotation (bergilir). Each season a different sibling farmed it and took the produce, then passed the land on to the next. If the crop failed, through drought or disease, then the one who had the land that season got a second shot.

(Shukor Kassim et al, "Poor Malays Speak Out," 1984)

1 relong = 0.54 hectare

I

'widening income inequalities'

The persistence of poverty in the padi sector, despite the outstanding achievements recorded in padi production, has attracted considerable attention. In examining rural development between 1955 and 1975, Peacock (1979; 1981) concluded that efforts to resolve the problem of rural poverty by using modern methods of agriculture within the traditional socio-economic patterns of the peasant society had acted to reinforce, and bind the farmer into, a structure from which he needed to escape if he were to be released from poverty.

The definition, and hence the measurement, of poverty is difficult. Most assessments, official or non-official, are necessarily based on some arbitrary 'poverty level'. This may be either *absolute*, requiring the identification of a universal minimum set of human needs to determine a poverty threshold, or *relative*, whereby individual or household incomes are related to a particular society's concept of a minimum 'living standard'.[2] The incidence of poverty in Malaysia has been measured officially since 1970 by the latter method. The Malaysian poverty line income, though not always clearly defined in monetary terms (Snodgrass, 1980), takes into account the minimum requirements of a household for three major items—food, clothing, and footwear—and a number of other, non-food, items such as rent, fuel and power, transport and communications, health, education and recreation. 'Minimum requirements' are based on recommendations by the Institute of Medical Research, the Ministry of Social Welfare, and levels of expenditure of the lower income households as were reported in the Household Expenditure Survey, 1973. The poverty line income is adjusted annually on the basis of changes in the Consumer Price Index. The Mid-Term Review of the Fifth Malaysia Plan (Govern-

[2] Some sociologists (see Townsend (ed), 1970) argue that all poverty should be regarded as a general form of relative deprivation.

ment of Malaysia, 1989) identified the 'hard core' poor as those households whose income was less than half of the poverty line income. Some of the background to the definition and analysis of poverty in Malaysia is described in Muniappan (1982), and a lack of clarity about the degree of consistency in the application over time of the 'poverty line income' is noted by Lim (1982).

Despite lack of clarity about the consistency of application or the monetary level of the poverty line income, however, there is substantial field evidence that poverty was widespread in the padi areas in the late 1970s and early 1980s. In a study of 31 households in Kg Asam Riang (Kedah),[3] Barnard (1981) reported that, during the 1977–78 season, the incomes of half were below the policy-defined poverty level. Even if the drought of that year were discounted, one-third of the sampled households would still have been in poverty. Gibbons *et al.* (1980), in their survey of sixteen villages in Perlis-Kedah-Penang concluded that the majority of farmer-innovators continued to live in absolute poverty. In terms of their padi income alone, only 7 per cent of 600 households within the Kemubu scheme area in Kelantan were recorded by Shand *et al.* (1982) as having net returns around or exceeding the 1978 poverty line when all income was taken into account. In those studies where efforts were made to assess the returns to padi farmers in strict accounting terms, by imputing labour costs to family workers and interest on invested capital (land), average net returns were usually negative, almost universally for tenants and frequently for both tenants and owners outside the double cropping schemes (Selvadurai 1972; Mokhtar and Hashim 1975; Fujimoto 1980; Shand *et al.* 1982).

The co-existence of substantially increased padi production with the persistence of a large number of padi-growing households below the poverty line implied the existence of an increasing income gap, a phenomenon that has been recognised implicitly by most writers. Writing on rural development strategies in Malaysia, M.N. bin Mohd Wali (1978) stated that the strategies followed appeared to have benefited the more progressive and larger farmers, rural capitalists and landlords rather than the small farmers. This statement was supported from Kelantan by Nik Hassani (1979), whose experience of the Kemubu scheme suggested that the rice policy had benefited a large proportion of the non-poverty group at the expense of padi farmers, especially tenants, and from Kedah and Perlis where the survey of Gibbons *et al.* (1980) found that development was unequal and that only a minority of farmers had prospered. Much of the literature of the 1980s that was concerned with the padi industry has contributed to a growing understanding of the reasons for the coincidence

[3] Kg Asam Riang is a pseudonym for the Kedah village studied.

of increasing productivity and widening income inequalities in the padi districts.

Tenancy and its associated rent payments are commonly viewed as major causes of income inequalities in rural areas and have received considerable attention in Malaysia. For some radical writers (eg Shamsul, 1979b; Fatimah, 1981; Husin, 1983), landlordism *per se* is the principal culprit. There is no doubt that tenancy is particularly common in the longer settled and more commercialised districts (Huang, 1975; Ishak et *al.*, 1979) and that concentration of land ownership exists. Fatimah (1980), for example, in a study of a Kelantan village, showed that 8.7 per cent of a population of 150 households owned 43.1 per cent of the land.

However, in many padi growing areas of Malaysia, landlordism and tenancy are as much a consequence of inadequate farms as their cause, as many farmers seek to rent land to raise their holding to a viable size. In 1975, Huang undertook an analysis of tenancy patterns, productivity and rentals in Malaysia to illustrate that a 'general condemnation' of tenancy and some of its institutional arrangements may be misleading.

Using data from the 1960 Census of Agriculture, Huang examined tenancy patterns, productivity, rental levels and incomes. He concluded that in relation to other investment returns, rentals did not appear to be excessive. Land prices, related to the prestige value of land ownership, were probably higher than the land's real economic value, a phenomenon that made tenancy economically more rational than ownership. This conclusion was supported by Fujimoto (1980) who also determined that tenancy appeared to improve rather than harm the cost-return relationship. As described by most other writers who comment on the tenancy question, Fujimoto noted that landlord-tenant relations were in most cases based on kinship or the local village and were often informal. Approximately 70 per cent of the total contracts he studied in Province Wellesley and Kelantan were between relatives, a figure that was confirmed from the Muda area by Tempelman (1981). In view of the kinship link, Horii (1981) prefers the term 'lessor' to 'landlord'. Tempelman has described the close connections between a padi farmer's life-cycle and his successive status as tenant, owner, owner-tenant and landlord or lessor.[4] Under such 'life-cycle' status changes, and while rents are not exploitative, area *worked* is more significant than area *owned* and, by this criterion, land is often more evenly distributed than ownership data would suggest.

[4] A young married padi grower commonly rents some land, mostly at a nominal charge, from his father or father-in-law, thus becoming a tenant. On inheriting the land he becomes an owner-operator and may be forced to rent in more land as his family grows. Later in his life-cycle, when his children have become farmers themselves and his own needs are fewer, he rents out some land to them and, when too old to work any land at all, he lives entirely on rent income. Such a 'landlord' may be amongst the poorest group in a village.

A number of writers have remarked on the relatively low level of rentals. Elliston (1980) reported from Baling that 40 per cent of the tenants surveyed paid no rent; Ishak *et al.* (1979) found that increases in rentals in Kedah and Kelantan did not seem commensurate with increases in land prices. Fujimoto (1980) reported that, in real terms, the prevailing rental level in his research area had shown little increase over 20 years. Ouchi *et al.* (1977) noted that rent levels in villages in Perlis and Pahang had not yet risen so that the benefits of increased productivity remained with the tenants, though they did not expect this situation to continue. More recent data seem to confirm their forecasts. From his surveys, some of which contributed to the Ouchi work, Horii (1981) concluded that the increased commercialisation of farming was beginning to lead to increased rentals. *Costs of Production Surveys*, compiled by the Muda Agricultural Development Authority (MADA), showed that average rents for the Muda area as a whole rose by 25 per cent between the 1979–80 and the 1981–82 main seasons, and Shamsul (1979b) reported as 'not uncommon' cases of a landlord doubling the seasonal rent in double-cropping areas. To some extent the 1967 Padi Cultivators (Control of Rent and Security of Tenure) Acts may have contributed to the limited extent of the rises in rentals noted during the 1970s but it is as likely that the kinship basis of many tenancy arrangements was a major factor. Barnard (1979), in her Kedah study, summed up the general opinion that land tenure did not appear to be a particularly pressing problem despite earlier fears that tenants would be vulnerable to dispossession and exorbitant rents. Despite this generally accepted view, however, it is likely that the increased commercialisation of padi cultivation and the associated weakening of reciprocal aid and informal tenancy arrangements have led to increasing pressure on tenants either to pay higher rents or to relinquish the land they work to its owner. Mechanisation has been a major contributor to this increasing commercialisation.

Probably the earliest reference to mechanisation in relation to padi growing is found in 1912 when Bateson noted the introduction of 'motor ploughs' in Siam, described as 'oil driven traction engines of a somewhat antiquated type' which 'pulled heavy disc harrows (and) ploughed hard clay to a depth of 4 inches or a little more.' The method was cheaper than ploughing with buffaloes or bullocks and seen as a possible technique for introduction into the Kerian area. Serious investigations of mechanisation date from about 1948 and, although Dobby (1953) claimed that mechanisation had prospects only in the development of virgin land and was 'not really feasible in existing areas where the local population cannot in practice be transferred elsewhere or to other employment', tractor use was increasing in the early 1950s. Mechanised cultivation was employed in 1953 in the double cropping trials in the Salor district of Kelantan (Ashby, 1954), and in 1954 Haynes reported that enough experience had

been gained with various types of machinery to indicate that, under certain conditions, the complete mechanisation of the wet padi crop was possible. He noted that the uniform planting date and the sudden onset of the dry weather in Kedah led to an acute shortage of labour at harvest time and, with considerable percipience, believed it was 'possible that combines may, in the future, be introduced to reduce, to some extent, the influx of harvesting gangs from Kelantan and Thailand'.

Mechanised land preparation began in Kedah in 1961 when 5,600 ha of padi land, representing about five per cent of the cultivated area, were tractor ploughed (Jegatheesan, 1972). By 1966, 40 per cent of the padi land in the Muda project area was prepared by machinery (Jegatheesan, 1972) and 32 per cent of the farmers were using mechanical methods (Huang, 1972). Hired labour was widely used in the Muda project area in 1966, particularly in land preparation, transplanting, harvesting and threshing but also in other field operations. Over 50 per cent of farmers were hiring labour for field preparation and transplanting, and almost 80 per cent for harvesting and threshing. The need to hire labour implied a shortage of on-farm family workers and was a principal reason for the adoption of mechanised cultivation methods, especially in land preparation for which techniques were earliest available. Double cropping, with its much tighter working schedules, made mechanisation almost obligatory.

The introduction of double cropping raised the demand for labour in two ways. First, the introduction of two short-season rice varieties in the year necessarily reduced the time available for each cultural operation. The time periods for land preparation, planting and harvesting *per crop* were reduced from the traditional three months during single cropping to approximately one month for each operation over the entire scheme area (MADA, 1972). Second, the adoption of standard varieties with uniform maturation periods, and the associated regional water control which led to all fields being flooded within a maximum time of six weeks, imposed a stringent cultivation schedule. Were the new highly seasonal requirements to have been met by manual labour alone, it was estimated that a trebling of the labour force would have been necessary (Mohd. Tamin and Noah, 1974). Mechanisation was seen as the only effective method of meeting the labour shortage and of avoiding the high costs that would have accompanied it.

By 1982, land preparation in the Muda area was entirely mechanised, and 90 per cent of harvesting was undertaken by machinery. Manual labour persisted longer in transplanting where experiments with modified Japanese planters were only partially successful and direct seeding faced difficulties arising from the clayey soils and rather high variabilities in yields that followed its use. Nevertheless 20,000 ha (about 20%) of the Muda area were direct seeded in 1982. Mechanised field preparation in Kelantan expanded rapidly with the development of double cropping and

was almost universal by 1982 (Shand *et al*, 1982) and had the added advantage that it permitted pre-monsoon ploughing and hence an earlier start to the agricultural cycle and a harvest before the potential flood period. Machinery for other processes was adapted more slowly. Towards the end of the 1980s, mechanical field preparation and harvesting were the norm in the major granary areas of Kedah/Perlis, Kelantan, Penang, Besut (Trengganu), Kerian and Sungei Manik (Perak), and Tanjong Karang (Selangor). In those areas of Pahang, Negri Sembilan, Malacca and Johore, where local physiographic conditions hindered mechanisation, its absence is seen as a major limitation on the ability of the industry to develop (see chapter six).

The mechanisation of labour-intensive farm operations in districts with high rates of natural population growth inevitably raised concern about employment prospects, and Ouchi *et al.* (1977) suggested the need for more positive plans to absorb rural labour into non-agricultural activities. However, given the situation whereby labour *shortages* have been at least a contributory factor in the adoption of machinery, it is difficult to determine a simple cause and effect relationship between mechanisation and changes in employment opportunities. Shand *et al.* (1982) actually saw the release of family labour for more profitable off-farm employment, even in the absence of any major development of industrial opportunities, as a distinct benefit of mechanisation.

Perhaps of greater concern than its direct effect on employment is the likely impact of mechanisation on the availability of land to rent. Mechanisation makes it possible for a household to cultivate more land than it could manage with family labour, even supplemented by hiring at peak work periods. This is even more true as transplanting becomes mechanised, since transplanting is the main determinant of the padi area that can be cultivated by an individual household. Pressure on pure tenants to relinquish land is thus probably inevitable; certainly a trend towards the replacement of generous lessor-tenant relationships based on kinship by more commercial arrangements is increasingly common. Horii (1981), for example, reported from Kerian that economically motivated and rigid tenancy contracts were gradually becoming the norm. Mechanisation also permits longer active involvement in farming by the elderly, thus requiring children to remain labourers perhaps well into middle age or alternatively encouraging them to migrate. One consequence of this trend, already apparent, is the ageing of the labour force in padi (see figure 5.1), 31 per cent of which was over 50 years of age in 1980, compared with only 11 per cent above that age in the total workforce. Dobby (1949) foresaw many consequences of mechanisation which, he claimed, would upset many social ties, break the tradition of communal assistance, eliminate the buffalo and oxen (which were amongst the few money-making adjuncts of the padi farmer), and place an emphasis on large holdings rather

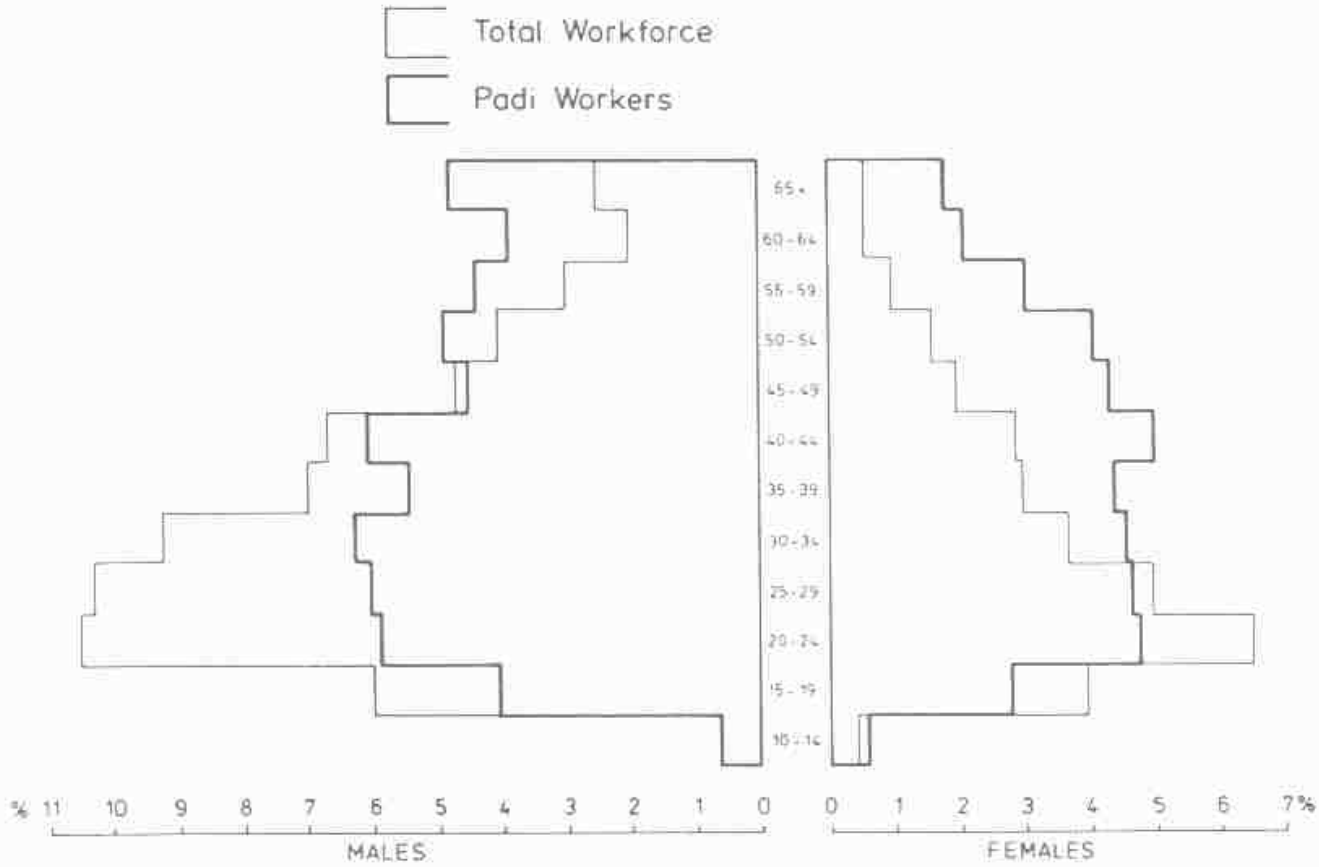

Figure 5.1 Peninsular Malaysia—age structure of padi workers and total workforce 1980

The latest Malaysian census data (1991) had not been published when this book went to press. It is therefore not yet possible to update this diagram.

than small. There seems little doubt that mechanisation is contributing to the polarisation of incomes not only within the villages, where the owner and owner-tenant stand to benefit over the pure tenant, but also within the region, as a result of income transfers increasingly flowing to outside contractors rather than to a large segment of the village population (Barnard 1981), and probably between the region and the wider national and international economy which provides the machines and their fuel (Ishak *et al.* 1979).

In a detailed study of 16 villages in Kedah, Perlis and Penang, which covered 1125 households, Gibbons *et al.*, (1980) concluded that the net return from the new technology was greatest for the bigger farmers and that the ability of technical progress to produce profitable results was fundamentally conditioned by farm size and tenure status. Their investigation suggested that improvements in income were linked in an increasingly exclusive manner to the amount of land available for operation. The large farmer was able concurrently to increase all forms of input while at the same time relying proportionately less on family labour and they concluded that the possibility of reproducing and increasing capital was a direct function of a farmer's capacity to hire labour, itself a function of his farm size.

The government initiatives of the 1960s and 70s had included the establishment of various institutions to ease the provision of credit to padi farmers, in order to release them from what had long been seen as the clutches of exploitative village moneylenders and to expand the availability of funds. The rural co-operative movement, Farmers' Associations and the Agricultural Bank (Bank Pertanian) of Malaysia were founded to provide, at moderate interest rates, seasonal loans for cultivation expenses and medium-term loans for the purchase and improvement of land and the acquisition of farm equipment and machinery. The Farmers' Associations were designed to provide extension services, processing, warehousing, transport and marketing services as well as credit. Both credit and services have proved to be more readily available to the larger farmer than to the smaller. Shamsul (1979b) has claimed that credit facilities which require collateral exclude from access the majority of landless tenants or very small farmers who may then be forced back to the moneylender who, in the absence of securities, exacts higher interest. Barnard (1979) has queried the extent to which Farmers' Associations serve all strata of the farm population, while Fredericks *et al.* (1980) noted a correlation between farm size and Farmers' Association membership which tended to be dominated by the wealthier farmers. Even the payment of *zakat*, the Moslem tithe, collection of which is limited in practice to grain producers or specifically to *de facto* padi cultivators, is regressive in that it is based on a fixed proportion of gross production with no consideration given to input costs or size of cultivated area.

One consequence of the introduction of large scale irrigation schemes and of double cropping has been the reduced opportunity for the production of non-padi crops by padi farmers. The 'traditional' subsistence economy of the padi areas often incorporated non-padi crops. Ishak *et al.* (1979) commented on the fact that mixed farming is more common in subsistence areas, and Huang (1972) noted that small farm sizes and lower yields were likely to discourage farmers from double cropping padi if alternative income sources were available. *A priori* it can be argued that there is likely to be an inverse relationship between the productivity of the padi farm and the need for other crops and/or off-farm work, and that modernisation to raise that productivity should eliminate the need for alternative income sources. Certainly where padi productivity is high (eg in the northwest), farmers spend less time on non-padi crops (Huang 1972).

Nevertheless, the fact that padi is often less profitable than other crops maintains the farmer's interest in alternatives even when irrigation permits double cropping of padi. Unfortunately in this regard, the regional irrigation schemes often prohibit the farmer from growing an alternative or keeping livestock, thus locking him into padi production and reducing his ability to take advantage of alternative market opportunities. In the Kemubu area, for example, Brown reported in 1973 that tobacco offered a higher return than padi but the opportunity for its production was restricted by the irrigation provided for double cropping. By 1976, Nik Hassani noted that the Kemubu farmers had become less dependent on tobacco which had shifted to farms outside the project. He attributed the change to the development of irrigation but also to rapid earlier expansion that led to low quality leaf. Mokhtar and Hashim (1975) found, however, that non-padi income remained attractive in Kelantan at the expense of further improvements in padi yields, and Shand *et al.* (1982) reported that, in the area of the Kemubu scheme, there had been an increase in cropping diversification during the ten years or so since the Ministry of Agriculture and Co-operatives' 1968 survey (Selvadurai *et al.*, 1969). This was particularly evident in rubber growing, which was found on 8 per cent of farms surveyed in the scheme area in 1968 and on 18 per cent of such farms in 1980. In Trengganu, Lemmens *et al.* (1981) noted a growing interest in tobacco and cattle raising and commented on the importance of rubber, tobacco and animal products to farm incomes. In Perlis, Blom *et al.* (1979) reported that tobacco was gaining importance as an off-season crop.

The alternative income source for the impoverished padi farmer who does not have the option of a more profitable crop is necessarily off-farm work. Non-agricultural sources of income for farming households have consequently become of growing significance and attracted the attention of a number of recent investigations. Horii (1981) described how the small size and low productivity of the padi farms in his survey areas created

the need for off-farm work but he found that the opportunities for such work were few. Padi farmers were often compelled to engage in occasional work such as coconut plucking or roof making, though some had more regular off-farm employment as shop-keepers or fishermen. In Perlis, non-agricultural work was found to be important both within and outside the Muda area, where approximately 45 per cent of man-days were spent on economic activities other than farming (Blom *et al.*, 1979). In Trengganu, Lemmens *et al.*, (1981) observed that off-farm activities had become a major reason for not resuming double cropping after low yields and water problems had led to its abandonment in the Pulau Musang and Nerus irrigation schemes. In Kedah the need for increased off-farm employment opportunities was seen as early as 1973 (Doering, 1973) and had become more critical by the early 1980s with a wider spectrum of jobs outside agriculture and outside the village required especially for men. Barnard (1981) drew attention to the limited opportunities for men to obtain employment in the developing light industries which preferred 'a lower paid, docile but high turnover labour force of young, unmarried women'.

The World Bank (1975) opinion that 'rural development programmes have to include provision for promoting non-agricultural activities in rural areas and for the linkages with agricultural sectors on the one hand, and the urban, industrialised sector on the other' is reinforced by the experience of the Malaysian padi industry and clearly influenced some of the strategies outlined in the National Agricultural Policy. These are examined in more detail in chapter six, but it can be noted here that, in the general absence so far of opportunities for off-farm employment of other than a casual kind, the introduction of double cropping has reduced the small farmer's opportunities for economic improvement.

II

'... such small size ...'

Underlying the paradox of a situation in which the Malaysian padi sector has been a major recipient of government attention and investment, has seen substantial improvements in total production of padi and in average production per economically active person, but continues to include the country's largest concentration of the poor, is the question of farm size. There is a broad consensus that the root cause of the inability of green revolution technology to overcome poverty, even with associated infrastructural, credit and extension facilities, is the inadequate size of the modal padi farm. As has been illustrated in this chapter, many of the technological advances and government initiatives that have made possible the increases in productivity have contributed to widening income gaps since the net return from the new technology and institutions is

greater for bigger farms. Amongst the five basic 'modern' inputs—high yielding crop varieties, chemical fertilisers, insecticides/pesticides, irrigation water and farm machinery—the first three are essentially scale-neutral, though fragmentation probably makes the application of fertilisers and pesticides demanding of greater time and effort than would be needed on a consolidated farm, and the limited earning capacity of the small farmer makes him a credit risk without subsidies. Water distribution systems and farm machinery have a strong scale bias and their employment on small farms, and even more so on small plots, becomes very costly if not impossible.

Both the average and the modal Malaysian padi farm are small—perhaps 1 ha in area. Care is required in comparing various survey data that refer to farm area since different concepts are employed—area owned, area operated and area under padi—but the general conclusions are consistent. Hill (1982), basing his figure on the 1960 Agricultural Census and referring apparently to area operated, gave the average size of the Malaysian padi farm as 1.02 ha, with a range from 0.51 ha in Negri Sembilan to 1.49 ha in Perlis. As a result of population growth over the last 30 years, the average sizes are certainly now even smaller, a conclusion supported by recent case studies. Lemmens *et al.* (1981), for example, reported that the 'overwhelming majority' of the farmers surveyed in six villages in Trengganu operated less than 1.2 ha of padi land; Horii (1981) recorded 60 per cent of tenants as operating less than 0.6 ha and 75 per cent of owners as possessing less than 1.2 ha in his survey village in the Kerian district of Perak; a survey of 20 randomly selected households in the Alor Gajah district of Malacca in 1987 revealed that the average area of padi land owned was 0.34 ha (Courtenay, 1988b). The problem of size is almost universally exacerbated by fragmentation and multiple ownership.

There can be no firm statement regarding the minimum size of a padi farm that will ensure at least a poverty line income for a household; clearly this will vary with household size, soil quality, local climatic conditions and personal abilities such as management skills. Mokhtar (1982) estimated that the minimum viable farm size on good, double cropped land was 1.2 ha, on poor double cropped land was 2.2 ha and on single cropped land was 3.2 ha. The Mid-Term Review of the Fourth Malaysia Plan accepted the minimum of 1.2 ha of double cropped land as necessary to generate income above the poverty line. However, a survey of households in the Kemubu scheme in Kelantan (Shand and Md. Ariff, 1983) found that average net farm income in the double cropped project area was approximately one third of the poverty line income which, since the average farm size operated in that scheme is 1 ha, suggests that a minimum size closer to 3 ha is necessary for a household to earn its livelihood entirely from padi. Whatever the minimum viable size, there is no doubt that most farms are too small to provide a living without additional sources

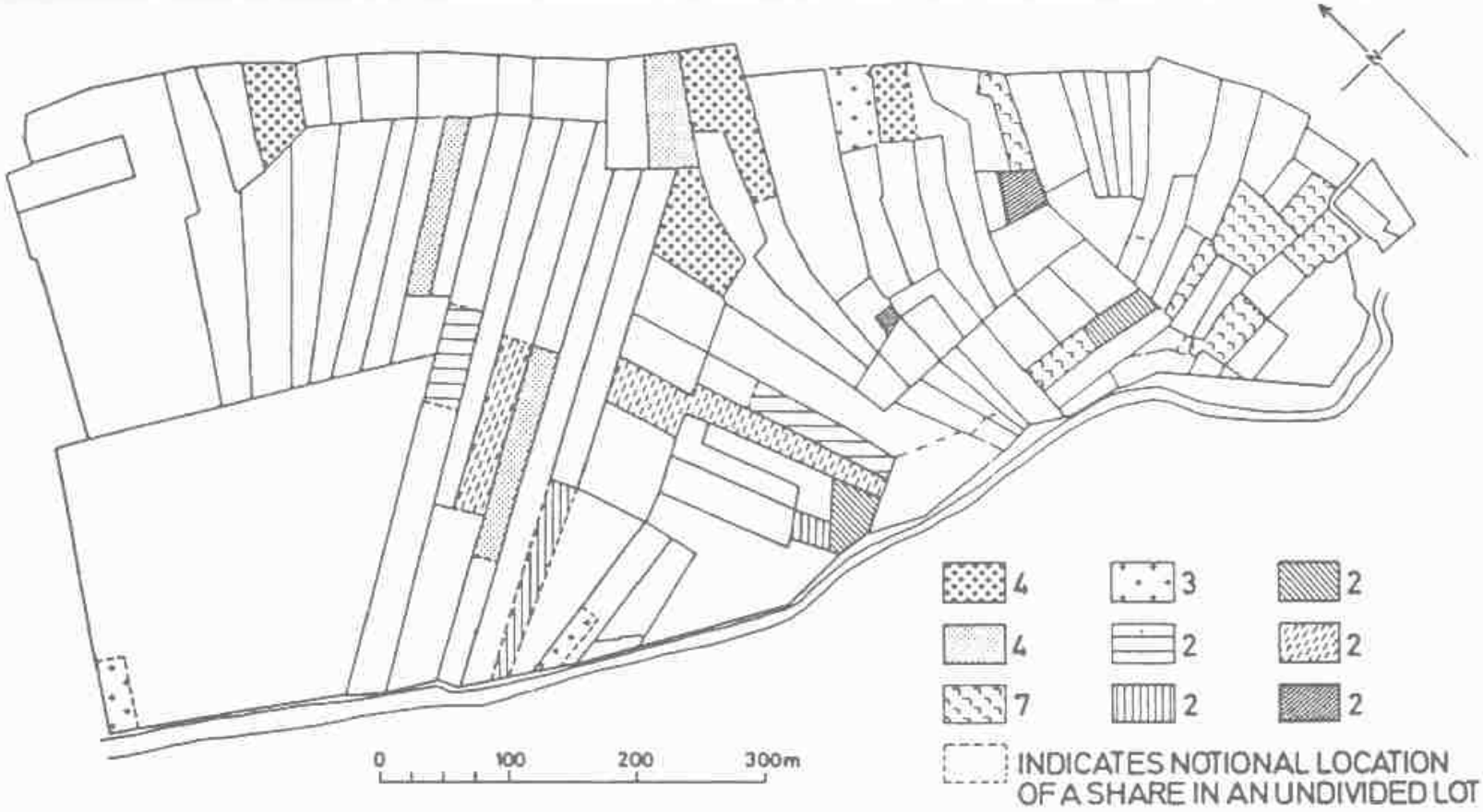

Figure 5.2 (a) Examples of fragmented ownership in the KADA Irrigation Area (Kg. Cherang Melintang)

Figure 5.2 (b) Examples of multiple ownership in the KADA Irrigation Area (Kg. Cherang Melintang)

of income being available to the household and, for reasons noted above, these sources are increasingly being limited to some form of off-farm employment. The Mid-Term Review reported that more than 50 per cent of Malaysia's padi farms were smaller even than its 1.2 ha minimum, and a recent Asian Development Bank report (1985) stated that 'perhaps as much as 40 per cent of the holdings in Peninsular Malaysia are of such small size that no known technology would permit the generation of farm incomes at levels that could comfortably place the farm families above the poverty line for the long term'. A growing response to this situation is for padi farmers to abandon padi growing altogether and to seek a full-time livelihood elsewhere in the economy.

III

'... the attractiveness of ... more remunerative employment opportunities ...'

Out-migration from the padi areas of Peninsular Malaysia has been apparent for a number of years. Between the 1947 and 1970 censuses, for example, the average annual population growth rate of the principal padi districts was 2.9 per cent, compared with the national figure of 3.47 per cent.[5] An analysis by the Muda Agricultural Development Authority (MADA) in 1972 of the population change between 1957 and 1970 of 26 Kedah *mukim* that were 'crudely classified as padi *mukim*' revealed an average population growth of only 1.54 per cent, with six below 1 per cent. Growth rates between 1970 and 1980 were even lower, with nine of the same *mukim* growing at less than 1 per cent per annum and two recording population declines. Wider evidence from the 1980 census preliminary field counts (Khoo, 1982) showed a marked population movement away from all the padi areas. Comparisons of *mukim* level populations with the 1970 census figures in all states except Selangor (where boundary changes in 1974 made complete comparison impossible) revealed declines in 22 per cent of *mukim* and growth less than the peninsular average in a further 45 per cent (figure 5.2). The vast majority (perhaps 75%) of these declining *mukim* were in padi areas. The number of economically active persons employed in padi growing fell by over 20 per cent in the intercensal period, and the average age of the remaining work force was considerably higher than the peninsula-wide figure (see p. 97). In one *mukim* (Melekek)

[5] Soon (1975) noted that, during the 1960s, there was only a marginal out-migration from rural areas as a whole and that the proportion of the population that was recorded as rural in 1970 was much the same as it had been in 1957 (73%). His analysis was, however, based on state figures and a simple rural/urban dichotomy in which out-migration from padi areas was concealed by the rapid growth of FELDA schemes during the period under review.

in Malacca the average age of household heads in the surveyed sample was 57, and 69 per cent of the 25–55 age group had left for employment elsewhere (Courtenay, 1988b).

A similar analysis of the 1991 census figures compared with those of 1980 (Department of Statistics, 1992) reveals that 23 per cent of *mukim* recorded absolute population declines and 42 per cent recorded growth less than the peninsular average. As over the previous intercensal period, many of these declining *mukim* were in padi areas—most notably in Malacca (where 28 *mukim* of the state's 82 lost population), Negri Sembilan (where absolute declines occurred in 23 of the state's 62 *mukim*) and in Perak (where 39 out of 81 *mukim* recorded population losses). Perhaps the most telling evidence of the changes in population in the padi districts comes from the Perak division of Kerian, site of the colonial period's principal irrigation project. In Kerian, between 1980 and 1991, every *mukim*, with the exception of the regional town of Parit Buntar, lost population. In 1991, the total population of the district had declined by 4.6 per cent since 1980. Outside Parit Buntar, the decline was 11 per cent.

The causes and effects of these population movements are complex. To some extent they are the consequence of 'pull' factors insofar as growth elsewhere in the economy is drawing population from the low-income padi areas. 'Growth areas' are both rural and urban. Land development schemes, especially those of FELDA, have attracted population to areas previously undeveloped where rubber and oil palm have provided the bases of highly organised commercial smallholdings and associated agro-towns. Some remote *mukim*, for example, in the interior of sparsely populated Pahang state, revealed population growths resulting from such schemes of over 200 per cent between 1970 and 1980. Other districts to which rural out-migrants have been attracted are the urban areas of all states, but especially of the west coast where commercial and industrial growth, and often associated spontaneous settlement, has been taking place. Between 1980 and 1991, certain districts of Trengganu, for example Dungun and Kemaman, also recorded very high increases resulting from developments associated with the processing of off-shore petroleum resources. There is little doubt, however, that the circumstances described in section 1 above, which have made it increasingly difficult for the small farmer, and especially the tenant, to make a living from padi farming, have been major 'push factors' in creating out-migration. In this context, such out-migration to urban areas may be seen as economically rational even when opportunities in the urban sector are known to be uncertain (Todaro, 1977; Stark and Levhari, 1982). The recognition of such uncertainty is often confirmed by the choice of many migrants to leave young children with grandparents in the *kampung*.

Although many out-migrants from the padi areas have been landless labourers or tenant farmers—the first group to suffer from falling employ-

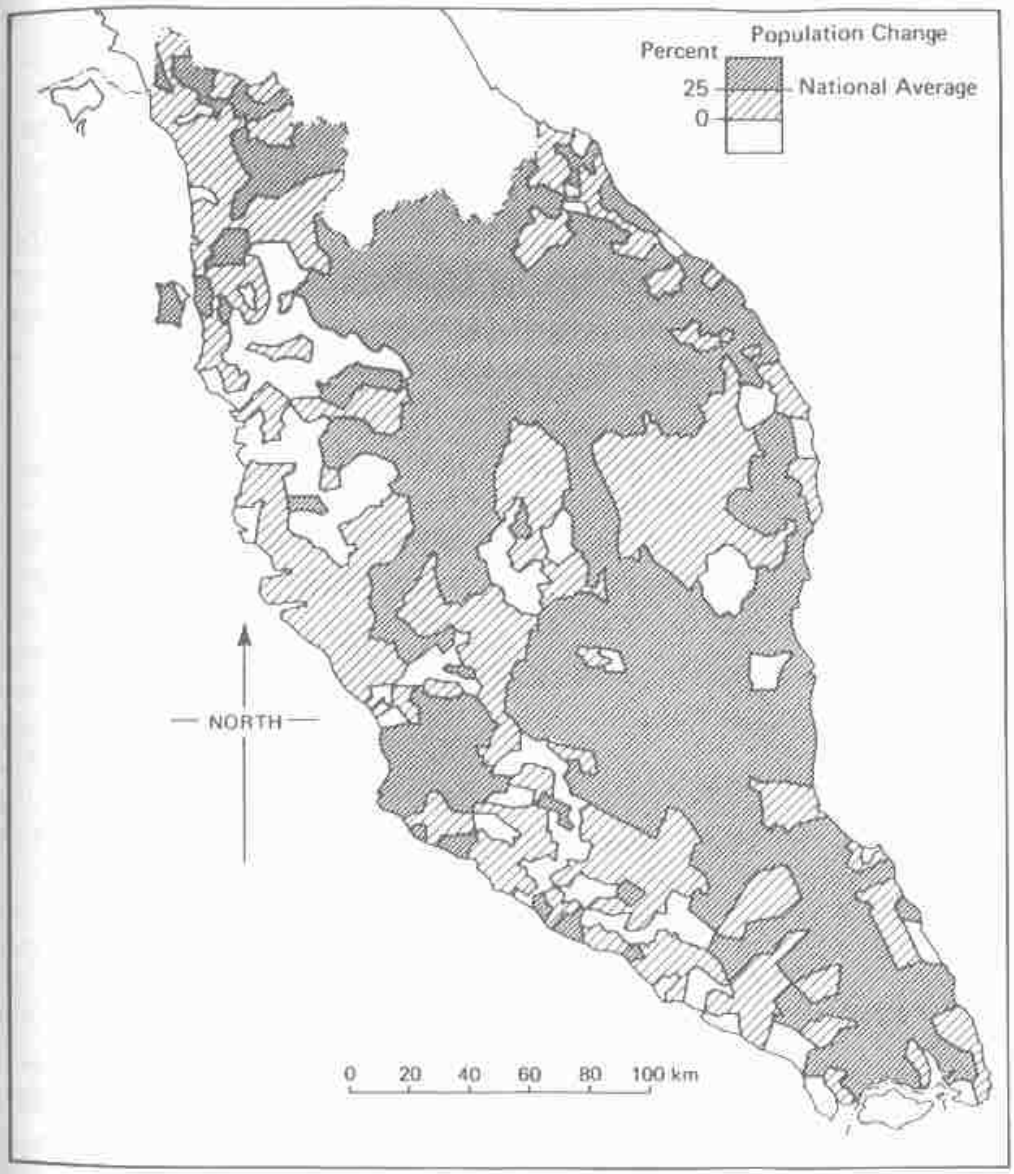

Figure 5.3 Peninsular Malaysia—percentage population change, 1970–1980 by mukim

ment opportunities and land repossession as mechanisation expanded—sufficient owners or owner-tenants have left to create a growing problem of idle padi land. This problem was recognised in the Mid-Term Review (1984) which attributed it to 'the shortage of labour leading to abandonment and underutilisation of alienated cultivable land'. In essence this rather bland statement is accurate, but it avoids specific identification of the cause of much of the shortage—the very low incomes that are earned by most padi households. The National Agricultural Policy also recognises the agricultural labour shortage, but attributed it entirely to pull factors—'the rapid migration of rural youths to urban areas as a result of the attractiveness of the more remunerative employment opportunities as well as glamour of living and working in non-agricultural sectors'. This statement is an interesting echo of the one made by Haynes half a century earlier (see page 50) and is surely one that many in the squatter settlements of Kuala Lumpur and other Malaysian cities would challenge as a description of their new environment.

Efforts to determine the extent of padi land that is lying idle have proved difficult and figures are not readily available. A distinction is made between padi land defined as permanently idle, that is land which has been alienated for padi but which has not been cultivated for three successive years, and off-season idle (better described as underutilised), that is land which is single cropped within a double-cropped area. Ministry of Agriculture figures for 1986 recorded 91,203 ha as permanently idle (an increase of 27 per cent over 1982) and 34,052 ha as off-season idle, though, as discussed in the footnote to Table 5.1, the figures raise statistical problems in some instances. Between 1982 and 1986, over 9,000 ha of the permanently idle land was rehabilitated by various agencies along lines discussed in chapter six, but this rehabilitation clearly was unable to keep up with the extent of abandonment except in the case of the states of Penang and Selangor. Table 5.1 illustrates the distribution by state of permanently idle land, with an attempt to estimate for each state the percentage of total padi land that it represents. In addition to the 91,000 ha of permanently idle land recorded in 1986, a further 34,000 ha of off-season land was reported idle by the Ministry of Agriculture (pers. comm., 1986) but the figures appear to contain many inconsistencies and are not reproduced here.

Although there is no way of confirming a precise congruence between the 130,000 ha of land which were 'lost' by the padi industry between 1978–79 and 1985–86 (see appendix table 1(a)) and the existence in 1986 of 125,000 ha of idle land in Peninsular Malaysia, it is a fair assumption that most of the reduction in cultivated area was due to an active withdrawal from padi growing by substantial numbers of farmers. The existence of approximately 25 per cent of its total padi land lying idle during the main season, with perhaps a further 14 per cent of irrigated

land uncultivated during the off-season, has clearly caused considerable official concern and investigations have suggested several reasons for its abandonment.

Writing in 1982 Mokhtar suggested four principal reasons for the abandonment of padi land—deteriorating physical circumstances; subdivision, fragmentation and consequent small farm size; high rents; and a shortage of farm labour resulting from out-migration. Deteriorating physical circumstances included soil degeneration, especially where acid sulphate conditions were exacerbated by dwindling water resources, and problems associated with drainage and irrigation. These rendered land unsuitable for continued cropping, in some cases as a result of bogginess caused by excessive irrigation water or by the inability of substandard schemes to deliver adequate supplies. Brookfield *et al* (1991) noted that, for example, in Selangor, a number of smaller, higher valleys had gone out of padi production by the mid-1960s. Stream aggradation, resulting from forest clearance for rubber and timber extraction in the upper parts of catchments, was seen as a major cause in reducing the suitability of land for *sawah* development. It has been noted in the Alor Gajah area of Malacca that most of the abandoned land in one *mukim* occurred in those parts to which irrigation water was most difficult to convey (Courtenay, 1988b). The incidence of pests, particularly of rats, can reduce productivity to a point where continued cultivation becomes quite unremunerative, a situation that has a positive feedback and consequent cumulative effect since idle fields are themselves a stimulus to the breeding of rodents. A detailed official investigation carried out in 1987 by the Ministry of Agriculture similarly places some emphasis on physical conditions, including climate, topography, land quality and inadequate infrastructure.

Clearly each farmer who chooses to leave some or all of his padi land uncultivated does so for a set of specific reasons. In some cases, but probably in only a relatively small proportion, the decision is forced on the household by physical circumstances but generally it is reached by the assessment of economic alternatives. Where the decision is no longer to cultivate padi, it will have been made on the grounds that returns from resources expended (including labour) are expected to be greater elsewhere in the economy. The differential between the alternative income and that to be derived from padi cultivation is necessarily greater, and liable therefore to affect even the better managed households, in those areas where yields are lower, water supply less reliable or infrastructure less developed. In such areas the proportion of idle land is accordingly higher, as is illustrated in table 5.1 which, despite the shortcomings of the data, indicates that the incidence of permanently idle land is greatest in Negri Sembilan, Pahang and Johore and lowest in Kedah/Perlis, Selangor, Perak and Penang.

Table 5.1 Peninsular Malaysia—permanently idle padi land by state, 1986[a]

	Area of padi land permanently idle, 1986 (ha)[b]	% increase (+) or decrease (–) since 1982	% of total padi land (1970s) permanently idle (1986)[c] (ha)[b]
Johore	2,017.6	+ 20.0	36.5
Kedah	7,338.6	+ 68.4	6.0
Kelantan	23,398.2	+ 16.9	33.3
Malacca	3,250.1	nil	27.3
Negri Sembilan	10,284.9	+ 9.6	100.0+
Pahang	20,281.6	+ 103.0	100.0+
Penang	4,017.1	+ 28.7	23.2
Perak	10,466.4	+ 15.9	20.9
Perlis	–	–	–
Selangor	1,427.1	– 0.02	6.9
Trengganu	7,138.4	+ 1.6	23.5
Peninsular Malaysia	91,202.8	+ 27.0	24.4

a *It has not proved possible to up-date these figures. An official of the Department of Agriculture reports that, although rehabilitation of idle padi land is taking place, through the medium of various of the schemes described in this book, abandonment continues to occur. One can sympathise with the difficulties of keeping check.*

b *These figures were collected by staff of the Ministry of Agriculture. The Ministry believed them to be reasonably accurate, though it is difficult to accept that, in both Negri Sembilan and Pahang, more padi land was reported as permanently idle than the largest area recorded under wet padi between 1970 and 1982. Both states recorded over 2000 ha of wet padi in the 1986–87 season. In view of the known out-migration from the Kedah padi areas between 1970 and 1980, the Kedah figure seems low, but may well be accurate. Kedah farms are larger than the national average and padi yields are amongst the highest in the country; much of the out-migration has probably been of the landless.*

c *It is extremely difficult, if not impossible, to determine the amount of land that has been alienated for padi in each of the states of Malaysia. These calculations are based on the largest area actually cultivated in each state since 1970. There is no guarantee that all of this land is still available for padi cultivation. Much has undoubtedly been lost to urban expansion alone.*

The decision to leave padi farming, most commonly taken by younger adult members of a household, inevitably reduces the availability of agricultural labour and this shortage *per se*, rather than the circumstances that created it, has been blamed for the phenomenon of idle land and the fall in padi production resulting from it. To reach the national output targets, as well as to derive maximum benefit from the investment in infrastructure, padi land cannot be allowed to remain idle. There appears also to be a feeling that it is intrinsically undesirable that padi farmers should be leaving the land. The National Agricultural Policy seeks 'to facilitate the retention of productive labour in agriculture', while the Final Report of the Kemubu Agricultural Development Authority (KADA) II Improvement Project writes of *artificial* shortages of labour created by

the migration of farm family labour to more lucrative crops or jobs and sees the reluctance of farmers to grow padi as a 'constraint that needs to be resolved'!

Small farm size is acknowledged in the official literature as the prime cause of land abandonment and of the poverty associated with padi growing although there was no attempt in the Ministry of Agriculture's 1987 report to correlate the occurrence of idle land with holding size. The National Agricultural Policy identified the existence of uneconomic-sized holdings as a constraint on agricultural improvement, and the Mid-Term Review of the Fourth Plan similarly commented on the 'constraints imposed by the small size of agricultural holdings'. The Fifth Malaysia Plan employed the same terminology, while the Sixth merely refers to programs for the consolidation of idle and uneconomic farms and the increasing of productivity through economic size operation, the adoption of modern. technology and the provision of improved infrastructural facilities. The policies adopted to tackle this problem—which are examined in chapter six—are squarely based on the belief that greater access to technology, to be made possible by land re-organisation of a physical kind, will result in higher returns per unit area and thereby help eliminate poverty. This belief is in keeping with the arguments that the net return from the new technology is greater for the bigger farmer, though there is some evidence (eg Mokhtar, 1978; Fujimoto, 1980) that there is no significant difference between the efficiencies of large and small farmers. It is clear, however, that any policies that bring idle land back into cultivation will contribute to total production and increase available incomes, while physical improvements that reduce obstacles to better water provision or coordinated pest control seem bound to have beneficial effects for those whose land is involved. The strategies that have flowed from the National Agricultural Policy have, nevertheless, avoided coming to grips with the principal structural weakness of the padi industry—the widespread occurrence of farms that are so small that, even in the high yielding Muda area, productivity would need to double to raise the average farm household above the poverty line (Shukor, 1984).

Schuh and Barghouti noted in 1988 that the use of new technology in basic food production can lead to the paradoxical situation of 'immiserising growth', whereby producers and workers in the sector become worse off then they were before the new technology was adopted. Gibbons *et al* (1980), in their study of villages both in Aceh (northern Sumatra) and Kedah concluded that even where the green revolution has spread widely, including among small farmers, as it has in Malaysia, a disproportionately large share of its benefits still goes to the bigger farmers and many inequalities are increasing. It is unlikely that there are many cases in Malaysia where padi farmers are worse off in an absolute sense than they were before the new technology was adopted, though some former tenants

whose land was re-possessed may be. Malaysia's poverty line income is relatively high (perhaps three times that of Thailand in monetary values) and the 1980 Census showed a fairly extensive ownership of consumer durables. Even in rural Kelantan, the poorest part of the poorest state, census tabulations suggested that 23 per cent of households possessed motorcyles and 19 per cent owned television sets. Relative deprivation, however, especially if it is worsening, is particularly divisive both socially and politically. More equal development in rural Malaysia requires more equal access to agricultural land, a question that, as yet, Malaysia has failed to address.

6

"Some Form of Land Consolidation is Imperative . . ." — New Policy Directions

'The performance of agricultural productivity is constrained by the small size of agricultural holdings . . .'[1]

Lahuma sat motionless. He was counting his seven children, as if he had forgotten how many there were. One, two, three, four, five, six, seven. His father owned twenty relongs of rice-land. Six relongs had fallen into the hands of a Chinese through a mortgage. That left fourteen relongs. And fortunately Lahuma was an only child. All fourteen relongs of rice-land became his by inheritance.

But the fourteen relongs remained fourteen relongs. No less, no more. Not one inch more. He had seven children. Two relongs each. What could be done with two relongs? What indeed? Lahuma stared at the dusty earth. To try and increase the number of relongs was out of the question. There were simply no ways open in that direction. Nor was there any point in looking for another source of income. So far the fourteen relongs had served to feed him and his family. He and Jeha had never yet starved. And his children had never had to eat boiled tapioca or maize porridge for lack of rice. For this he thanked God, Allah the Almighty.

But what would happen after his death? The fourteen relongs of rice-land would be divided up. Two relongs each. And when his children had children of their own, their shares would again be divided up. His grand-children would get very little each. And perhaps by the time it got down to his great-grand-children, there would not be even a hand-span left for each.

[1] The chapter heading is a quotation from Mokhtar and Hashim (1975) and the introductory quotation is from the Mid-Term Review of the Fourth Malaysia Plan (1984).

Lahuma felt an aching congestion in his breast. Slowly he looked up and again his gaze was fixed on the tops of the jungle trees which were still straining to touch the sky.

'Our great-grand-children will be beggars. Our great-grand-children will be beggars,' he muttered to himself.

(Shahnon Ahmad, "No Harvest but a Thorn" 1972)

1 relong = 0.54 hectare

I

'... the full commercialisation of agriculture...'

The adoption of the National Agricultural Policy in 1984 had as its principal purpose the provision of guidelines to help unify and direct the efforts of all those involved in agricultural development. The Policy was a response both to the changing situation in agriculture in the late 1970s and early 1980s, especially to the increasing abandonment of padi land and the consequent decrease in padi production, and also to the slow-down in the nation's industrial growth which seemed likely to absorb fewer rural out-migrants. As noted in chapter four (p. 87) its specific objective was to maximise income from agriculture through the efficient utilisation of the country's resources and the revitalisation of the sector's contribution to the overall economic development of the country. The production of all agricultural commodities, except rice, was to be based on technical, including agro-climatic, considerations as well as economic returns. In respect of rice, the country's staple food, its production was particularly concerned with considerations of national food security, theoretically aiming at 80–85 per cent self-sufficiency.[2]

The National Agricultural Policy sought to achieve two ends—the maximisation of farm incomes by the raising of productivity and the retention of productive labour in agriculture. In terms of the development models on which the policy is based, the objectives are to some degree

[2] Self-sufficiency as a national policy emerged during the post-war period of rice shortages, and became a major issue again following the international shortage of 1973–74. The percentage of self-sufficiency at which official policy has aimed and the actual achievements have varied. The official aim was 90% under the Second Malaysia Plan (1971–75), 100% under the Third Malaysia Plan (1976–80) and 80–85% under the NAP (1984). Actual achievements have been 78% (1970), 90% (1976), 92% (1980). Informed sources suggest 65% is likely to be the future aim. In autarkic terms, self-sufficiency is a deceptive concept in Malaysia anyway unless the inputs on which production now depends—the fertilisers, pesticides and farm machinery—can all be produced within the country.

in conflict with each other. To raise productivity in the padi sector, reliance is placed on the same green revolution technology that was responsible for the large increases of the 1970s and seemingly accepts the belief of some recent researchers (eg. Lipton, 1987; Hayami, 1988) that it is the *insufficient* progress of the green revolution that explains the widening inequalities visible in many rural areas (Rigg, 1989). As spelled out in the Mid-term Review of the Fourth Plan and in both the Fifth and Sixth Plans, emphasis is to be put on the full commercialisation of agriculture rather than on maintaining a subsistence system. In terms of the Weitz (1971) model (see chapter one, p. 10) this represents a positive shift into the third and last stage of 'farm evolution', or in Lim's (1977) typology into the fourth, or commercial, type.

As part of the commercialisation program, the National Agricultural Policy plans to intensify padi production in existing double cropping areas, where much infrastructure has already been provided, and large-scale cultivation is to be encouraged. Economies of scale are expected to raise productivity per hectare, and presumably per worker, by the use of 'modern farming practices' (NAP) 'managed by trained professional management teams' (Fifth Plan). This expectation is an unambiguous acceptance of the position of those, like Graham and Floering (1984), who believe in the general applicability to all agriculture of the corporate plantation system, though co-operative farming is seen as an alternative form of large-scale operation. Outside the granary areas all other current padi land not used for rice production is to be phased out gradually and used for the production of other more remunerative crops. In some instances these will be export crops; in others fruits, vegetables and perhaps livestock, the consumption of which tends to increase as per capita incomes rise.

The Fifth Plan acknowledged that the 'estatisation' of agriculture (its term for consolidation to benefit from economies of scale) would be accompanied by the further release of labour from the land. Although fully consistent with all agricultural growth models, with historical precedent, and even with common sense, this acknowledgement is contrary to the National Agricultural Policy's expressed intention of retaining productive labour in agriculture. The conflict between the Policy's intention to retain labour in agriculture and the Fifth Plan's expectation of further out-migration may reflect different theoretical beliefs, with the Policy adopting, for example, Lewis's (1955) opinion that traditional institutional frameworks were quite adequate for enormous advances in productivity, and the Fifth Plan accepting Higgins's (1959) views that the ratio of land to labour needed to be increased 'a good deal' if the marginal productivity of the former were to be raised.

The inadequacy of the modal Malaysian padi farm to yield an income above the poverty line has already been argued (chapter five) and most researchers would agree with the statement of Mokhtar and Hashim (1975)

that the incremental earnings from greater efficiency would raise most farm incomes only marginally. The belief, advanced by those authors in relation to Kelantan, that some form of land consolidation is imperative to provide padi farmers with a minimum sized holding to enable them to achieve a reasonable standard of living presumes an increase in the land available per household. 'Estatisation', by contrast, involves consolidation for technical reasons with no enlargement of the land base of the individual household and is being undertaken on the basis of various models within the existing ownership structure. The physical consolidation made possible by the various forms of 'estatisation' is intended to permit the achievement of scale economies and anticipates higher yields, the benefits of which will flow on to the owners of the land incorporated into the 'estates'. Idle land will be rehabilitated and worked as part of the consolidated schemes whether owners are present or absent. The 'estatisation' concept is strongly influenced by the plantation or estate sector which, in terms of productivity, has undoubtedly achieved substantial economic success in its near century-long experience in Malaysia. As it has become streamlined over the years, it has benefited from economies of scale in clearing and opening land, in processing its crops, in financing and management. Land development schemes of the FELDA type have themselves been modelled on the estates, especially in their techniques of operation, and their settlers' incomes have been shown to be at least three times greater than were received from previous rural employment (Shamsul et *al*, 1979). 'Estatisation' of padi seeks to give the padi grower similar rewards.

Experiments with land consolidation to rehabilitate idle land and permit the more efficient use of modern technology were undertaken in the Kemubu Agricultural Development Authority (KADA) irrigation and double cropping scheme in Kelantan before the release of the National Agricultural Policy and its 'estatisation' concept. The principal objective of KADA's consolidation projects was to rehabilitate idle padi land and to bring it back into production by undertaking necessary drainage and/or irrigation works and by reallocating existing land holdings, less 10 per cent surrendered for service areas, so that the resulting lots were of more appropriate sizes, shapes and levels for effective irrigation, mechanised farming and efficient management. It was anticipated that the projects would encourage farmers both within and adjacent to the pilot areas to adopt new agricultural technology and thus enhance productivity at the farm level. Project implementation involved the identification of suitable areas, tracing the owners, convincing the owners of the benefits of the project and obtaining their agreement to participate, planning the lay-out of the project, and project construction.[1] The first four projects were completed

[1] In more detail, the implementation of KADA consolidation projects involved:

by mid-1984. The first project (figure 6.1) was expensive. Covering an area of 12 ha, it involved 39 owners whose farms averaged 0.31 ha, though—owing to co-ownership—there were only 24 active operators. An original 45 lots, ranging in size from 0.1–0.86 ha, were re-allocated as 126 new lots of regular shape and approximately 0.1 ha area. The total cost of the scheme was nearly M$350,000, or about M$29,000 per ha (M$14,500 per operator).

Various modifications were introduced in later projects. These included cost reductions by the use of less expensive irrigation materials and methods, the grouping more completely of individual operators' lots which would ease farming operations but meant the abandonment of the attempt made in the pilot project (see note 3) to retain some traditional land for each owner, the encouragement of owners of small areas to sell their land through a land bank project, and the granting of preference as settlers on commercial crop resettlement schemes to small owners who sold or rented their land to neighbours. Whereas the early KADA consolidation schemes dealt entirely with idle land, later projects involved land still worked and required payment of compensation for crops forfeited during construction.

Underlying the KADA consolidation schemes were a number of prin-

1. the identification of suitable areas. For the first six projects this involved idle land—in the case of the first, this was inadequately drained land alongside the primary canal.
2. tracing owners. This was undertaken with the assistance of the district officer and *pengulus* (headmen). For the existing projects, this posed no problems, there were no absentee owners and all were quickly located. (In the case of the first, 80% of the owners had left padi farming and were employed in off-farm work or were growing other crops).
3. convincing owners of the benefits of the project and obtaining their agreement to participate. This was planned through key persons at the village level, including the *pengulu* (headman), *imam* (mosque official) and religious teachers; the younger and better educated owners generally proved easier to convince. (In the case of the first project, at the end of 5 months, 39 owners agreed to participate, a number of owners of land that could have been included chose not to do so). Reluctance to participate was attributed by an evaluation report as due to the traditional attachment to land, rumours about the government's intention to dispose of the land to overseas interests, and innate conservatism.
4. planning the lay-out of the project. This was undertaken with the assistance of a committee representing owners and operators. A number of criteria were involved in designing the new lot lay-outs; these included the determination of size on engineering grounds, attempts to include at least some of an owner's original land in his new holding, the allocation to each owner of an area of land equal to his existing holding, less 10% service area (for quaternary canals, farm roads, etc.), in one or only a few lots, the provision of independent water off-takes and drainage outlets for each lot and access to farm roads for each lot.
5. project construction. This involved drainage, levelling, new bunding, construction of water channels, drains, roads etc.

Of the total area involved in the first project 14.5% was held by owner-operators, 42.4% by owner/tenants and 42.1% by tenants.

Figure 6.1 KADA farm lots before and after consolidation

ciples that have become standard in most 'estatisation' programs. Production values are paramount in that the principal purpose of all programs is to bring idle land back under cultivation and to raise general productivity. There is no interference with existing ownership rights. Each owner involved in any program retains not only title to a particular area of land but specifically to his original lot or lots, even if that land is worked by someone else as a consequence of the re-organisation. Inheritance is of the traditional land but, except perhaps by chance, the heirs are unlikely to have physical access to it. Involvement in schemes is voluntary, though strong moral pressure may be exerted on individuals especially those whose land is particularly central to a project, and 'estatisation' schemes are able to incorporate idle land whose owners cannot be traced.[4]

The 'estatisation' strategy is evolving in two forms, *group farms* and *padi estates*. During the period of the Fourth Malaysia Plan (1981–85), about 27,000 ha of abandoned padi land were rehabilitated with much incorporated into one or other of these models of land consolidation. The Fifth Plan rehabilitated 38,600 ha of idle land in the country as a whole through the activities of the Federal Land Consolidation and Rehabilitation Authority (FELCRA). About 7,800 ha of abandoned padi land were rehabilitated partly through group farming or as padi estates run by private companies (Government of Malaysia, 1991). The concept behind group farms and padi estates is to operate previously idle land on a cooperative basis paying rent to the owners, wages to the operators and any balance that might accrue, following sale of the crop, to the project. In the case of the group farm, this will be paid to the operators in proportion to their labour input, or, in the case of the padi estate, to the corporate group (Farmers' Association or private entrepreneur) which operates the estate. Labour may be hired if participating farmers are too few, or unwilling to provide it themselves. Project implementation is similar to that of the KADA consolidation schemes except that idle land whose owners cannot traced may be incorporated. In such cases income accruing (rent and/or profit) is held in trust against the time when owners may be located. Both models may, of course, incorporate active farms as well as abandoned ones and, indeed, full implementation of the 'estatisation' concept requires that they should. As noted in relation to the KADA consolidation schemes, however, such incorporation will involve the loss of at lease one season's crop (except perhaps in single cropping areas) and require compensation.

Group farms are generally below 40 ha in size and may be organised

[4] Under the provisions of the National Land Code (1965), the traditional period of three successive years (see p. 34) without cultivation makes padi land liable to repossession by the state (in lieu of the raja). Since, by definition, idle land is land left uncultivated for three successive years, there is no legal impediment to its incorporation into a government-sponsored project even in the absence of permission from its title-holder.

under the aegis of a Farmers' Organisation[5] and receive regular extension visits, perhaps on the basis of 'training and visit' (T and V) groups. Padi estates are larger and may be operated by a Farmers' Organisation or a private company. A minimum size of 200 ha is recommended. Land owners may participate in the estate either by leasing their land directly, by shareholding, or by profit-sharing. Share values are based on the value of the yield of the land 'surrendered' to the association or company. Within the broad concept of the padi estate, details vary from scheme to scheme according to local circumstances. In the Tanjong Karang district of Selangor, for example, where individual farms are less fragmented because of more recent, planned settlement, farmers continue to operate their own land. The estate, operated by the Farmers' Organisation, provides (at a cost to the farmer) mechanised land preparation, seeding, fertiliser transport, pest control and harvesting. The farmer undertakes the application of fertiliser, weeding, maintenance, necessary spraying and stubble burning on his own plot.

II

'... these towns ... will increase and diversify opportunities.'

Rural development, however it might be defined, clearly involves more than agricultural modernisation and although, as noted in chapter four, emphasis in government expenditure has been on increasing the productivity of the padi sector, much investment has been made in other rural infrastructure, such as roads, schools and the provision of clean water and electricity. By 1985, for example, over two thirds of the rural population were provided with sanitary latrines, 58 percent with safe water and 68 percent with electricity (Government of Malaysia, 1986) and it was apparent that the cost of extending services to the remaining, mainly small and remote communities was likely to be unacceptably high in cost/benefit terms. The Mid-Term Review of the Fourth Malaysia Plan introduced the concept of rural urbanisation, or *kampung* regrouping,[6] as a means of dealing with this and associated rural problems.

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[5] Farmers' Organisations are defined as 'rural institutions created by the Malaysian government to perform multi-purpose functions within the over-all context of rural development'. They were created in 1975 by the integration of Farmers' Co-operatives (set up in 1922) and Farmers' Associations (established in 1958) (Fredericks *et al.* 1980). Farmers' Associations still exist as voluntary organisations concerned with local business activities such as selling fertilisers. Farmers' Organisations are under the control of the Ministry of Agriculture.

[6] The official term for this policy is *Hala cara baru pembangunan luar bandar* or 'a new approach to rural development'. In view of the non-specific nature of this term, the more descriptive 'village (or *kampung*) regrouping', also called 'rural urbanisation', is

Rural urbanisation, or *kampung* regrouping, was described in the Mid-Term Review as the 'settlement of population in peripheral villages to form an urban nucleus'. The regrouping policy aims to tackle three elements of rural underdevelopment conjointly—small farm size and the associated phenomenon of idle land; the limited availability of alternative, off-farm, employment in many rural areas; and the non-viability of basic service provision to many small, and more remote, communities. The strategy of the policy involves the selection of a number of *kampung*, in some cases as many as 15 or more but most commonly 2 or 3, and the relocation of their populations into planned, geographically centralised settlements. These will be large enough to support urban services that could not be provided individually to small villages with sometimes as few as 40 households. The Mid-Term Review anticipated that the growth of 'these towns, supplemented by relevant social and economic policies, will increase and diversify opportunities for productive employment largely through the development of linkages between the non-agricultural activities of these towns with the agricultural activities of the rural hinterland'. The improved rural-urban linkages are also expected to act as catalysts for rural modernisation.

Rural re-structuring is an essential component of the regrouping policy. It is a basic premise of official Malaysian thinking that the small size and fragmented nature of very many holdings are the principal factors that are limiting modernisation and the reduction of rural poverty. The introduction of 'green revolution' technology—including irrigation and mechanisation—into padi growing is clearly difficult and costly when total holdings are small and usually fragmented and individual lots are irregular in shape and often minuscule in size. For many individual households, available resources are inadequate for the hiring of farm machinery or to pay rent in advance, as is being demanded by many landlords, if they seek in that way to expand the area of land they operate. The consolidation of holdings, and their subsequent working as a group farm or padi estate, is seen as a means of raising over-all productivity and hence the incomes of all whose land is incorporated. Replanting of old rubber with new, high yielding material is also impossible on smallholdings since no income will be forthcoming during the 5–6 year maturation period of the replanted seedlings. Amalgamation for replanting purposes of neighbouring smallholdings into a mini-estate, with short-term cash crops to provide interim incomes, is a technique developed by the Rubber Industry Smallholders' Development Authority (RISDA) to overcome this difficulty. Thus, the starting point of a village regrouping scheme is the voluntary amalgamation of holdings, some of which may be lying unplanted or untapped,

employed in this chapter, though it should be understood that the policy involves more than the mere relocation of settlements.

for consolidation, restructuring and/or replanting but with no loss of original title. In some cases, house lots and associated orchards *(dusun)* may be incorporated in the re-structuring and a whole *kampung* cease to exist (Courtenay, 1990), (fig. 6.2).

The creation of non-agricultural, off-farm employment is a crucial accompaniment to farm consolidation. There is much evidence that agriculture is already a part-time occupation for many. Most recent surveys report considerable off-farm employment undertaken, for example, by padi farmers, though it consists largely of unskilled, low paid and irregular work—coconut plucking, construction work, thatching, peddling, driving and the like. More formal employment in the industrial or the service sector will be necessary to absorb the additional numbers seeking non-agricultural work as the regrouping policy proceeds.

The amalgamation of holdings into group farms or mini-estates will create 'surplus' labour in two ways. First, the mechanisation of a consolidated padi cooperative or 'estate' will, almost by definition, require fewer workpeople. Similarly a replanted rubber mini-estate initially will need fewer, if any, tappers. Secondly, landless padi farmers who had worked rented land, or others who had tapped rubber on larger smallholdings owned by neighbours will clearly receive no income from an amalgamated holding since they will have no title to a share in it. When these two groups of newly unemployed workers are added to those household members who, because of shortages of land, were already seeking off-farm employment, a sizeable pool of labour will exist that will have no prospects of agricultural work.

The establishment of small scale industries, with the assistance of the Ministry of National and Rural Development, is expected to provide employment for some, at least, of these individuals. Food processing, canework, pottery—perhaps organised by small co-operatives—are seen as potential activities. Although regrouped villages will find it difficult to attract any but the most basic localised industries, the success of the policy is likely to depend upon a wider range of industrial options than those provided by a few craft-type activities of this kind. At present, although Malaysia's industrialisation has grown to a point where manufacturing contributes 27 per cent (Government of Malaysia, 1991) of gross domestic product, most industrial employment is to be found in the major urban centres, industrial estates and export processing zones. The indentification and attraction of appropriate manufacturing to regrouped villages will need to be a high priority.

The physical regrouping of villages into planned townships is the third and final stage of the process. Its implementation is not seen as a constraint to the continuation of the first two stages and its ultimate achievement may well lag behind them. Basic services, including health and educational facilities, water and electricity are provided by government

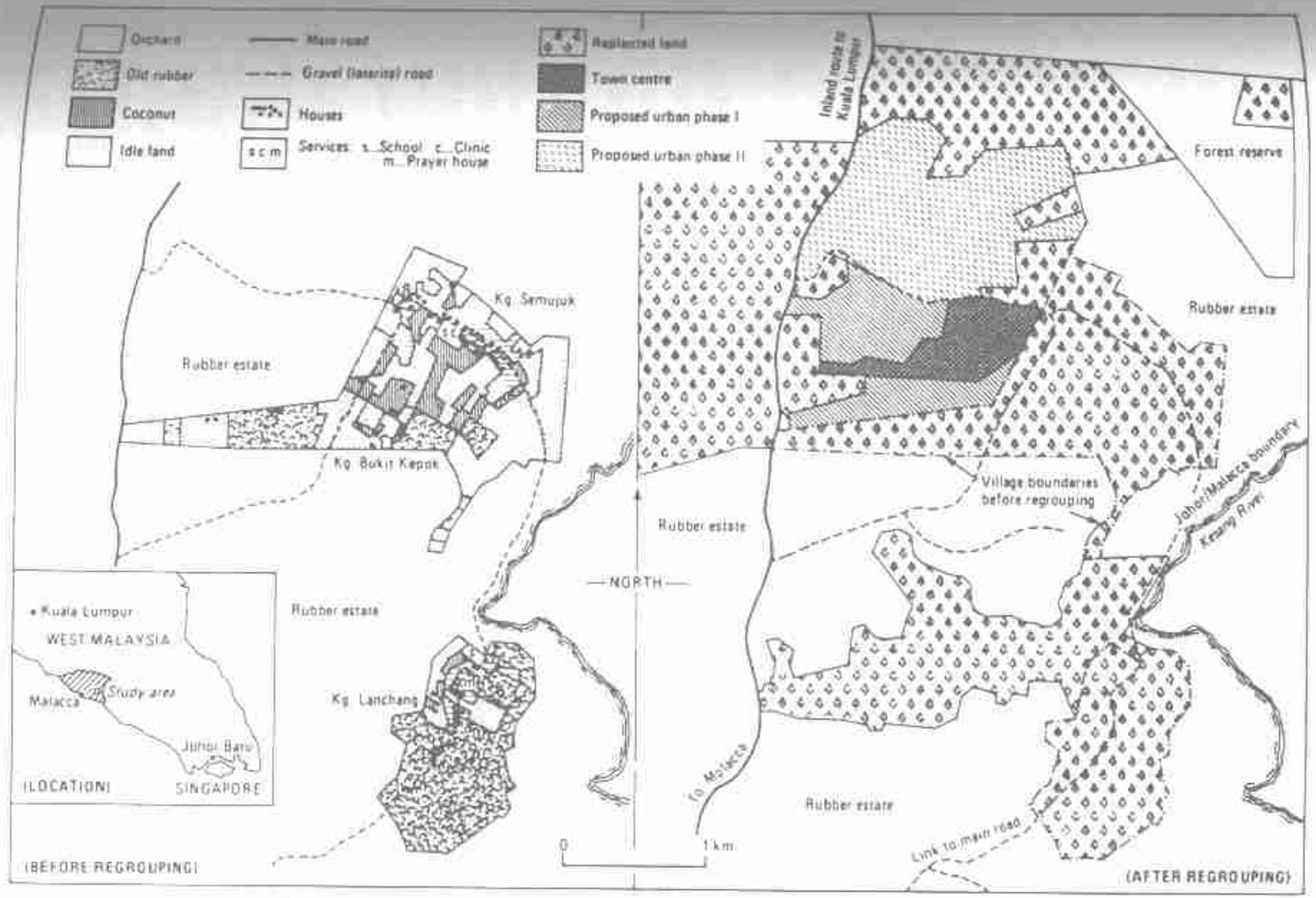

Figure 6.2 A regrouped *kampung* in Malacca—Kg. Seri Mendapet
(Map courtesy of the *Geographical Association*)

in the township. Housing costs are met, often on mortgage, by households themselves, either through the low cost housing scheme loans available from the Ministry of Housing and Local Government or through schemes managed by private financial institutions. The 'ideal' size of the new townships is 2,000–3,000 people (500–600 families), drawn from *kampung* within 3–4 kilometre radius. Once regrouping has taken place, the abandoned *kampung* sites are incorporated into the agricultural schemes.

By the end of 1988, 33 regrouping schemes had been planned in Peninsular Malaysia, with a further four in East Malaysia. Schemes are located in every state and will involve a total of 9,255 households, of which 96 percent are in the peninsula. The sizes of the planned regrouped townships vary considerably, from a total population of 200 to 6,000 in the peninsula, and between 400 and 700 in East Malaysia. The numbers of villages included in individual schemes range from one (which is hardly regrouping!) to 19, with a modal number of three. The agricultural bases of the villages vary; a number of those selected for regrouping grow padi and will continue to do so, though the larger proportion will concentrate on non-padi, commercial crops—rubber, oil-palm and cocoa, with a few producing tobacco and dairy products.

In terms of amenity provision, there is no question that the householders in regrouped *kampung* are to be far better served. In terms of land productivity, improvements are undoubted. In common with related concepts such as padi estates and group farms, which in many cases will be integral elements of 'rural urbanisation', *kampung* regrouping has its problems nevertheless. While landowners retain title to their original holdings, and thus to an equivalent share in the reorganised agricultural undertaking, the landless have no such privilege. Some will doubtless obtain employment from the contractors who will prepare the land, plant it and maintain it, or from the bodies responsible for the agricultural organisation—the Federal Land Consolidation and Rehabilitation Authority (FELCRA), RISDA or the local Farmers' Organisation.

The future of others will depend on the expected, but still only potential, employment opportunities in the new townships which are far from guaranteed. The elderly particularly will stand little chance of obtaining paid work. Repayment of development costs is also likely to be a burden to those landowners whose 'shares' are small, especially when world market prices for their export commodities are low. In general, the success of *kampung* regrouping in helping reduce rural poverty is likely to depend on a greater degree of rural industrialisation than is yet occurring in Malaysia.

Kampung regrouping is the most recent strategy adopted in Malaysia to contribute to the broad objective of rural development, and joins a wide range of other strategies such as double cropping, land consolidation, the provision of loans and subsidies, infrastructural development, rubber

replanting and the encouragement of Farmers' Co-operatives. Although often the responsibility of different government departments, the strategies clearly overlap in considerable measure and none can be undertaken in isolation. The recognition of this fact lay behind the establishment of a number of Integrated Agricultural Development Projects (IADPs), each responsible for co-ordinating and overseeing rural development on a regional scale. The co-ordination of a number of separate and independent agencies within an IADP—the Department of Agriculture, the Drainage and Irrigation Department, Bank Pertanian, the Malaysian Agricultural Research and Development Institute (MARDI), the Farmers' Organisation Authority and the Land Office—is the responsibility of the Ministry of Agriculture. IADPs operate or are under construction in Northwest Selangor (Tanjong Karang), Kedah/Perlis (Muda Agricultural Development Authority—MADA; Kedah Valley; Perlis); Kelantan (Kemubu Agricultural Development Authority—KADA; Kemasin); Trengganu (Besut); Johore (Johor Barat I and II); Perak (Kerian—Sungei Manik); Negri Sembilan (Negri Sembilan Timur); Pahang (Pahang Barat; Rompin Endau); Malacca (Melaka); and Penang (Balik Pulau—Seberang Perai). Four new projects were announced for implementation in the peninsula under the Fifth Plan—Semerak, Sungei Golok and Sungei Nal/Sungei Sokor in Kelantan and Tumbuk Block in Perak. During the Fifth Plan period (1985–90) all the infrastructural components were completed for eight IADPs. The completed projects covered 3.5 million ha. and benefited 273,900 farm families (Government of Malaysia, 1991). These IADPs are embryo regional development authorities whose co-ordinating function could evolve into a strong positive planning role under a national development strategy.

III

'... economic betterment without socio-institutional adaptation ...'

There is no argument about the fact that a major underlying cause of poverty in a large proportion of the Malaysian padi sector is inadequate farm size. This is recognised in the government's own planning documents, in the reports of international bodies, such as the Asian Development Bank (see p. 105), and of independent consultants, and by most, if not all, academic writers on the subject, whether they are radical critics of the government or are more generally sympathetic towards its policies. Consensus over the causes is not matched, however, by agreement on the methods to counteract them.

As noted above (p. 124), official policies seek to overcome the effects of small farm size by a variety of land reorganisation schemes. The Mid-Term Review of the Fourth Malaysia Plan emphasised the policy of land consolidation in a number of paragraphs (see chapter four, p. 88). 'When-

ever possible, land will be consolidated and developed as co-operative farms and, to reap the full benefits, these farms will need to be managed on an estate basis which will also promote mechanisation and assist in raising the productivity of farmers' (Mid-Term Review, para. 562). Despite its apparent attractions, particularly those related to the presumed ability of larger undertakings to use modern technology effectively, this strategy has two major weaknesses. These relate to limitations to its 'estatisation' and agro-technic methods *per se*, and to their inability to cope with the continuing problems of *production* inadequate to support a household when farms are too small.

Although co-operative farming has been shown, for example in the Northwest Selangor IADP, to be capable of raising padi yields to a consistent 3 tonnes per hectare, the ability of the group farm or padi estate consistently to achieve high levels of productivity has still to be demonstrated. The success of the estate sector, seen as the model for the padi industry, has been based partly on the 'modern' organisational techniques employed by the commercially oriented plantations, but also on the ecological suitability of rubber and oil-palm for plantation or estate type agriculture. These crops are perennials which, once planted and mature, yield a regular, year-round return based on daily (or bi-daily) tapping or approximately weekly harvesting. Yields fluctuate in response to local rainfall patterns but, provided in the case of oil-palm the area exploited is sufficiently large (ca. 80ha), a fairly smooth flow of income is assured. These two crops are well suited to 'industrial' type production methods based on a regulated daily working routine.

Seasonal crop production on an estate basis faces particular difficulties. Work loads in seasonal cropping are heaviest at planting and harvesting times, with relatively lighter requirements during the growing period or in the off-season if there is no second crop. The demand for labour at harvest time, even with the use of mechanisation, is likely to be concentrated into a short period and activities are often very intensive at that time. The mechanisation of transplanting, or even of planting, still faces many difficulties and casual labour continues to be required. Regular 'industrial' working patterns will often be quite inappropriate when it is necessary to complete the harvest of a grain crop while weather is dry or, in a double cropped area, before the release of irrigation water for the second crop. World-wide experience with large scale seasonal crop production, on company or co-operative bases, in general has been disappointing, with well known difficulties experienced in the former Soviet Union (wheat), central Queensland (sorghum) and the Northern Territory of Australia (rice) amongst others. The need for the personal commitment of the household to its crop seems to be far greater for successful seasonal crop production than for perennial tree cropping.

The identification of these difficulties is not to say, however, that a

departure from an entirely individual farming system would have *no* benefits. Involvement in such group farming ventures as the co-operative management of irrigation works or the joint use of certain capital equipment such as tractors or combine harvesters has certain obvious advantages. It has been noted (Wong, 1979), that in Japan, South Korea and Taiwan, which are frequently seen as economic models for emulation by Malaysia, group farming spread rapidly in response to the structural transformation of the agricultural sector under the impact of industrialisation, which drew productive labour away from agriculture and created a tendency towards part-time farming. Strong government tutelage and support has been an essential element in these non-socialist, east Asian situations, however, as has land reform. Both Mokhzani (1979), and Wong comment on the fact that Malaysia's most successful experiments in agricultural development, where professional management and large-scale operation of an estate type have been twinned with individual plot ownership, i.e. the Federal Land Development Authority (FELDA) schemes, have by-passed many intractable socio-economic problems through the direct creation of new communities. In this context it is disappointing that a former scheme to develop 11,000 ha of new padi land in the Rompin Endau (Pahang) IADP has been abandoned, since it might have provided valuable evidence of the viability of FELDA type organisation in padi production.

A more basic criticism of the full-blown technocratic approach of the National Agricultural Policy is in its social and economic consequences at the individual and household level. The crux of the problem is that, almost regardless of their productivity,[7] very many of Malaysia's padi farms are just too small to provide a living—and the consequence is increasing abandonment. As noted previously, households with very little or no land can benefit only marginally, if at all, from programs of group farming, 'estatisation' or the other government initiatives. Shukor (1984), writing specifically of the Muda area is convinced that 'existing programs in group farming, tenancy legislation, price support and other forms of subsidy without an equalisation of size distribution of padi farms will result in further deterioration in the level of living of small households'. He sees group farming to be of little benefit to small farmers, and likely to aggravate the position for small tenants since they have no rights to a share in a consolidated farm or estate and only limited possibilities of employment thereon. Indeed to many small farmers and tenants, far more

[7] At least within realistic levels of attainment. Shukor (1984) states that, in the Muda area where average yields are already the highest in the country, productivity increases would have to be of the order of 100% to raise the average farm household above the poverty line. In certain single cropping districts of Malacca, the increase would need to be sevenfold!

reformist a policy than any of those expounded in the National Agricultural Policy is still necessary to guarantee them even moderate economic betterment.

Many writers, and not only those of more radical views, have discerned a conflict between the objectives of modernisation of the padi industry in a technical sense and an unwillingness by government to modify, least of all to undermine, the traditional social structure of the Malay countryside. Rudner in 1971 had described the policy quandary of Malaysian rural strategy as 'the dilemma of pursuing economic betterment without socio-institutional adaptation'. Burns noted in 1982 that the government had 'thus far failed substantially to improve the living conditions of the peasants or to turn them into prosperous capitalist farmers'. Fatimah (1981) was particularly critical of the government's technological approach to the problems of the padi sector:

> 'Instead of attacking the structural causes of poverty head on, and in the process inevitably alienating the class of rich landlords from whom the Malay bourgeois class draws its main support, the state prefers to adopt the World Bank type of solution to rural poverty which attempts to raise productivity through imported technology viz. rubber replanting, state-managed land schemes and the so-called integrated approach to agricultural development enhancing the whole panoply of agro-chemical, bio-technological and credit inputs channelled through numerous state agencies'.

Syed Husin (1983) puts the blame for Malay rural poverty squarely on the landlords, middlemen and moneylenders.

> "Poverty in . . . the Peninsula . . . is closely related to the pernicious practice which encourages much of the country's wealth to be concentrated in the hands of only a few. The concentration of ownership and control is allowed, in fact, encouraged by the socio-economic system based on laissez-faire philosophy. This system has to fall victim to various types of exploiters at three levels, namely, the landlords, middlemen and moneylenders at the village level; the big capitalists and feudal groups at the state level; and the foreign monopoly capitalists at the international level. Under such condition it is not surprising that the peasantry is the most depressed section of the people".

The scarcity of padi land in Malaysia which has resulted in the average farm size of only 1 ha suggests that, with or without major land reform policies, there is an urgent need to reduce the number of households dependent on padi growing for their livelihood. To some extent such a reduction is already occurring spontaneously, to which the growing areas of idle land and the extent of rural-urban migration bear witness. Increasingly, rural households are dependent on off-farm work (Shand, 1986), pensions, and remittances from family members in the cities. The rehabilitation of idle land, the raising of rural incomes in the padi sector

by the various forms of 'estatisation', even the success of the rural urbanisation policy are nevertheless dependent upon the availability of more formal alternative employment in the rural areas. It is possible, perhaps even likely, that the rural policies expounded in the Fifth and Sixth Malaysia Plans will enhance the productivity of the *land*, and where farmers (i.e. outside the rice 'granaries') move out of padi and into alternative crop production, household incomes may well be raised. It is difficult to see, however, how incomes in the padi sector can be increased much beyond present levels by any form of consolidation, given the small farms, or equivalent shares, owned by many households and which, as a result of traditional inheritance practices, are likely to continue to become further reduced. Admittedly a small move was made in 1984 towards prevention of excessive subdivision by amendments to the Land Code, but the minimum size of 0.4 ha, below which new restrictions on subdivision, joint ownership and transfers apply, is well below economic size for a padi farm.

With current structures and policies, off-farm work, common already for a large proportion of padi households, will remain essential if they are to achieve even poverty-line incomes and there is little doubt that the National Agricultural Policy, or any rural strategy, will succeed in Malaysia only in conjunction with the creation of alternative employment elsewhere in the economy. It seems inevitable, however, that any long-term solution to the problems of the padi sector will require a more reformist approach to a number of social and cultural blockages. These are examined in chapter seven in a consideration of the options available to future policy makers.

7

"Ecological Necessity . . . Combines with the Urgency of Welfare Considerations" — Future Ways Forward?

'But this time there will be no miracles'[1]

the green revolution is now in danger. Average yields have stopped rising and population in many Asian countries is growing faster than food production. Over the next 30 years, it is estimated that the number of mouths to feed will double. If famine is once more to be averted, then scientists must find new ways of increasing rice yields.

But this time there will be no miracles. Yields cannot be expected to double and triple again. Instead, future growth will depend on a combination of approaches, each of which will bring only an incremental improvement.

These approaches will involve new breeding methods, based on hybridisation and the techniques of biotechnology. Such techniques include tissue culture, which speeds up the time it takes to develop new varieties, and genetic engineering, which can be used to transfer abilities such as resistance to viruses, from one species to another.

To enable plants to fight disease and pests as well as grow in unfavourable environments, the world's estimated 120,000 existing rice varieties will have to be ransacked for resistant genes.

In addition, to reduce dependence on the expensive fertilisers and pesticides that were part and parcel of the green revolution, new methods of application must be developed, along with the introduction or encour-

[1] The chapter heading is a quotation from Dwyer (1977) and the introductory quotation is from an article by Johnstone in the *Far Eastern Economic Review*, (1988).

agement of natural biological controls and home-grown materials.

Ultimately, the effectiveness of these incremental improvements will depend on how successful scientists are in persuading farmers to adapt to the changes needed. Bridging the huge gap which exists between the laboratory bench and the paddy field is perhaps the greatest challenge that rice researchers will face in the future.

(Bob Johnstone, "Fading of the Miracle", 1988)

I

'... land (is) static and population ... not'

More than any other country in South-east Asia, Malaysia has applied western liberal theories of agricultural development to its traditional subsistence sector. It has noted, and usually put into practice, advice tendered by international agencies and private western consultants. It has built on expertise, plans and engineering schemes inherited from the colonial period, often continuing to employ the skills and knowledge of experienced personnel, and has made no major revolutionary breaks with the past. National policy towards the padi-growing regions of the country has been motivated by the desire to produce domestically as much rice as possible to meet local demand, if not to achieve full self-sufficiency, and by the wish to reduce both the absolute and relative poverty of padi-growing households. The primary mechanism adopted for the achievement of these objectives has been the maximisation of padi output through the application of technology, aided by certain controls over pricing.

Figures quoted in this book (especially appendix table 1) reveal the very substantial success that had been achieved in raising total production and productivity to record levels in the 1970s, to a point where the country had the capability of reaching self-sufficiency in an average year, with climatically good years yielding a surplus and poor years a deficit. Evidence suggests, however, that the production accomplishments of the 1970s were less successful in reducing poverty than in raising output, and that even the latter achievement faltered as increasing numbers of farmers abandoned their land, though yield increases in the later 1980s—due partly to heavier usage of fertiliser—restored production to levels achieved earlier in the decade. Given that Malaysia's opportunity cost of increasing rice production is higher than that of neighbouring countries, since she has a range of alternative investment opportunities, (Brown, 1973), emphasis on the padi sector does not make economic sense in the absence of improvements in rural incomes and welfare. If the various efforts to deal with the continuing problem of rural poverty in padi areas do not show

signs of real success in the next few years, very serious reconsideration of policies towards the padi sector will be essential.

The Malaysian government's approaches to its padi sector have almost reached an *impasse* in the face of a major dilemma. This dilemma lies in the situation in which the development of the rural sector, and especially of the padi growing areas, has been a principal strand in national social, economic and political strategies for nearly 40 years, while, at the same time, extensive and increasing areas of potentially productive land are being left idle and the incomes of padi households are declining in relative terms. The National Agricultural Policy's original objective of 80–85 per cent self-sufficiency, and even its more recently downgraded 60–65 per cent, requires the maintenance of a productive padi growing industry yet, even given the substantial subsidies received by padi farmers, the average or modal farm (or share in a group farm or padi estate) is too small to support a household without an additional source of income being available. In some instances, for example parts of the east coast (Templeman, 1982), padi farmers have been reported as reluctant to commit themselves to the additional work required by double cropping since it would require abandonment of more profitable off-farm employment.

There appear to be four principal options available to help Malaysia escape from this dilemma and to develop a padi sector that could offer improved living standards for those households that choose to remain in it. Each depends upon political choice and decisions, and will have its own economic, social and geographical consequences.

The "free-market" option implies the abandonment of any policy of self-sufficiency and would be fully in accord with the objectives of the National Agricultural Policy as formulated for *non-rice* crops. The National Agricultural Policy acknowledges that, in view of the fact that the country is a high cost producer, it would not be economic to grow its total requirements but that the national objective should be to achieve a level of self-sufficiency adequate (it is implied) to feed the population in a period of emergency. Even this level (80–85 per cent current consumption), is now acknowledged, at least unofficially, as unrealistic in most years. The question that might reasonably be raised, therefore, is whether specific efforts should continue to be undertaken to achieve any particular level of production rather than to let the market determine it. The autarkic argument in favour of national food production is largely meaningless, anyway, as more and more locally grown rice is dependent on imports of fuel, fertilisers, pesticides and machinery.

As well as requiring an acceptance of the fact that Malaysia would be dependent on imports for a considerable proportion of its basic foodstuffs,[2]

[2] Such a dependence would not be unacceptable to many consumers since there is a strong preference for Thai rice amongst Malaysians.

the free-market option would probably also imply the abandonment of land policies of 80 years' standing. As noted in chapter three, these have been based on the Malay Reservation Enactment (1913) of the Federated Malay States, the Rice Lands Enactment of 1917 and later amendments which:

(i) made it impossible for an ethnic Malay to transfer or lease his land to a non-Malay and, under a 1933 amendment, for it to be seized by a non-Malay creditor in discharge of a debt;
(ii) prohibited the cultivation of crops other than padi on Malay-held lands suitable for its cultivation; and
(iii) provided that no state land suitable for wet padi cultivation (or capable of being made suitable by irrigation) could be alienated for any other purpose.

Releasing at least some padi land, notably land currently single cropped, for alternative uses might well raise also the question of its transfer to non-Malays, either smallholders or planters, who might wish to develop it. Such a change to well established policies could be more difficult politically than relaxing the 'padi only' provision but it would almost certainly raise the value of padi land which has been depressed as a result of the reservations policy.

It is likely, of course, that a completely free market approach to the padi sector, if it were to go as far as the complete elimination of all government support other than the maintenance of irrigation systems, would lead to such an exodus from Malaysia's padi lands that the viability of many of those systems would themselves be in question. Lower yielding schemes, or schemes dependent on higher quantities of inputs such as fertilisers, would be at greatest risk. Not only would there be considerable changes in land use in states such as Negri Sembilan and Malacca, where the proportion of idle land is already high, but probably in the east coast states as well. A major concentration of padi growing in the northwest would be the most probable geographical outcome thus taking the granary area concept to its extreme. The consequences would be so far reaching as to make the adoption of a completely free market policy unacceptable in any foreseeable situation.

Some writers (e.g. Fatimah, 1980; 1981; Syed Husin, 1983) have argued for reformist or radical approaches to Malaysia's padi dilemma based on the belief, expressed clearly by Griffin (1974), that 'the major cause of inequality in the distribution of income in . . . rural areas is the inequality in the ownership of land'. These solutions involve land confiscation and redistribution with or without compensation. Syed Husin (1983) describes the radical approach as one whereby personal or individual ownership and operation of land is replaced by co-operatives or collective ownership and operation, and its produce is divided amongst peasants according to the needs of their families. The reformist approach, as adopted for example

in Thailand in 1975, involves ceilings on the area of land that can be held by a family and gives the government powers of compulsory purchase, if needed, to permit redistribution.

Evidence presented earlier in this book leaves little room for doubt that, in the Malaysian context, Griffin's dictum is true—inequalities in land ownership in the padi areas are a principal cause of inequalities in income. The transition from this now generally accepted situation to a solution by redistribution is, however, too facile, simply because of the physical limitation to the availability of padi land. It is impossible to determine the total area of land in Peninsular Malaysia that is suitable, in a physical sense, for padi cultivation, though it is probably about 400,000 ha. The survey of 1974, based on aerial photography (Wong, 1974), suggested a figure of 428,502 ha which excluded areas of hill padi incorporated in shifting cultivation systems but included newly cleared, flooded and fallow padi land. The largest area cultivated in any one year was 393,258 ha in 1970/71. The most simplistic calculation, based on an assumed total padi area of 400,000 ha and the 151,000 households recorded as padi households by the Fourth Malaysia Plan (1981), gives an average potential holding per household of 2.65 ha. This exceeds Mokhtar's (1982) estimate of the minimum viable farm size on poor double cropped land by only 0.45 ha and is only 80 per cent of his viable size for a single cropped farm. Comparable figures are not available in more recent Plans but, given both the loss of land in recent years to urban and industrial development around most of Malaysia's cities and the declining population in padi areas (see p. 106), the area of the *average potential holding* is likely to remain similar to that calculated for the 1980s.

Such an average potential holding could be achieved by total land redistribution only if padi households were sufficiently mobile to move around the country to 'even out' the distribution. In fact, the distribution of padi households, and of padi land, is spatially skewed. Calculations on a state, or better, district basis are needed but more difficult to compute. Nevertheless, available figures suggest (Courtenay, 1985) that there are five states (Kelantan, Negri Sembilan, Penang, Selangor and Trengganu) where a complete redistribution of padi land would result in average potential holdings smaller than 2.6 ha.

The argument as pursued with the assistance of these figures is not directed against a reformist approach to the problem that would lead to greater equality of land ownership. A very strong case could clearly be made on grounds of equity for the abolition of landlessness amongst those economically active in the padi sector by some form of limitation on land holdings and appropriate redistribution.[1] What *does* seem clear is that if

[1] Not all writers favour redistribution, Corner (1983), for example, argues that land reform and redistribution in the Malaysian context can be seen as a 'stop-gap and retrograde measure

3 ha is seen as a desirable minimum size for a holding to support a family above the poverty line, there simply is not enough padi land to support the existing number of households whilst the fairly marginal gains provided would be unlikely to survive more than one generation owing to subdivision upon inheritance. In terms of land availability, redistribution is physically more feasible in some regions than in others or than on a nation-wide basis. Shukor (1984) has stated, for example, that there is sufficient land in the Muda irrigation area in Kedah to provide an adequate holding for every padi growing household. He makes the suggestion that, if *ownership* redistribution is seen as too radical a policy, then at least the redistribution of the *right to operate* land could be considered. Even if politically more acceptable than transfers of ownership, however, such redistribution would be no more able to survive a generation of population growth.

An 'easy' alternative both to the free market approach to padi production and to a thorough reform of the area owned or operated might be to maintain the existing pattern of the industry but to raise its profitability by increasing subsidisation or by establishing a sufficiently high minimum price. This option might seem appropriate if padi households were expected to continue to grow the crop for national, autarkic reasons. In recent years, however, agricultural subsidies have already been running at a high level. They represented about one percent of the total Fourth Plan expenditure, for example, and it is unlikely that they could be increased to the extent that would raise the incomes of the average padi household above the poverty line, even if some kind of 'means test' eliminated payments to farmers deemed not in need. Current intentions, anyway, as first expressed in the Mid-Term Review of the Fourth Plan, are progressively to reduce the role of subsidies in agricultural development to 'assist in eroding the subsidy mentality among farmers' and were set at about 0.7 per cent of total public expenditure in both the Fifth and Sixth Plans. Despite this objective, however, the padi price subsidy, payable on delivery of the crop to a registered mill, was increased by 50 per cent during the 1990 election campaign. A minimum-price high enough to make all padi farms viable would exacerbate the 'misallocation' of resources criticised by Baldwin (p. 80).

If the continuation of current policies, with the likely consequence of a continuing withdrawal from padi farming and under-utilisation of expensive infrastructure, is not a viable option, then certain hard political

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of dubious long term benefit to those it proposes to aid.' She sees land distribution as seeking to preserve the peasantry, in direct opposition to the long term implications of the development model pursued by the government. However, as much of this book argues, it is the very attempt to preserve many of the attributes of the peasantry whilst seeking agricultural modernisation that is at the root of the padi sector's dilemma.

decisions are imperative. The fourth choice available to the padi sector depends upon the willingness of government, and of Malay society in general, to revise both 'traditional' social and 'modern' economic ideas rather than pursuing policies which resist changes to the former while seeking wholeheartedly to adopt the latter. There is little room for doubt that the maintenance of a padi growing industry that will contribute to, though could never fully satisfy, national demand for rice and that, at the same time, will support a prosperous farming community requires a substantial reduction in the number of padi growing households. This reduction must be achieved in such a way that families who remain in the industry have the opportunity to achieve standards of living well above the poverty line and are located in the most productive padi areas. Any continuation of land abandonment in areas such as the Muda IADP where investment in infrastructure is high and some of the country's best padi land lies idle, should be quite unacceptable.

Rather than attempting to cope with the problem of low incomes from small farms by raising technological inputs and consolidating holdings merely for operational benefits, policies must aim to create larger working units for the individual household and prevent their future subdivision. Simple in concept and not too difficult to achieve in principle, such policies would nevertheless run counter to vested landlord interest and traditional Islamic inheritance practice. They would also be dependent upon a total national economy that was providing alternative employment for those who left the padi industry. Already farming is becoming a part-time occupation for many. This is occurring, however, in an informal way in all the padi areas and, especially in the vicinity of the industrial estates and free trade zones, factory employment is available particularly for young women. Industrial planning of the kind that is needed if the village regrouping schemes are to be successful could as well provide employment opportunities for those leaving the padi industry but who could, if they chose, remain resident in villages or smaller country towns. For those who continue to work the padi land, farms of an economically viable size must be provided. Reformist policies, perhaps on the Thai model,[4] might persuade larger landlords to release land in exchange for investments in the industrial sector or at least make land available for rent along the lines suggested by Shukor (1984). A scheme such as a Land Bank could make available, for lease or purchase, land belonging to farmers who have chosen to leave padi growing but who, as is customarily the case, have retained ownership of their family land.

Amongst Malaysia's agricultural policies most frequently praised for

[4] The Thai Land Reform for Agriculture Act (B.E. 2518) of 1975 aimed to expand owner cultivatorship and limited holdings of arable land to 8 ha (50 rai) per family.

their success[5] have been the land development programs of the Federal Land Development Authority (FELDA). Whilst these had resettled 94,000 families on formerly undeveloped, usually forested, land by 1985 and had converted mainly former padi farmers into relatively prosperous commercial rubber and oil palm growers,[6] they have not needed to tackle the existing structural weaknesses of the agrarian economy, namely uneconomic holdings, tenancy and indebtedness. In essence, they have circumvented these fundamental obstacles to rural development (Lim, 1973). Apart from the commercial orientation of FELDA schemes, with their plantation-like mode of centralised management, it has been their provision of viable 4-hectare blocks and prohibition of subdivision upon transfer that have been crucial elements in their achievements.

While it is true that second and subsequent generations who do not inherit shares of FELDA blocks will be required to find livelihoods elsewhere in the economy, the continuing ability of the schemes to provide acceptable incomes for their owners is based substantially on their retention of a minimum operating size. It is clear that the prohibition on subdivision applied to FELDA holdings has been made possible by the fact that the grants to the first settlers were free of all former private ownership, a situation untrue of most padi land. Nevertheless some attempts have been made to limit, at least excessive, subdivision of padi land. Kelantan passed a law forbidding the subdivision of land to less than 0.1 ha (0.25 acre) as early as 1938, whilst the National Land Code (Act 56 of 1965, Part IX) stated that no subdivision could be carried out if it interfered with existing production or interrupted the activities of a planning authority. The National Land Code (Amendment) Act, 1984, introduced a new paragraph to Section 42 (2) of the Code whereby the State Authority shall not alienate any land so as to have the effect of less than 0.4 ha being held by more than one person except in exceptional circumstances, and new subsections (3) and (4) were added to section 205 generally to provide that joint ownership of agricultural land is not permitted if the area of any resulting portion is less than 0.4 ha, and transfers of land which are less than 0.4 ha are to be restricted.

Although these provisions still do not prevent padi land from being reduced by inheritance to sizes well below the minimum considered necessary to support a household even on the best double-cropped land, they do indicate a willingness to move, albeit very cautiously, towards such an objective. Some politicians have seemed willing to encourage more rapid reviews of the inheritance system. In 1977, the then Primary

[5] e.g. Alladin (1979) 'The FELDA-model of land development has been tested and has proved to be able to deliver the goods .'

[6] A survey of 11 FELDA schemes carried out in the late 1970s suggested that 72.8% of settlers had 'adequate' incomes compared with only 9.0% at their point of origin.

Industries Minister (Datuk Musa Hitam) had called on Moslem scholars to give thought to the question of land division to determine a realistic approach to inheritance since 'land was static and population was not' (*New Sunday Times*, 21 August 1977). More recently the Deputy Minister in the Prime Minister's Department (Drs. Suleiman Mohamed) urged Malay landowners in Kampung Baru, Kuala Lumpur to discard the traditional practice of dividing land among their beneficiaries (*Star*, 29 December 1989). In the absence of some acceptable reform to traditional practice, current trends in the padi industry can lead only to continuing unplanned abandonment and the accompanying destruction of the rural society that the practice has been intended to preserve.

II

'.. approaching.... the disaster phase...'

The success of the Malaysian padi industry in trebling its total production between 1950 and 1980 was based unequivocally on technological inputs, most notably on the adoption of new high yielding hybrid varieties of seed, the widespread use of agricultural chemicals, notably fertilisers and pesticides, and the construction of drainage and irrigation schemes that permitted double cropping and/or more reliable yields in the main wet season. Any further intensification of land use to raise padi yields beyond their present levels would required increased inputs and improved management especially of water and fertilisers.

Compared with the situation in many western countries, the use of fertilisers in Malaysian agriculture is relatively low (about 30 per cent per hectare of Netherlands usage for example). Nevertheless consumption, measured in hundreds of grams of plant nutrient per hectare of arable land, increased by 167 per cent in Malaysia between 1970 and 1985 (World Bank, 1988) and is high by Southeast Asian standards, being approximately 4 times that of Thailand or 2.6 times that of the Philippines. Although this figure relates to use in agriculture as a whole, a substantial increase occurred in the padi sector as hybrid varieties were almost universally adopted. Estimates prepared by Barker and Herdt (1985) suggest that Peninsular Malaysia was applying 97 kg of fertiliser nutrients (nitrogen, phosphates and potassium) per hectare of padi in 1976–79, approximately double its 1961–65 usage, even though the full fertiliser subsidy was not introduced until 1979. In 1990/91, World Bank (1993) figures record that Malaysia was applying 195 kg of plant nutrient per hectare of all arable land, compared with 91 kg in 1979/80, which suggests that the usage on padi fields had more than doubled again since the late 1970s.

The consumption of pesticides has expanded with the adoption of the small number of high yielding padi varieties. Over 1975–78 approximately

5600 tonnes of active ingredients, representing about 2 kg per ha of agricultural land (Barker and Herdt, 1985), were consumed to control pests which built up rapidly in conditions of dense coverage by uniform varieties and of high humidity. The chemical control of weeds, which have become a particular problem arising from direct seeding, requires additional inputs.

The dependence of the current productivity of Malaysia's padi sector on the input of agricultural chemicals at even the present level, and of any yield increases on enhanced usage, has produced two major problems. As noted earlier (p. 70), the success in production terms of the new padi varieties depended heavily on the availability of cheap *fertilisers*, made possible in the 1960s by advances in fertiliser production technology. This cheapness was based on the contemporary abundance of low cost energy, notably of petroleum. The sharp upward movement of petroleum prices in 1973–74 abruptly ended this historic downturn in the cost of chemical fertiliser (Barker and Herdt, 1985). In order to maintain what were seen as necessary levels of application, the subsidy policy provided 183,669 tonnes of fertiliser free to farmers in 1984 alone (Rosenani, 1985).[7] Sharp rises in the cost of *pest control* have occurred as infestations have built up from the low levels, with only sporadic serious attacks, that were the norm before the 1970s. In 1982, 38,683 ha of Malaysia's padi lands were attacked by eight major pests and diseases resulting in losses valued at M$ 31 million (Hussein and Ibrahim, 1985). Similar losses were incurred in 1983. Many pests which attack padi can no longer be controlled by chemicals.

The economic incentive to cut back on the consumption of agricultural chemicals in the Malaysian padi industry is itself powerful enough to have stimulated searches for cheaper means of nutrient provision and pest control, but is now also being reinforced by a growing ecological concern. This concern is particularly over the contamination of waterways and water supplies by the accumulation of chemicals from fertiliser-rich run-off and pesticide sprays, hazards from chemical residues in harvested crops, and undesirable side-effects on non-target organisms such as parasites and predators, fish, birds and other wildlife, domestic animals, and the human population itself.[8]

In the Malaysian context, the economic imperative is undoubtedly the stronger in encouraging the development of more efficient methods of

[7] A subsidy to counter the price rises and to encourage the use of urea had been introduced in the 1973–4 season.

[8] Tan *et al* reported the effects of pesticides on padi field fish as early as 1973. In Keriam, where they undertook their survey, large numbers of fish were shown to have been exterminated and insecticides were accumulating in fish tissues where they were a potential health hazard to consumers.

fertiliser use and of alternatives to chemical means of fertilisation. While many Malaysian authorities, including some at the highest level, continue to regard a deep concern about the environment as 'the luxury of a highly-developed economy' (Moulton, 1973), the increasing cost of nitrogen fertilisers is beginning to have the effect sought by those concerned about the long-term consequences both of the energy subsidy represented by artificial fertilisers and their cumulative impact on the environment. Experiments on the optimum timing of fertiliser application, and on the form and placement of the chemicals, suggest that usage can be reduced by as much as one-third without lowering yields (I.R.R.I., 1980). The use of fertiliser pellets, for example, which are placed below the soil surface into the padi root zone, can double the effect of nitrogen fertiliser.

Particularly exciting is work that has been undertaken over the last 10 or 15 years into the *Azolla-anabaena* symbiotic association, which has the potential of becoming an important natural source of nitrogen in the wet padi ecology. *Azolla* is a genus of water fern that assimilates atmospheric nitrogen in association with nitrogen-fixing, blue-green algae *Anabaena azollae* that live in the cavities of *Azolla's* upper lobes. *Azolla* is a traditional part of padi culture in China and Vietnam where it has long been used as a green manure (Liu, 1979), made into compost for fertilising maize plants, and fed to pigs and poultry. Interest in *Azolla* as a green manure in South and Southeast Asia, however, has been generated only in recent years, with experiments and trials in the Philippines, India and Pakistan.

Azolla is widely distributed in Malaysia, where the species *Azolla pinnata* var. *imbricata* is indigenous, and occurs particularly in the padi growing districts of the west coast. It is found floating in ponds, irrigation canals and in the fields themselves, co-existing with the padi plants, though completely disappears in certain places at particular periods of the year. Apart from seasonal changes in environmental factors, it is suspected that its occurrence is affected by herbicidal contamination of the water (Rosenani, 1985). When in full bloom it may cover the greater part of the water surface in a velvety matted layer.

Azolla has potential as a bio-fertiliser mainly because of its ability to accumulate a high concentration of nitrogen and rapidly to increase its bio-mass. Under padi field conditions in Malaysia, preliminary experiments have suggested that 150,200 tonnes per hectare of fresh *Azolla* can be attained in about 15 days. Philippine field experience reports a potential fixation rate of 412 kg of nitrogen per hectare per year (Watanabe *et al.*, 1977). Environmental factors critical to the growth of *Azolla* and to its capacity to fix nitrogen include the availability of water with an optimum pH value of 5.5 (though it tolerates a wide pH range between 3.5 and 10), temperatures not exceeding 31°C above which growth is depressed, and the availability of phosphorus. Since available phosphorus is scarce

in tropical soils, this element is the major limiting factor to the extensive growth of *Azolla* under Malaysian conditions. Given sufficient phosphorus, the complex can grow very well under full sunlight, though the species indigenous to Malaysia grow best with some shading when phosphorus availability is less than optimal.

As a supplement, if not a complete alternative, to artificial nitrogenous fertilisers, *Azolla* has considerable potential in Malaysian padi fields. It can survive even under adverse conditions provided moisture is available and can be kept as stock between seasons in ponds or any patches of stagnant water. Unlike chemical fertilisers, which are subject to various channels of loss once applied, *Azolla* supplies more continuous available nitrogen for uptake by the padi plant. Its cultivation and recycling represent the harnessing of solar energy to produce a bio-fertiliser that requires no refining and incurs no transport costs, especially if it is incorporated before transplanting and encouraged to co-exist with the padi crop. If spread as a green manure after transplanting, however, application is very labour intensive and expensive and *Azolla* will not be adopted unless the prices of urea and other nitrogenous chemical fertilisers rise steeply and subsidies are phased out. Escalations in petroleum prices, such as those of later 1990, will doubtless further stimulate research into *Azolla* varieties, particularly to develop strains more tolerant of the high temperatures of the tropics. Reductions in herbicide usage, desirable on other grounds anyway, would enhance the attractiveness of the complex whose co-existence in flooded fields with the grain crop could make a major contribution to the Malaysian padi industry both economically and ecologically.

Despite the obvious potential of *Azolla*, its requirement for generally sparsely-available phosphorus is encouraging experimentation with other possible nitrogen-fixing plants of which *Sesbania rostrata* offers prospects. An aquatic legume discovered several years ago in Senegal, *Sesbania* has nitrogen-fixing nodules both on its roots and stem. In Africa, the plant is grown between rows of padi and ploughed in after a couple of months. In Malaysia, it has possibilities as a fallow season cover—at least in single cropping areas—to be cut before the padi is planted. Up to 100 kg of nitrogen per hectare per year can be fixed by *Sesbania*.

While the search for alternatives to chemical fertilisers is being stimulated by price rises, environmental concerns are proving increasingly effective in encouraging research into biological techniques of pest control in the padi industry—though here also the economic imperative is strong. Although pesticides remain the most powerful tool in pest management, being highly effective and readily and quickly marshalled for immediate impact even over large areas, over-reliance on them is producing a range of problems. Lipton (1989) has described the relationship of the new high yielding varieties to pests. The problem is not, he claims, "as sometimes

alleged", that many high yielding varieties of crops are worse than the varieties they replace at fighting local pests. Increasingly they offer multiple resistance against major pests and diseases. Yet they do bring a problem. In Lipton's words, the high yielding variety "is almost always *more stable* in face of pest attack than its predecessor variety". . . . but the *set* of high yielding varieties—unless it can be fairly rapidly and regularly turned over in ways that vary the genetic base—will probably in the long run prove less stable in the face of pest attack than its predecessor set. "The very success of a narrow genetic range of the modern varieties—success not least in pest resistance—tempts farmers to use this range only". On occasions this can lead to widespread outbreaks of pests and/or diseases, to which the farmer's only reliable response is the application of heavy doses of pesticide.

In the padi agro-ecosystem, great faunal diversity exists, with the crop predators subject to attack by their own natural enemies. The green revolution padi hybrids, and the extensive cultivation of only two or three varieties, have intensified the pest problem and generated changes in the pest complexes. The prolific crop growth resulting from generous supplies of water and nitrogen fertiliser, and the continuous presence of susceptible padi plants under double cropping, have proved conducive to pest infestations on scales previously unknown. Yunus (1965) reported 159 species of insect that attacked the padi plant, of which 12 are pests of considerable importance. Since 1970, the brown plant-hopper and the white backed plant-hopper have emerged from an innocuous position to become the most important pests of padi in Peninsular Malaysia (Ooi *et al.* 1979–80). Md Ghazali *et al.* (1988) estimated that, in general, losses from pests and diseases in the field represent 20–40 per cent of the crop. The resistance of the brown plant-hopper to insecticides had already arisen by the mid-late 1970s.

Before the 1970s, serious attacks by insect pests occurred only at low levels and insect treatment on small plots usually led to initial yield increases. During the early 1970s, pesticide usage in the Muda area increased at over 50 per cent per annum (Gill, 1974). In 1982, however, 38,683 ha of padi land (7.8% planted area) were attacked by eight major pests and diseases resulting in losses valued at M$31 million. 37,575 ha (7.9%) were similarly attacked in 1983 (Hussein and Ibrahim, 1985). Pesticides are the most powerful tool that is readily available in pest management. They are highly effective and readily and quickly marshalled for immediate impact even over large areas. However, their indiscriminate use, often as an insurance, may lead to pest resurgence or secondary outbreaks.

Over-reliance on pesticides has a number of deleterious effects (Lim *et al.*, 1979). These include:

- the development of pesticide-resistant strains and a consequent need for repeated treatment;

- hazards from residues in harvested crops;
- outbreaks of secondary pests resulting from the destruction of natural enemies;
- undesirable side effects on non-target organisms such as the pests' natural parasites and predators; fish, birds and other wildlife; humans and domestic animals and plants;
- direct hazards from application;
- the reduction and simplification of the biotic component of the ecosystem; and
- soaring costs.

Available evidence suggests that the development of pesticide-resistant strains of pest is probably the most serious hazard to the Malaysian padi industry. Many of the pest outbreaks of the 1970s were in areas where pesticides were used freely.[9] The resistance of the brown plant hopper to pesticides had already risen by the mid-1970s, and the indiscriminate use of chemicals was leading to the resurgence of other pests. Stem borers, for example, and the normally rare army worm had become a problem in Tanjong Karang by 1977.

The impact of the simplification of the ecosystem by the emphasis on only very few padi varieties can be illustrated by the outbreaks of pests and diseases in the 1988/89 season. In that crop year, 17.7 per cent of the main season crop and 15.5 per cent of the off-season crop were destroyed by pests and diseases (Department of Agriculture, 1989). Only three varieties of padi (MR 84, IR 42 and MR 77) accounted for over 75 per cent of the nation-wide main season plantings, and only two (MR 84 and MR 77) for 72 per cent of the off-season plantings. Particularly significant, however, was the fact that almost the total area of crop loss occurred in the rice bowl area of the Muda scheme where, in the main season, two varieties (MR 84 and IR42) accounted for 90 per cent of the plantings and two (MR 84 and MR 77) for 76 per cent of the off-season plantings.

Evidence relating to the side effects of pesticide use is mixed. A 1971 study of Province Wellesley (Seberang Perai) and Kerian (Ahm. Yunus and Lim, 1971) revealed little evidence of toxicity in ponds and irrigation canals adjacent to padi plots on which pesticides had been used—a situation explained by the fact that overflow rarely occurred, and that the residual chemicals were diluted and broke down rapidly. A later study carried out in the Kerian river basin in 1990 (Yap and Ong, 1990) similarly revealed no danger of acute toxicity to aquatic life in the running waters of the Kerian river and the irrigation canals. Observed declines in the fish population were more reliably attributable, according to the authors, to altered drainage and irrigation practices resulting from double cropping which created shorter water retention time in the padi plots. The authors claimed

[9] Balasubramaniam (1974) reported that 87% of farmers in Seberang Perai and 88% in Kerian were using pesticides in 1970.

that a far greater danger was inherent in the bio-accumulation of pesticides *in situ* in the fields leading to concentrations at the end of the food chain in humans and recommended that fishery products from Kerian padi fields should be declared unfit for human consumption.

Heong *et al* reported in 1992 from a study in the Muda region that few farmers had training in spraying techniques or sprayer maintenance which created potential hazards for themselves as much as to the environment. A 1988 nationwide random survey of agricultural workers (n=1214) by Ramasamy and Nursiah revealed that 52 per cent of padi farmers claimed they had experienced symptoms of poisoning after spraying. The investigators declared a significant relationship (r=+0.87) between pesticide use and incidences of poisoning. Yap and Ong in 1990, by contrast, believed that incidences of directly adverse effects of pesticides on humans were rare—a belief founded on confidence in the 'strict supervision' carried out by officers of the Department of Agriculture when distributing chemicals.

Concern with the various impacts of increasingly heavy use of pesticides led to the first Regional Symposium on Biological Control held in 1985 at Universiti Pertanian Malaysia at Serdang at which it was reported that many pests that attack padi could no longer be controlled by chemicals (Hussein and Ibrahim, 1985); A national committee to co-ordinate biological control was set up in 1986, with data collection its first objective. The need for positive action in this area is becoming crucial in Malaysia as, to use Smith's (1969) terminology, the pest problem is moving from the *crisis* phase, when occasional and potential pests regularly occur, to the *disaster* phase, when pests have become resistant to chemicals and no control measure works adequately.

III

'. . the husbandry of a nation's soil and water resources'

Writing in 1965, before the green revolution with its accompanying need for increased fertiliser and pesticide use, Wikkramatileke noted that 'agricultural expansion in this day and age must surely entail the husbandry of a nation's soil and water resources, and not merely be concerned with taking immediate advantage of nature's bounty'. The need for a combination of 'ecological necessity . . with . . welfare considerations' is even more urgent in the 1990s than when Dwyer wrote these words in 1977. The resurgence of the belief (Lipton, 1987; Hayami, 1988; Rigg, 1984) that technology needs to go further to solve the problem of the Third World's rural poor, must be seen in the context of the development of a sustainable agriculture rather than in the genetic creation of even more heavily-yielding padi varieties.

The 'principles of permanence' to which the sustainability of traditional agriculture can be ascribed, as detailed in 1977 by Clarke, included a number abandoned by the 'modern' technology of the green revolution. These included

- low dependence on inputs from outside the farm system;
- no 'self-poisoning' from the accumulation of toxic substances within the agro-ecosystem;
- maintenance of the natural resource base (e.g. soil quality) for sustaining the function of the agro-ecosystem; and
- system diversity.

As noted by Marten (1986), there are compelling reasons for farmers' not retaining all Clarke's principles as their agriculture is modernised—system diversity may run counter to the market advantages of crop specialisation for example—but potential exists in the padi industry for a partial return to some of them. It is in this direction that current and future technology must aim to move .

Malaysia's padi industry has become increasingly dependent on inputs from outside the farm system. The need for chemical fertilisers and pesticides, for irrigation water in the off-season of double cropping regimes, for farm machinery and the fuel to operate it, has far removed the modern padi farmer from the largely self-sufficient operator of only one or two generations ago. Figures published by Fujimoto (1983) for the 1977–78 season suggest that the costs incurred for seeds and seedlings, fertilisers and pesticides, and ploughing averaged M$ 102.2 per tonne of padi produced in Kelantan and $88.52 per tonne in Seberang Perai (former Province Wellesley). Given padi prices at the time of about $440 per tonne on the west coast and $384 per tonne on the east coast, these costs, plus that of hired labour and imputed costs for family and unpaid *gotong royong* labour and for interest on farm assets, resulted in negative net overall revenues, with owner-farmers performing worse than tenants. Calculated on the basis of data in Lemmens *et al.* (1981), average total production costs per tonne in the Pulau Musang and Nerus schemes of Trengganu were M$206 per tonne for owner-operator and as high as M$ 363 per tonne for tenants. Figures from the Muda Agricultural Development Authority (MADA, 1981; 1982) for the same period were $561 per hectare (main season) and $528 per hectare (off-season), or approximately $130–140 per tonne varying according to variety, season and location. Even with guaranteed minimum prices of the order of $400–$450 per tonne, the margins for tenants, especially on the east coast, were very narrow when input costs had been met.

The maintenance of the natural resource base—the soil, its structure and fertility, the range of natural predators of crop pests, the fish of the padi fields—requires care in husbandry methods. The long or even medium

term effects of heavy machinery on soft, wet padi soils are not fully known but those of the self poisoning of the agro-ecosystem from continuing chemical use are increasingly documented. Rather than seeking further hybrids of padi which, similar to those of the past, aim at further raising yields (which cannot be expected to have the proportional expansions of the early green revolution), bio-technology must involve greater genetic engineering to transfer useful qualities, such as resistance to viruses, from one variety to another. IRRI's Rice Genetic Resources Laboratory, a germ plasma bank with more than 83,000 varieties of padi from around the world, is an essential component of the Institute's genetic evaluation and utilisation program. The design and production of farm machinery suitable for wet padi field conditions, low priced and very fuel efficient, must accompany hybrid seed development.

If Malaysia's padi industry is to have a viable future in a nation primarily committed, as is contemporary policy, to concepts of over-all economic growth with a strong emphasis on expanding the industrial base, it can no longer avoid social reform allied with greater ecological responsibility. The extent of permanently idle land which, despite efforts to reduce its occurrence, had reached 91,000 ha (25%) by 1986 was positive evidence of the degree of failure of 40 years of development to maintain, or re-establish, the attractions of padi farming to younger generations of rural Malays. In the late 1970s (Kratoska, 1982) alternatives to padi cultivation still offered better economic returns and more attractive working conditions. In many areas the children of padi farmers had opted for government jobs or for factory work. Kratoska reported that, in the Kerian district in 1978, farmers disapproved of the tendency of the younger generation to seek employment that was physically less demanding than padi planting, but they calculated that factories paid up to one third more per day than did labouring in a padi field. Lemmens *et al.* (1981) reported similar attitudes from the east coast where, in their survey area of Trengganu only 30 per cent of farmers foresaw a future in padi planting for some of their sons, but even then mostly as a part-time undertaking. Even families on land development schemes, where earnings are considerably greater than from padi growing, rank agricultural work low in the occupational prestige scale. A survey of settlers by Chan and Lim (1981) on land schemes of FELDA and the Johore Trengganu Development Authority (KEJORA) revealed that fewer than 14 per cent wanted their children to remain in the schemes. Village studies (e.g. Mohd. Nor, 1979; Courtenay, 1988) consistently reveal substantial out-migration by the economically and physically most active age group.

Current policies for the padi sector, as elucidated in the National Agricultural Policy and the subsequent Fifth Plan and maintained in the Sixth, though largely in keeping with much contemporary neo-classical economic thinking, are unlikely to reverse the drift away from padi growing. Corner noted in 1983 that the development path chosen by Malaysia,

which was reconfirmed in the National Agricultural Policy and the Fifth and Sixth Plans, implies the long run dissolution of the peasantry and the conversion of a minority to commercial farmers. Total acceptance of this model has geographic, social, demographic, economic, political, and ecological implications, a number of which conflict with other national priorities and policies and which require strong growth in other sectors of the economy. Truly liberal solutions to the problems of Malaysia's padi sector, especially if they are to be in tune with the natural environment, are proving much more difficult to find than was anticipated by the development theorists of the 1950s and 1960s.

IV

'. . but one part of the overall system. .'

There is growing opinion that the conventional economic wisdom concerning agricultural modernisation, almost regardless of its particular theoretical background, is inadequate. Armstrong and McGee (1985) make the telling point that agricultural modernisation of the 'conventional' kind sandwiches the producer, even when he retains formal control of the land, into a sequential capital—technology package. He becomes 'but one part of the overall system which encompasses upstream investment in machinery, fertilisers and pesticides, and the downstream activities of processing, storage, transport and marketing'. As already noted (chapter five), the use of new technology in basic food production can even lead to producers and workers in the sector becoming worse off than they were before the adoption of the new technology, the paradoxical situation described by Schuh and Barghouti (1988) as 'immiserising growth'.

In addition, few, if any, theories of agricultural modernisation yet make allowances for environmental costs. A growing body of literature is drawing attention to the radical changes in hydrological regimes created by the major irrigation schemes, and by the ecological effects of pesticides and chemical fertilisers. In Malaysia, Environmental Quality Regulations dating from the 1970s relate to the oil palm and rubber industries, and control of the use and abuse of pesticides is the responsibility of the Ministry of Agriculture under the Pesticides Act, 1974 (Laws of Malaysia Act No. 149). Nevertheless, the Fifth Plan states that the maintenance of sound environmental conditions 'will be balanced against the goals for socio-economic development' and the implication is that ecology is likely to be subservient to perceived economy. The Sixth Plan, like the preceding Fifth Plan includes a chapter on the environment. Its closing sentence states that 'Focus will be given to conservation, environment and ecological balance within the context of sustainable development'. One short, three-sentence, paragraph is devoted to 'pollution from agricultural chemicals' which merely states that 'no specific programmes have been

implemented to control pollution arising from the use of chemical fertilisers, pesticides and herbicides in agriculture'.

The planning and implementation of development are political processes and the formulation of national plans and policies is necessarily undertaken within the framework of a particular philosophy or ideology of development. Most theories of economic development which, to date, have influenced planning, in the majority of market and socialist economies alike, postulate changes in the structure of production in which traditional subsistence agriculture is converted to some form of commercial agriculture, while the emphasis of the economy as a whole moves towards manufacturing, commerce and services. In many ways, the Malaysian economy, especially since the 1950s, may be seen as a model example of this process as the contribution of agriculture to GDP has progressively fallen, the secondary and tertiary sectors have expanded both absolutely and relatively, and agriculture itself has become increasingly commercialised. Insofar as official figures can be assumed reliable, and there is little evidence to suggest that they are particularly inaccurate, *average* per capita incomes have been increasing in real terms in all sectors of the economy, even if relatively faster in non-agricultural and urban activities (table 7.1).

The basic hard-core problem of rural development lies in the inability of policies to date to eliminate the continuing poverty of about one half[10] of padi families while their social and cultural environment is incongruent with the economic objectives of the policies themselves. When the growing environmental concerns over fertiliser and pesticide use and the increasing energy subsidies involved in 'modernised' padi cultivation are added to the economic and social situation, Malaysia's padi industry is facing the need for some crucial decisions. Clearly, the documenting and analysis of problems is a simpler undertaking than offering solutions—especially if those solutions are to be applied in a complex, multi-ethnic society grappling with a wide range of formidable issues. In a sense, it can be argued that the role of the academic is complete when the documentation and analysis have been achieved and that the solutions are the responsibility of politicians and the advisers they choose to employ. Nevertheless there is perhaps some moral obligation on the critic to do more than point out the need for new directions.

[10] Unlike earlier plans, the Sixth Plan does not differentiate between rural groups in its listing of poverty incidence. It is therefore no longer possible, at least on the basis of the official figures, to identify the incidence of poverty of padi households specifically. Nevertheless, it does identify the hard-core poor as including households located in remote traditional *kampung* and settlements, as well as on plantations, in the former 'new villages' and in some urban areas.

Table 7.1 Peninsular Malaysia: Incidence of poverty (%) by rural-urban strata, 1970, 1976, 1984, 1987 and 1990

Stratum	1970	1976	1984	1987	1990	
Rural	**58.7**	**47.8**	**24.7**	**22.4**	**19.3**	**4.8***
Rubber smallholders	64.7	58.2	43.4	40.0		
Padi Farmers	88.1	80.3	57.7	50.2		
Estate workers	40.0		19.7	15.0		
Fisherman	73.2	62.7	27.7	24.5		
Coconut smallholders	52.8	64.0	46.9	39.2		
Other agriculture	89.0	52.1	34.2	–		
Other industries	35.2	27.3	10.0	–		
Urban	**21.3**	**17.9**	**8.2**	**8.1**	**7.3**	**1.4***
Agriculture	–	40.2	23.8	–		
Mining	33.3	10.1	3.4	–		
Manufacturing	23.5	17.1	8.5	–		
Construction	30.2	17.7	6.1	–		
Transport and utilities	30.9	17.1	3.6	–		
Trade and services	18.1	13.9	4.6	–		
Activities not adequately defined	–	22.4	17.1			
TOTAL	**49.3**	**39.6**	**18.4**	**17.3**	**15.0**	**3.6***

Sources: Fifth Malaysia Plan,
Mid-Term Review of Fifth Malaysia Plan
Sixth Malaysia Plan
** Hard core poverty—see endnote(10)*

This book has attempted to examine the padi industry of the geographic region now known as Peninsular Malaysia within its particular physical and cultural environment and giving consideration to its historical background especially since about 1910. Although not seeking overtly to fit the industry into any particular development model—indeed the writing of the book has convinced the author of the inadequacies of most, if not all, models of agricultural growth—efforts have been made to relate events and policies to the theories that appear to have influenced them. Earlier in this chapter some options available to policy makers were briefly outlined. It is the author's considered view that the last of those options (p. 136) holds out the best prospects for a prosperous, self respecting, sustainable padi economy. This option involves both the hard decision to revise the attitude that the maintenance of traditional rural lifestyles is *per se* an ideal and the adoption of industrial policies that will provide for a greater dispersal of alternative employment opportunities. Malaysia needs fewer and more viable padi farms located primarily in the granary areas that are operated in a way that is sustainable both in ecological and social senses. The point was well put in the 1985 report by the Asian Development Bank when it spoke of the need for a flexibility that can

accommodate future consolidation by individual farmers and a rigidity that legally can prevent further fragmentation. The same report believes that the hitherto strong social attachment to land is gradually being weakened and that, over time, what it describes as 'friction' in the land market will ease. The problem of idle land will become more readily solvable, perhaps by way of land leasing, and ultimate sale, as education makes non-agricultural careers more attractive and employment in secondary and tertiary activities becomes geographically more widely available. The paradox of continuing poverty in a sector to which so much technological and financial attention has been given might then cease to exist.

Malaysia is a small, increasingly prosperous country which, more readily than most of its neighbours, can provide a lead in the formulation of a sustainable and progressive padi industry. In order to do so, the future of that industry must be planned in concert with the national economy as a whole and also in its regional context. In addition, attention must be given to the development of technologies that will be in harmony with the natural environment and on a scale that the individual household can realistically apply.

Appendix

A Note on Rice Statistics

Data on areas, production and yields are an important part of a work that is concerned with an agricultural industry and many conclusions are based upon the figures published in official reports, academic papers and government statements. It is necessary, therefore, that a brief statement be made on the procedures whereby the quantitative data have been collected.

Rice statistics have been published in a consolidated form by the Department of Agriculture only since the 1950/51 season in the bulletin, *Rice Statistics (Perangkaan Padi)*. The collection of statistics from approximately 150,000 padi households, not all of whose heads are necessarily literate, cannot be undertaken in the systematic way in which, for example, data are collected from commercial plantations. The methodology employed has been described in detail by Selvadurai (1972):

> Estimates of the planted and harvested areas of padi are made every season by the extension staff of the Department of Agriculture as part of their routine work in the collection of agricultural statistics. Each of the extension staff confines his work to limited and well defined areas and a junior agricultural assistant will generally be responsible among other things for the collection of area statistics for one or a group of mukims. The basic figure for area under padi is essentially the records of the Land Office which refer to the area alienated for various crops; the junior agricultural assistants make annual adjustments to the basic figure according to what they observe (eye observation) as areas that have gone out of production or been brought into cultivation during that particular season. The extension staff often work closely with the staff of the Irrigation Department, the *penghulu (headmen)* and the Land Offices, to obtain more accurate information on the areas under padi and other crops. The acreage statistics reported refer to the *gross* area under padi. By gross area is meant the area under padi including the area occupied by bunds, irrigation and drainage canals and the area taken up by the farm-house. The statistical returns by the extension staff are summarised at the District and State levels and finally, at the Federal level the Ministry of

Agriculture and Fisheries checks the information for internal consistency before publication.

In recent years two important projects have been initiated to improve the basic statistics of land utilisation or areas under the principal crops. In 1966, a land use survey (or PLUS: Present Land Use Survey) was undertaken by the Division of Agriculture with assistance from the Canadian Government. This land-use survey based on aerial photography aimed at giving an accurate picture of existing land utilisation, both cartographically and statistically, so that a complete account of all significant forms of land-use could be given and displayed for every mukim, district and state. The results of this land use survey which are available show that the estimates of the area under padi as reported by the extension staff of the Department of Agriculture are fairly reliable; but where there were divergences, the padi statistics were revised on the basis of the results of PLUS.

At about the same time (1965), the Department of Statistics undertook a major project to determine the land use pattern particularly of small holdings within the country National Crop Survey (NCS). The main objective of the NCS was to build up a sample survey system to obtain reliable annual estimates of area under principal crops for each State of West Malaysia.

Production of padi is estimated as the product of the area planted and the yield per acre. *Yield data* are obtained from crop cutting surveys in the major padi growing districts. These crop cutting surveys cover about 90% of the padi area and provide objective estimates on the basis of actual harvesting of randomly selected plots. The Department of Statistics is responsible for designing and implementing the crop cutting surveys. The State Agricultural Departments, and more recently the Drainage and Irrigation Departments, jointly undertake the field work. An Inter-Departmental Committee, known as the Implementation Committee, exercises overall control and direction for the Survey.

Data earlier than 1950 were based on information collected from local Land Offices and field staff but were often less systematic and liable to larger margins of error. Errors were compounded by the varying use of local measures. For example, a farmer would commonly report his yield in *kuncas*, a relatively large unit approximately 406 kg. The government reported yields in terms of *gantangs*, units of only 2.54 kg (160th of a kunca). Mill door and government prices were quoted in terms of *pikuls*, approximately 60 kg. Any yield statistics involved at least one conversion between large and small units. Farmers often rounded their total production to half or quarter *kuncas* thus producing rounding errors that, cumulatively, could represent a substantial quantity of padi.

For the sake of consistency, all quantitative data in this book are presented in metric units, though Malaysia has published its data in this form only since 1977. Earlier data have therefore been converted. In some cases, especially when early data were rounded estimates, the conversion may give the quite false appearance of precision (e.g. an estimate of, say, 10,000 *gantangs* converts to 25,401 kg).

All data are therefore likely to contain errors of variable degree some of which were admitted at the time of collection, and, while general statements can be based upon them and broad trends identified, conclusions reached on the basis of only small percentage differences must be particularly suspect.

It should also be noted that, since rice cultivation does not fit neatly into calendar

years, rice statistics for a particular calendar year (eg 1980) refer, in the cases of main season and dry rice, to the crop year that ends in the calendar year (i.e. 1979/80). All data for off-season production refer to the calendar year. In some contexts, the crop year (1979/80) is quoted.

For convenience of reference, padi data for the period 1950/51–1989/90 for the Peninsula are appended.

Appendix Table 1 Peninsular Malaysia—padi statistics 1950/51–1989/90

A1(a) Area under padi (in hectares)

	Wet: main season	Wet: off season	Dry	Total
1950–51	275,732	2,117	15,246	293,095
1955–56	275,417	3,394	16,761	295,572
1960–61	299,890	14,358	16,886	331,134
1965–66	308,947	42,287	18,275	369,509
1970–71	373,214	159,417	20,044	552,675
1971–72	361,400	197,510	13,619	572,529
1972–73	369,481	212,356	9,927	591,764
1973–74	371,283	217,125	9,113	597,521
1974–75	372,352	213,319	9,708	595,379
1975–76	347,757	222,404	10,008	580,169
1976–77	345,260	212,500	9,480	567,240
1977–78	335,340	103,200	7,310	445,850
1978–79	331,500	223,280	7,440	562,220
1979–80	319,390	204,300	6,430	530,120
1980–81	316,150	198,930	8,030	523,110
1981–82	274,670	212,190	6,230	493,090
1982–83	295,170	173,490	4,680	473,340
1983–84	243,019	190,579	2,970	436,568
1984–85	269,174	195,363	960	465,497
1985–86	247,284	183,852	725	431,861
1986–87	255,267	196,222	534	452,023
1987–88	269,461	203,778	867	474,106
1988–89	256,206	217,577	664	474,447
1989–90	269,505	221,041	526	491,072

Appendix Table 1 Peninsular Malaysia—padi statistics 1950/51–1989/90

A1(b) Production of padi (in tonnes)

	Wet: main season	Wet: off season	Dry	Total
1950–51	573,837	3,315	13,105	590,257
1955–56	544,957	7,013	17,837	569,807
1960–61	785,527	33,325	22,525	841,377
1965–66	777,462	118,065	21,657	917,184
1970–71	998,080	496,778	24,967	1,519,825
1971–72	919,220	602,080	17,572	1,538,872
1972–73	1,018,575	662,655	13,487	1,694,717
1973–74	1,074,080	699,982	12,092	1,786,154
1974–75	1,008,060	664,568	13,145	1,685,773
1975–76	951,302	743,881	11,742	1,706,925
1976–77	904,466	715,643	9,573	1,629,682
1977–78	915,538	304,808	8,486	1,228,832
1978–79	1,034,593	753,326	11,146	1,799,065
1979–80	1,028,843	723,392	8,537	1,760,772
1980–81	1,032,287	705,639	10,842	1,748,768
1981–82	905,390	683,111	6,962	1,595,463
1982–83	940,094	531,796	6,315	1,478,205
1983–84	643,534	542,675	3,327	1,186,209
1984–85	913,052	628,361	1,274	1,542,687
1985–86	847,022	605,492	1,010	1,453,524
1986–87	886,386	536,528	616	1,423,530
1987–88	897,334	597,724	1,124	1,496,181
1988–89	879,693	713,539	1,829	1,595,061
1989–90	1,008,781	777,983	595	1,787,359

Appendix Table 1 Peninsular Malaysia—padi statistics 1950/51–1989/90

A1(c) Yields of padi (in tonnes per hectares)

	Wet: main season	Wet: off season	Dry	Total
1950–51	2.111	1.571	0.870	2.04
1955–56	2.025	2.080	1.074	1.97
1960–61	2.636	2.334	1.339	2.56
1965–66	2.519	2.821	1.259	2.62
1970–71	2.747	3.124	1.247	2.86
1971–72	2.544	3.056	1.290	2.76
1972–73	2.754	3.149	1.358	2.92
1973–74	2.889	3.241	1.352	3.08
1974–75	2.741	3.155	1.352	2.88
1975–76	2.729	3.390	1.173	3.00
1976–77	2.620	3.368	1.010	2.96
1977–78	2.730	2.954	1.161	3.02
1978–79	3.121	3.374	1.498	3.25
1979–80	3.221	3.541	1.328	3.39
1980–81	3.265	3.547	1.350	3.42
1981–82	3.296	3.219	1.117	3.24
1982–83	3.185	3.065	1.349	3.12
1983–84	2.648	3.848	1.120	2.72
1984–85	3.392	3.216	1.327	3.31
1985–86	3.425	3.293	1.393	3.37
1986–87	3.472	2.734	1.153	3.15
1987–88	3.330	2.933	1.124	3.16
1988–89	3.434	3.279	2.754	3.36
1989–90	3.743	3.520	1.130	3.66

Source of raw data: Department of Agriculture, Rice Statistics

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