

Agricultural Land Use: Problems and Prospects

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INTRODUCTION

Like any other factor of production, land – and more importantly, good agricultural land – is subject to the problems of scarcity. A given piece of land therefore often competes among several alternative uses. In theory, and as often realized in practice, the selection procedure settles on the 'highest and best use', a concept which relates to the land use that would provide an optimum return to their operators or to the society (Barlowe 1986). In simple terms, it is the one which is the most efficient (Dovring 1987). This selection procedure often leads to conversion of agricultural lands to other alternative uses. By and large, the conversion of agricultural land can either be active or passive (Hart 1968; Furuseth and Pierce 1982). In addition, parcels of land close to or bordering the city areas are also subject to speculative activities (Sinclair 1967).

On the active side, huge areas of land which were once used for farming have been lost when they were converted to such other uses as housing developments, commercial and industrial establishments, highways, airports, reservoirs, military reservations, and state or national forests (Hart 1968). Implicitly, the land providing the greatest returns is making the highest bid and is displacing other land uses. Since the land use providing the highest returns or economic rent is generally the urban land use, this often results in urban land uses displacing the rural land.

The passive process occurs when the former farm land has simply been abandoned, permitted to grow up in brush, and eventually reverted to woodland (Hart 1968). Quite often, lands with poor soil conditions, resulting from severe erosion, for instance, were instead completely abandoned or taken out of their productive uses.

In between the two extremes of active and passive processes of land-abandonment, there are cases where the lands are subject to

speculative activities. This often occurs to parcels of land close to or bordering the cities. Here, the common features would be broad expanses of barren, unused land, owned by speculators, or by farmers who intend to sell the land at the most profitable time. Farming activities on these parcels of land, if any, would only serve the purpose of keeping down the weeds (Moore and Barlowe 1955).

LAND USE MODEL

This paper will incorporate the concepts of agricultural margins (Dovring 1987; Barlowe 1986) and Thunen's spatial location model (Hall 1966). Further application of Thunen's model which has been extensively discussed by others (Chisholm 1962; Sinclair 1967; Barlowe 1986; and Atkins 1987), is included as a source of reference.

CONCEPT OF AGRICULTURAL MARGINS

A study on land use would not be complete without touching on the concepts of agricultural margins. Based on the production function and the static law of diminishing returns, Dovring (1987) underlines three types of margins: intensive, extensive and absolute. Although the absolute agricultural margin is rarely used, the intensive and extensive agricultural margins are widely applied in decision-making pertaining to competing land use activities.

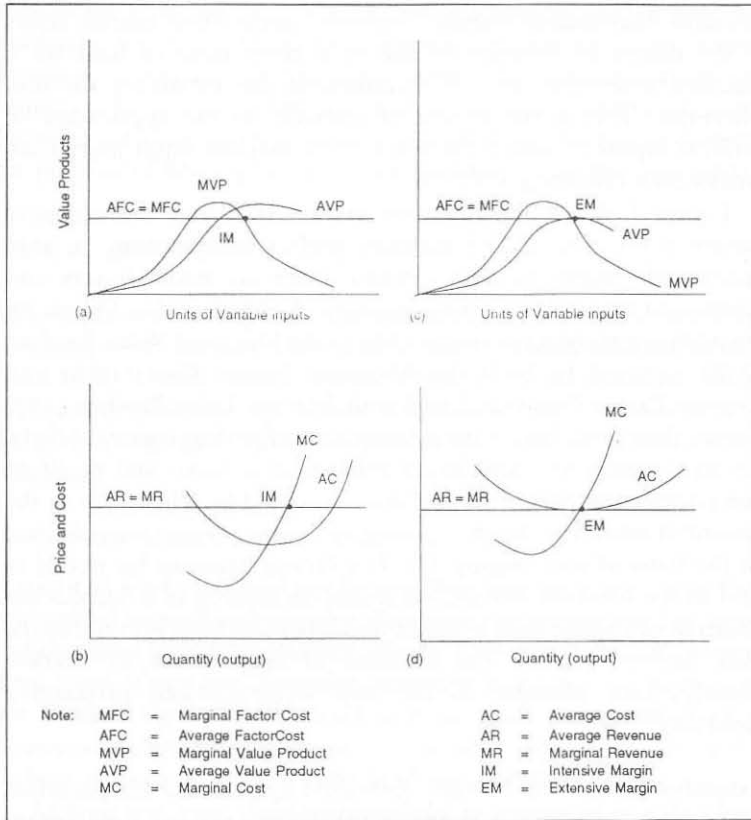
As limit concepts, these margins help an enterprise to utilize the land under various land use capabilities. Land use capability refers to 'the degree to which a given grade of land quality can yield a net return under a given enterprise, under stated assumptions about technology' (Dovring 1987:73). Although defined in the static form, they are also adaptable to dynamic situations such as changes in cost structures, production or input prices, and productive capability of a given piece of land.

Implicit in these margins is the concept of land intensity which is the ratio of farm inputs to land area; the level of intensity indicates the amount of inputs per unit area. By similar reasoning, intensive or highly intensive land use occurs when a large quantity of inputs per unit area is used. Non-intensive, or extensive land use, on the other hand, occurs when small quantities of input per unit area are used (Found 1971).

Intensive Agricultural Margin Intensive agricultural margin refers to the degree of intensity of use of a given piece of land for a specified enterprise, and of homogenous use capability for that enterprise. This is the degree of intensity in the application of variable inputs of which the last unit of variable input more than breaks even (Dovring 1987:73).

Figure 1 shows the intensive margin (IM) and the extensive margin (EM). The model assumes perfect competition, in both factor and output markets – where there are many buyers and sellers; and where firms are price-takers. As illustrated in Figure 1a, the intensive margin (IM) occurs where the Marginal Value Product (MVP) is equal to both the Marginal Factor Cost (MFC) and Average Factor Cost (AFC), and with Average Value Product (AVP) greater than MVP. Under the assumptions of perfect factor markets, the MFC equals AFC and hence behaves in a horizontal position. The intersection point (IM) in Figure 1a could be referred to as the abnormal profit for the enterprise if the same analysis were defined on the basis of cost (Figure 1b). If a farmer operates his parcel of land at the intensive margin, he would be assured of a surplus net return or economic rent, a return which is well above his total costs. This happens under the absence of any forms of market imperfections, changes in the cost structure and productive capability.

Extensive Agricultural Margin Extensive agricultural margin refers to the situation in which a specified enterprise will just break-even, producing no net returns or loss. Subject to the given assumptions of perfect competition, Figure 1c illustrates the extensive margin (EM), which occurs where the MVP is equal to MFC, AFC and AVP ($MVP = MFC = AFC = AVP$). On cost basis, this would simply imply a normal profit for the given enterprise (Figure 1d). Thus, in a modern and competitive economy, very few people will ever operate the land which is the extensive margin for the enterprise being applied. Exceptions are however found under conditions of extreme scarcity of food combined with zero-opportunity cost for labour. Operating agricultural land at the extensive margin would not be a wise decision to take considering the high risk and uncertainties surrounding the agricultural sector; flash floods, severe drought and other natural disasters, for instance, could cause extensive damage to the crops or livestock.



Source: Doving, Folke. 1987. Land Economics. Fig. 4.1, p 74

FIGURE 1. Intensive and Extensive Margins

VON THUNEN'S LOCATIONAL MODEL

In his *Isolated State*, von Thunen tried to work out the most profitable pattern of land use on an area of uniform land arranged in concentric circles around a single market for land produce (Hall 1966). The main variable factor in his analysis was transport costs, which were related to distance and the nature of the commodity. He made various assumptions which further simplified his analysis; for example, he assumed that the cost of transport was proportional to distance and that the costs of production, other than transport, were constant.

For a given crop produced in this ideal condition, the net returns or economic rent would decrease as distance from the city -

and hence transport costs - increase. However, the gradient of decreasing rent would vary from crop to crop. This variation also applies to different systems of growing the same crop. The produce for some crops would be more sensitive to transport costs than for other crops. As Thunen pointed out, bulky, low-value commodities would be more sensitive than higher-value commodities. If demand existed for several land products under these given assumptions, then the model concluded that the most profitable land use for a given location could be identified by the economic rent of the various alternative land uses as illustrated in Figure 2.

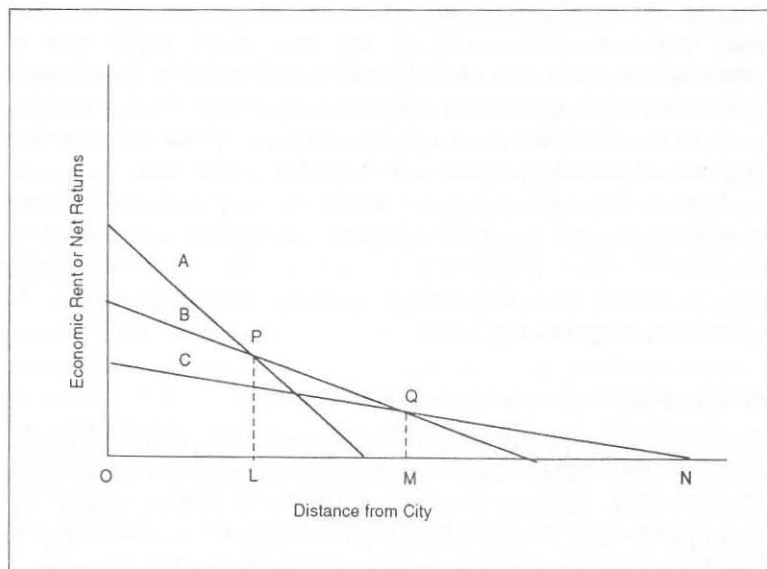


FIGURE 2. Rent-Distance Function in Land Use

Following Thunen's approach, the decision for a particular land use would be determined by the level of net returns. Under the given assumptions, and assuming also that land use decisions were purely determined by economic considerations, then land use A in Figure 2 has the steepest slope, hence indicating the highest intensive margin and net returns. The figure does not only reflect the competition between particular crops but it also refers to competition among three different systems of growing the same crops; the per-hectare production of any crop can, in other words, be influenced by more or less intense application of labour and fertilizer. In the city areas with relatively scarce cultivable lands, an

extremely intensive use of land is desirable because the resulting increase in production pays off in a higher economic rent. In addition, the higher economic rents attached to the urban lands demand a significant increase in production, which can possibly be realized through intensive use of the available parcels of land.

The level of intensive margin decreases in descending order as it moves to land uses B and C. The intersection points P and Q indicate the margins of transference between the various land uses. This gives rise to different zones of transference: OL for land use A, and LM and MN for land uses B and C respectively. Land close to the city earns higher economic rents, indicating declining intensity with increasing distance from the city. With rapid rate of urbanization, more agricultural lands would therefore be acquired and converted to urban and other municipal uses. In this process, some, if not all, of the good agricultural lands would be lost unless they can effectively compete with the other urban uses.

Rent declines with distance from the city until a no-rent distance is reached. Beyond point N in Figure 2 is the extensive margin of production, where production is economically infeasible. Simply put, it would cost the farmer nothing should he decide to completely abandon the land.

APPLICABILITY OF VON THUNEN'S MODEL

Given the assumptions adopted by Thunen, his locational theory serves as the primary basis for explaining the principle of declining intensity with distance from the city. To a certain extent, the assumptions used by von Thunen are considered to be too ideal to reflect the reality of the modern world (Jackson 1972; Barnbrock 1974). But as early as 1925, Europe's agricultural zones have been characterized as consistent with Thunen's principles (Jonasson 1925).

Chisholm (1962) cites examples of Thunen-like zones near nucleated agricultural settlements in Southern Italy and the Spanish Meseta, agro-towns in Bulgaria, rural parishes in Finland, towns in the Pakistan Punjab, villages in Nigeria and Ghana, and the settlements of shifting cultivators in Africa and South America. He argues, indeed, that von Thunen's principles can be applied on scales both smaller (on an individual farm) and greater (on world scale) than that of an urban area.

Similar concentric patterns have been reported from around cities elsewhere, such as Montevideo, Uruguay (Griffin 1973), and

Addis Ababa, Ethiopia (Hovarth 1969), where supplies of food and other land products still come largely from the local hinterland.

Sinclair (1967) underlined the changing factors that might affect the validity of Thunen's model: for instance, the rapid change brought about by the on-going revolutionary developments of the last few decades in technology, in human organization, and in living habits.

In his explanation, Sinclair argued that developments in the field of transportation have had the greatest influence. Improved and more efficient means of transport, for example, have displaced former rudimentary methods. In general, costs of all types of transport have declined greatly in relation to most other agricultural production costs. Unlike the situations that prevailed during Thunen's time, the transport costs during this modern era are not necessarily directly proportional to distance and bulk. Because of modern refrigeration and air-conditioning techniques, perishable commodities can be processed, stored, moved and distributed to consumers at longer distances with little risk of spoiling.

Also related to these transport considerations, Sinclair strongly argued that three other factors have profoundly altered the agricultural pattern in modern industrial areas: modern organization which favours large-scale production and mass transportation of agricultural produce; the development of nationwide or worldwide markets as opposed to a single market; and that competition between various agricultural land uses is often complicated by increasing competition from non-agricultural uses.

Sinclair also agreed with Clawson's earlier findings (Clawson 1962), that in many advanced parts of the world, the basic forces determining agricultural land use near urban areas are associated with urban expansion. An 'urbanized area' in the United States has been defined for each city of 50,000 persons or more at each decennial census of population since 1950 (Hart 1976:5). The urbanized area, according to Hart (1976:5), might properly be described as the 'geographical city' because it includes the entire closely built-up area of the city and is enlarged as the city grows. Due to rapid urban expansion, most urban lands today are much more valuable than rural lands, so that where there is a direct competition between these uses, urban uses which offer higher economic returns generally take over. As a result, rural land is often converted to comply with particular urban uses. By conventional

bookkeeping criteria, competition between land uses is resolved by the prices the proponents of competing uses are able and willing to pay for each piece of land. By this token, urban uses almost always win over agricultural uses. They entail much higher investment per acre, hence more risk, and consequently more necessity to buy the land which is most advantageous for the purpose and the least costly to develop.

Parcels of land which are exposed to future urbanization process are also expected to be more valuable than if the lands were to remain in rural uses. This is often brought about by possible transactions between the land owners and developers and speculators. Hence, where these forces are in operation, the agricultural pattern is often one of increasing intensity and quality with distance from the city, quite the reverse of the pattern generalized by Thunen's theory. To support his contention, Sinclair cited the exemplary developmental changes in some of the areas in the USA, in particular the Midwest Region, areas near Lansing, Michigan, and to some extent areas near Milwaukee, Wisconsin.

However, the basic forces identified by Thunen are still important in less developed parts of the world where modern technological development has been very slow and has caused very little impact compared to that of the industrialized nations. In these areas, therefore, Thunen's theory can still be applied as the basic explanation of agricultural land use patterns.

Barlowe (1986:95) underlined five major factors that have led to variations in the modern patterns of land use: location of cities; urban land use patterns; industrial locations; locations of commercial establishments; and locations of residential developments. The interactions between these factors have had a tremendous impact on agricultural lands bordering the cities.

Atkins (1987) argued that the concepts of location and intensity of production covered in Thunen's model paved the way for competition for land uses based on the relationship between the cost of transportation to the city and the land rent generated by growing a crop on a particular piece of land. Land rent in this context refers to 'the residual net income left to the farmer for the sale of his produce, after deducting the cost of production' (Atkins 1987:130). The significance for farmers of this concept is that land uses have different potential land rents for a location according to their characteristics, and a rational decision-maker will therefore

choose an enterprise combination bearing opportunity costs in mind.

GAIN AND LOSS OF AGRICULTURAL LANDS

Experiences from several countries reveal that development activities can lead to either gain or loss of agricultural lands. But quite often, the loss of agricultural lands has been relatively more significant. This, in part, results from lands being converted to urban uses in response to rapid urban encroachment process and, to some extent, due to idling of potential agricultural lands. Experiences in the USA, Europe and other regions of the world offer some interesting examples.

THE USA EXPERIENCE

In a study conducted on the farmlands in Kentucky, Hart (1964) revealed that physical quality of land was the main determinant for loss of agricultural land in the eastern part of the state. Compared to the western part of the state, the eastern part has relatively rough topography. As a coincidence, this part of the state is close to the Appalachian Range. Also associated with this area is the poor soil quality as a result of continuous soil erosion and rapid depletion of plant nutrients through very intensive use of the available land. During the decade, 1950-1960, the amount of farm lands in the United States has declined by more than 40 million acres (Hart 1964:1). Kentucky alone lost about 50,000 acres of agricultural land during that same period. Hart (1964:2) cited three major ways for the loss or abandonment of agricultural lands in the United States: (a) thousands of acres which were once used as farming have been converted to such other uses as cities and highways, reservoirs, and military reservations; (b) land-abandonment, with subsequent re-clearance, has been so regular in parts of the South that it amounts to a system of woodland fallow; and (c) in some areas farmland has simply been abandoned. The process of urbanization, according to Hart, has had very little impact on agricultural land loss in Kentucky.

Following another study in the states of Eastern United States, Hart (1968:423-424) underlined six major causes for the loss or abandonment of agricultural land: the growth of urban areas; coal strip-mining; the development of competitive disadvantages for a

regionally dominant crop; governmental programs, such as the Soil Bank; land acquisition by forest industries; and physical impediments to effective agricultural utilization such as climatic handicaps, rough surface features, and unproductive soils. He believed that the loss and abandonment of agricultural land in 31 states covered in the study has been more widespread than is commonly recognized.

During the 50-year period prior to 1968, the loss was a result of the operation of a complex variety of factors, working singly and in combination, more powerfully in some areas than in others (Hart 1968). Of all the factors, however, the process of urban encroachment on rural areas has been the major reason for diverting and converting agricultural lands in the United States (Hart 1976; Plaut 1980).

Fravega (1970), following a study on Madison County in Tennessee, concluded that the growth of cities has greatly reduced the amount of not only poor quality agricultural lands but also those in the best category. In this respect she disagreed with Hart's earlier contention that the loss of agricultural land was mainly due to poor quality.

Over the last decade alone, 1.5 million acres of California agricultural land were converted to urban or other non-farm uses. Yet, during this same period, agriculture has remained the state's number one economic force with an annual value in 1982 of US\$14 billion (Cohen ed. 1983). And even though 1.5 million acres were being converted to other uses in the last decade, California has experienced a net gain of 2.5 million acres of irrigated cropland in the last 20 years; the principal reason being the extensive application of irrigation facilities to existing farm lands.

In the case of Florida, the source of half of the total world supply of grapefruit, and a quarter of its oranges, all the prime farmlands will be put to other uses by the end of the century if the trend continues; and the loss of prime cropland would be 24 per cent for Virginia and 16 per cent for California (Cutler 1980, quoted in Brown and Flavin 1988).

Jackson (1983) pointed out that the North-Eastern states in the United States have been the scene of land-abandonment as marginal land was allowed to revert to brush, or transferred to other types of uses. With the exception of the Mississippi Delta States and Florida, the entire south is a region of cropland abandonment. Jackson contended that the abandoned lands were

infertile, unsuitable for mechanization, or both. Between 1952 and 1972, about 6 per cent of the total taxable farm acreage was converted to urban-related uses. In the same period, New England lost half of all its farm acreage, and New Jersey lost 45 per cent. And during the decade, 1959-1969, an average of 1.2 million acres of rural land per year was shifted to intensive urban-related uses, with one million acres per year shifted to extensive uses (Conservation News 1978).

THE CANADIAN EXPERIENCE

The problem of agricultural land loss is no exception to Canada. The long-term viability of Canada's food producing sector is threatened both by the conversion of prime agricultural lands to non-agricultural uses and by the abandonment of large areas of marginal agricultural land, principally in Eastern Canada (Manning 1987). The net result of these trends is increasing dependence upon a reduced agricultural land base. Since 1966, over two-thirds of Canada's urban growth has been on high capability agricultural land (Classes 1 to 3), most of which had been producing farms. Because most of Canada's major cities are located in the middle of high capability lands, this trend is likely to continue (Manning 1987).

THE EUROPEAN EXPERIENCE

The net gain or net loss of agricultural lands can also be assessed from experiences of the European nations. In Europe, urban encroachment during the decade, 1960-1970, has resulted in the loss of grazing lands and croplands; in West Germany (1 per cent); and France and United Kingdom (2 per cent) per year (OECD 1976).

Based on secondary data and on the United Kingdom's (UK) annual June Census of Agriculture, Hill and Ray (1987) estimated that about 30,000 hectares per year were shifted from agriculture in the period 1960-1970, representing less than 0.2 per cent per annum of the total agricultural land, or 0.25 per cent of the crops and gross area. They found that most of these went into urban use, construction of reservoirs and mineral extraction and forestry. Despite this problem, they maintained that effective land planning control in recent years has significantly reduced the possibility of further agricultural land loss. Currently, the UK agriculture occupies about four-fifths of the total land area. Of this, some 90

per cent of Grade-1 land and 85 per cent of Grade-2 land are still in agricultural use. The current rates of land loss from agriculture therefore do not pose any significant threat to the overall UK food output. Increases in productivity means that output per hectare has been rising by about 3 per cent per annum, a figure at least ten times greater than the annual land loss, total farm output has thus been increasing despite using less land (Hill and Ray 1987).

In another study in Czechoslovakia, Gottlieb and Pavlu (1987) found that the country lost most of the agricultural lands and agricultural functions to residential, recreational and industrial functions. This was mainly due to the upsurge of industrial production which made significant impact on the agricultural settlement by the end of the nineteenth century. It began with the depopulation of rural areas around 1930. This was followed by the process of concentration of settlements close to the industrial centres after 1945. As industrial population expanded beyond its capacity, more agricultural areas were utilized for their settlements.

THE AFRICAN EXPERIENCE

In Northern Africa, the loss of prime agricultural land takes a different form. In this arid region, rapid deforestation for fuelwoods, and with other economic activities combined, have turned once massive productive areas into barren lands and finally into deserts. In addition to the influence of human activities, this process of desertification is further reinforced by adverse climatic condition (Ahmad and Kassas 1987).

In the preface of the report to the United Nations, Ahmad and Kassas (1987:viii) revealed that desertification has continued to spread and intensify despite efforts undertaken since 1977; land irretrievably lost through desertification continues at about six million hectares annually, and land reduced to zero or negative economic productivity is more than 20 million hectares annually; areas of productive land affected by at least moderate desertification include 3100 million hectares of rangeland, 335 million hectares of rainfed croplands and 40 million hectares of irrigated land; and rural populations in areas severely affected by desertification number 135 million in 1984, compared with 57 million in 1977.

Desertification indeed posed a very serious threat, not only to the overpopulated regions of the African continent, but also to other third world nations having similar conditions. Its cost in

human, social and economic terms would therefore be extremely high. A 20-year world-wide program to arrest further desertification would require about US\$4.5 billion a year; developing countries in need of financial assistance would require US\$2.4 billion of this (US\$48 billion in the 20 years) (Ahmad and Kassas 1987).

In addition to the major causes for the loss of prime agricultural lands, as the above experiences have shown, other factors may also be equally responsible. In many cases, this occurred as a result of various economic activities which ultimately led to environmental degradation. For instance, severe depletion of top soil through soil erosion process (Brown and Flavin 1988); and severe toxicity from use of chemical fertilizer and pesticides in farming practices (Postel 1988) offered some of the major current issues around the globe.

LOSS OF AGRICULTURAL LAND IN WEST MALAYSIA

Malaysia has a total land-area of 330,434 Km². West Malaysia, with more than 85 percent of the country's total population, occupies only 131,587 Km² or 40 percent of the total land-area. The rest is shared by the East Malaysian states of Sabah and Sarawak. In terms of population density, East Malaysia is relatively still underpopulated. This is shown in Table 1.

TABLE 1. Malaysia: Area and Population 1989-91

	Land Area (Km ²)	Pop ('000)		1985-90	1991 Density
		1989	1991	Av. Annual Growth Rate (%)	
Malaysia Total	330,434	17,353	18,174	2.6	55.0/Km ²
of which:					
West Malaysia	131,587	14,297	14,942	2.5	113.6/Km ²
Sarawak	124,449	1,633	1,706	2.7	13.7/Km ²
Sabah	74,398	1,424	1,526	3.9	20.5/Km ²

Source: *Fifth Malaysia Plan (1986-90)*; *Economic Reports 1989/90 and 1990/91*.

Overall, less than one-third of the total land-area in Malaysia is utilized for agriculture, residential, industrial and other commercial activities. In East Malaysia, the low percentage of land-area devoted to agriculture and other uses is mainly due to inaccessibility. Undoubtedly, inaccessibility also forms the major factor for the slow rate of development in that region of Malaysia. On the

contrary, West Malaysia does not only host most of the agricultural and industrial development programmes but also currently supports a higher population density.

In West Malaysia, the loss of agricultural lands has been the result of both active and passive processes. Besides the abandonment of agricultural lands, urban encroachment process has, to a great extent, had a significant impact on the loss of agriculturally-based regions and, hence, agricultural output.

Although there are no published records that show the acreage of prime agricultural lands which have been lost to the urban encroachment process, it can still be justified by the geographical locations and rapid expansion of the major cities in the country. In response to increasing demand for residential and other social requirements, arising mostly from increased economic activities and rapid outward migration of rural labour force, major cities and townships in the country have invested heavily in planning and development to fulfill these basic social needs. And further increases in the demand for housing, businesses and other amenities, the cities' frontiers too have to be expanded outward into the once highly productive agricultural lands. This is really the trade-off. Urban expansion would not occur unless at the expense of a reduction in agricultural areas. These include the highly congested industrial estates in the Klang Valley (Selangor), Perai and Bayan Lepas (Penang), Senawang (Negri Sembilan) and Pasir Gudang (Johore). Also affected are the major cities of Kuala Lumpur, and new townships of Ipoh, Johore Bahru, Penang, Petaling Jaya and Subang Jaya.

Commenting on the agricultural lands lost through land-abandonment or idleness, it is clear that a total of 890,000 ha of agricultural lands have been abandoned by the end of 1980; of which the rice sector accounts for only 18 percent of the total. The non-rice sector, particularly rubber, accounts for the remaining 82 percent; the bulk of the abandoned lands is found among the rubber smallholders (Malaysia 1981).

THE RUBBER SECTOR

The land abandonment that arises in the rubber smallholding sector is not a new phenomenon. Probably, its process must have started during the last two decades, primarily due to future uncertainties and price fluctuations. Had it not been for the development of new planting areas for rubber, as was actively

initiated by FELDA, FELCRA, RISDA, and many other state enterprises, and more intensive rice cultivation through double-cropping practices, the negative effects of land-abandonment to the economy would have been much greater.

Many reasonably large land settlement schemes organized by FELDA, in particular, have successfully operated on large scale production capacities. The goal of this development is to increase the income level of the landless farm workers and rubber farmers who have been operating on uneconomic sized rubber holdings. Although FELDA has achieved great success in its venture, the performance of the rubber smallholding sector, on the other hand, has not been very impressive. The main reason is the reportedly increasing cases of land-abandonment by many rubber smallholders.

In a study on the rubber smallholdings in Ulu Selangor, Malaysia, Hitam (1986) found that the rubber smallholders abandoned their holdings partly in response to low productivity, uneconomic size, distance from home and more importantly, higher returns from other off-farm employments. Although low returns from rubber smallholdings have been off-set by relatively higher income from other off-farm jobs, not many farmers have succeeded in breaking them away from the poverty circle. The incidence of poverty among rubber smallholders dropped only slightly to 43.4 percent in 1984 from 64.7 percent in 1970 compared to the total incidence of poverty for the rural areas which dropped to 24.7 percent from 58.7 percent for the same period (Malaysia 1986).

THE RICE SECTOR

The rice sector in the country offers another venue for assessing the net gain and net loss of prime agricultural lands. Assessment can be made by considering the single-cropping and double-cropping regions. A further insight into this matter is also offered through a recent case study by Tempelman (1982).

Single-Cropping Regions With the exception of the main irrigated regions, other traditional rice growing areas in the states of Negeri Sembilan, Malacca, Johore, Terengganu, and Pahang, are somewhat unorganized and sparsely scattered. Provision of any kinds of irrigation and drainage facilities in these areas would be too costly for the government as the marginal increase in total rice output, thus net marginal returns, from such investment would still be

relatively very low. This is partly due to poor soil conditions, undulating plains and farms too small to provide sufficiently attractive returns to their operators.

In view of the latest government policy of creating a more efficient cost structure in rice cultivation (Malaysia 1987), most of the rice farmers in the traditional rice growing areas are rapidly quitting rice farming. In this policy, the government tried to phase out rice farming activities in the non-irrigated and non-productive regions by abolishing the price support, input subsidies and other technical assistance to the farmers. To this effect, more rice farms are actually undergoing rapid transition toward complete abandonment. The displaced farmers are encouraged to work in the government-sponsored small industries in the neighbourhood or find jobs elsewhere. To these affected farmers, this current policy will indeed cause a major turnaround in their socio-economic activities.

Double-Cropping Regions In the rice sector, proper irrigation and drainage systems have successfully converted certain single-cropped rice growing regions into double-cropping activities. Other than the provision of irrigation and drainage facilities, increases in rice output in these regions have been accomplished through various other measures. These include the development and introduction of new technology for rice farming, the intensification of agricultural extension services, expansion of research, a guaranteed minimum price for padi, price subsidy, import quota, input subsidy and production credit (Mamat 1984). These measures have initiated new ways for better and more effective adoption of the green revolution technology in rice farming.

Case Study In certain cases, enormous government efforts in establishing rice double-cropping just failed to live up to expectation. A study by Tempelman (1982) in a small rice irrigation scheme in Terengganu produces a classic example.

Despite the provision of irrigation facilities, the farmers abandoned the double-cropping project after only two growing seasons. The main reasons claimed by the farmers, are low yields, mostly because of plant diseases and pests, irrigation problems and the lack of credit. Most of the farmers surveyed in this study are busy with off-farm employment, so that they instead consider themselves as part-time farmers. The incomes that they earned from

various off-farm employments are too important for them to give up. To some extent, they are no longer prepared to return to double-cropping practices even with all the technical assistance that the government might be willing to offer. This is in agreement with the result from another study where the trend suggests that padi farmers outside the major and intermediate irrigation schemes claimed themselves as only part-time farmers (Chamhuri 1985).

In his analysis, Tempelman (1982:58) concludes that 'it will be very hard to induce farmers to resume double-cropping, especially in the face of rising wages in the developing oil industry, rising land prices (for construction) and ever growing needs for consumer goods'. It can be deduced from the study that a process of turning to off-farm employment by small farmers to supplement meager agricultural incomes, has become irreversible and may negatively affect future agricultural development.

POLICY IMPLICATIONS

Land-abandonment or land-conversion activities, have brought about many important implications to the economy. While land-conversion would probably have benefitted the alternative sector in terms of further development and improvement, land-abandonment however would have direct negative effects on the agricultural sector. Whatever the implication is, continuous land abandonment processes would definitely incur a very high cost to the economy.

The abandonment of lands has at least two important consequences on the agricultural sector. Firstly, there has been a continuous decrease in the total planted areas for many major crops. These include land areas devoted to coconuts, tobacco, vegetable gardening, and pepper. During the last decade, 1980-1990, negative annual growth rates were registered for rubber (-1.9 percent), padi (-1.9 percent), coconuts (-1.0 percent), tobacco (-3.7 percent), vegetable gardening (-3.0 percent), pineapple (-5.2 percent) and pepper (-5.2 percent). However, cocoa, oil palm and orchards have shown great improvement during the same period, with annual growth rates of 67.8 percent, 18.8 percent and 14.9 percent respectively. The exception for cocoa, oil palm and orchards is primarily due to their better future prospects. The landuse status for major crops in the country is shown in Table 2.

TABLE 2. Malaysia: Agricultural Land Use, 1980-1995 (Hectares)

Crops	1980	1985	1990	1995 ¹	Average Annual Growth Rate 1980-1990
Rubber	2,004,670	1,948,700	1,810,800	1,750,000	- 1.9
Oil Palm	1,023,300	1,482,399	1,984,167	2,165,912	18.8
Padi	735,215	649,325	664,000	645,749	- 1.9
Cocoa	123,800	303,879	420,000	452,459	67.8
Coconut	349,400	334,054	331,496	327,606	- 1.0
Pepper	12,720	5,243	9,400	10,050	- 5.2
Pineapple	12,180	10,007	9,000	12,000	- 5.2
Vegetables ²	12,800	14,546	14,692	19,400	- 3.0
Orchards ³	93,000	119,024	162,085	246,019	14.9
Tobacco	12,450	16,180	10,168	13,000	- 3.7
Others	n.a	69,026	65,046	74,139	n.a
TOTAL	4,379,535	4,952,383	5,480,854	5,716,334	5.0

- Note:*
1. Forecast.
 2. Refers to Peninsular Malaysia only and includes leafy, fruit, and root vegetables.
 3. Includes fruit trees, bananas, and watermelon but excludes pineapple.

Source: *Fifth Malaysia Plan, 1986-1990; Sixth Malaysia Plan, 1991-1995.*

Secondly, another major and direct impact arising from continuous loss of agricultural lands is the subsequent reduction in the total annual output. Affected most are rubber, padi and coconuts. For the period 1985-1990, the growth rates for the total annual output of rubber, padi and coconuts are -2.6 percent, -4.0 percent and -3.1 percent respectively. However, the production of other commodities during the same period have been quite encouraging, registering positive rates of growth. This is illustrated in Table 3.

The decline in the planted areas and total annual output have various important implications for the economy.

1. Our agricultural sector has been declining relative to the industrial and services sectors. The value-added of the agricultural sector for 1991 remained unchanged compared to that of 1990 with its output increasing marginally at only 0.1

TABLE 3. Malaysia: Production of Agricultural Commodities 1980 - 1995
(^{'000} Metric tonnes)

Items	1980	1985	1990	1995 ¹	Average Annual Growth Rate 1980-1990
Rubber	1,530.0	1,470	1,291	1,300	-2.6
Crude Oil Palm	2,575.9	4,133	6,095	7,600	8.1
Palm Kernel	222.3	1,212	1,336	1,845	8.8
Sawlogs ²	27,916.0	30,956	41,000	29,000	5.8
Sawn Timber ²	6,238.0	5,550	8,900	9,100	9.9
Cocoa	36.5	108	262	339	19.4
Padi	2,040.2	1,953	1,590	1,671	-4.0
Coconuts ³	787.5	1,826	1,557	1,572	-3.1
Pepper	31.6	19	29	36	8.7
Pineapple	185.3	153	173	248	2.6
Tobacco	n.a	9	10	13	1.6
Fruits ⁴	n.a	852	1,165	1,584	6.4
Vegetables ⁴	n.a	184	224	256	4.0
Fisheries	743.7	626	905	1,097	7.8
Marine	n.a	575	830	984	7.6
Aquaculture	n.a	51	75	113	7.9
Livestock					
Beef	17.2	17	18	21	1.9
Mutton	0.8	0.6	0.7		1.9
Poultry	125.6	251	368	560	7.9
Eggs ⁵	2,534.7	3,395	4,718	5,640	6.8
Pork	135.9	164	211	2	5.1
Milk ⁶	8.3	24	34	68	7.4

- Note:
1. Forecast.
 2. Measured in thousand cubic metres.
 3. Figures for 1980 refer to copra (in ^{'000} metric tonnes); figures after 1980 refer to coconuts (in million units)
 4. Refers to Peninsular Malaysia.
 4. Measured in million units.
 5. Measured in million litres.

Source: *Fifth Malaysia Plan*, 1986-1990; *Sixth Malaysia Plan*, 1991-1995.

percent. In addition, its total GDP has declined substantially from about 35 percent in the late 1960s to just about 18.7 percent by the end of 1990. It is expected to drop further to 17.3 percent by the end of 1991 (Malaysia 1991). Although the relative decline of the agricultural sector cannot be fully borne by the continuous loss of planted areas it is pertinent to note that abandoned lands have contributed quite substantially.

2. The decline in planted areas, thus total annual output, has now made the rubber sector relatively less important to the economy. Since its introduction in the early 19th century, Malaysia has for many decades remained as the world's largest producer of natural rubber. But with continuous decline in its output, Malaysia has, since the last three years, moved to third place behind counterparts Indonesia and Thailand (Commodity Year Book 1991). But quite surprisingly, the recent decline in planted areas and total output occurred simultaneously as more funds were injected into the rubber sector, particularly through RISDA, FELDA and FELCRA.

Continued abandonment of the rubber farms would not only affect the rubber sector but also the economy as exports from rubber contribute a significant proportion of the country's total export earnings. In addition, it would be very costly to the country to rehabilitate and consolidate the rubber smallholdings back to their productive state unless higher taxes are collected from the land-owners for that purpose.

3. As far as the rice sector is concerned, further loss of productive rice farms seems to be inevitable. This is primarily due to their closeness to the cities and townships, as in the case of the MUDA and KEMUBU schemes. Open competition between several economic uses of land would often result in agricultural lands losing to other alternative uses which are usually capable of offering better and attractive prices. As indicated by von Thunen's landuse theory, lands close to the city centres would fetch higher economic rents or net returns simply because of strong competition. In this process, therefore, those land uses which can effectively offer more can easily buy out the agricultural activities. Unless effective steps are taken to offset these losses, this phenomenon would have at least two important implications. Firstly, the national objective of achieving self-sufficiency in most food products, including rice, as has been stressed in the National Agricultural Policy

(1984), would have little merit. Records showed that the local rice outputs could not, in any circumstances, fully meet the country's consumption level. All these years, our local rice output is only about 60-70 percent self-sufficient, indicating that the country has been increasingly dependent on rice imports. For 1991 alone, Malaysia had to import 400,000 metric tonnes of rice totaling to RM328 million (Malaysia 1991). Based on the current performance it was forecasted that our total rice output would be reduced by about 35 percent from the current annual level of 729,000 metric tonnes by the year 2000, thus resulting in rice imports to increase by about 257 percent for that period (Mohd Amin 1991). Secondly, the loss of productive rice farms, either due to land-abandonment or land-conversion, still persists despite government efforts to support the rice sector through various subsidy programmes and land-rehabilitation activities. This would therefore lead to unnecessary waste of resources.

4. The rural-urban or outward migration posed another issue of major concern. As a result of relatively low and unpredictable earnings in the agricultural sector, rural youths are moving out of their surroundings seeking for better jobs in the cities. This would further jeopardize the landuse situations in the agricultural sector.
5. Despite the reduction in planted areas for rubber, rice and coconuts, other crops particularly cocoa, oil palm and orchards have registered positive growth rates in landuse acreages. Most of these increases in land acreages devoted to cocoa, oil palm and orchards are the result either of the opening of new planting areas, the replacement of old rubber trees or intercropping activities (in the case of cocoa). Several reasons are responsible for the current changing process. Among the most pressing ones are the unpredictability in rubber prices, strong competition from other major rubber suppliers (particularly Indonesia and Thailand) and from that of synthetic rubber, shortage of labour force in the rubber sector, and better opportunities in other crops sector, particularly cocoa, oil palm and fruits. For these reasons, many areas which were formally occupied by old rubber trees were replanted with oil palm. As far as the conversion of rubber holdings to oil palm is concerned, the estate sector has now taken the lead. This is evidenced from the fact that by 1991, the

oil palm estate sector controlled 91.1 percent of the planted areas (Malaysia 1991).

CONCLUSION

Land loss through land-abandonment and land-conversion would continue indefinitely as long as competition between various alternative economic uses persists. And when competition between these landuses occurs, it is normally the agricultural uses which often have to give way to other alternative uses. In order to preserve the agricultural sector and its contribution to the economy, it is deemed important that appropriate checks and balances be imposed. This would ensure a better utilization of the agricultural lands.

Substantial amount of funds have already been directed towards the rehabilitation of rubber smallholdings and rice farms, yet the results have not been very encouraging. Due to the inability on the part of the authority to secure these farmers a decent income earning capacity, the land rehabilitation programmes, in most cases, had failed to achieve their goals. Most of the successes were only short-lived; they just come and go. This represents the costs which have to be borne by the government.

The development and expansion of the agricultural sector, just like any other enterprises, require that farm operators be awarded better prices for their products. Failure to comply to this basic requirement would only lead to more lands going out of production. Alternatively, these lands would be converted to other alternative uses. If these processes continue, one would anticipate a further decline in the agricultural sector and the failure of our National Agricultural Policy (NAP). The decline would be even faster if these agricultural lands were instead converted to other commercial uses.

REFERENCES

- Ahmad, Yusuf J. & Kassas, Muhamed. 1987. *Desertification: Financial Support for the Biosphere*. West Hartford, CT: Kumarian Press.
- Atkins, P.J. 1987. The Charmed Circle: von Thunen and Agricultural Around Nineteenth Century London. *Geography, Journal of the Geographical Association* 72:313 Part 2 (April) 129-139.
- Barlowe, R. C. 1958; 1986. *Land Resource Economics: The Economics of Real Estate*. 4th. ed. Englewood Cliffs, New Jersey: Prentice-Hall.

- Barnbrock. 1974. Prologomenon to a Methodological Debate on Location Theory: the Case of von Thunen. *Antipode* 6:1, 59-65.
- Brown, Lester R. & Flavin, Christopher. 1988. The Earth's Vital Signs. In *State of the World*, Lester R. Brown et al. eds. A Worldwatch Institute Report on Progress Toward a Sustainable Society, Washington D.C., New York: W.W. Norton & Company.
- Chamhuri, Siwar. 1985. Changing Patterns of Income Distribution and Employment in the Changing Malaysian Padi Sector. In *Changing Patterns of Development and Income Distribution*, Kuala Lumpur: I.Z. Bhattu (ed.). Association of Development and Research and Training Institute of Asia and Pacific (ADIPA).
- Chisholm. 1962. *Rural Settlement and Land Use: An Essay in Location*. London: Hutchinson.
- Clawson, M. 1962. Urban Sprawl and Speculation. *Land Economics* 38: 9-111.
- Cohen, Eleanor M. ed. 1983. How Can Land Be Saved From Agriculture? Proceedings of a Working Conference to Find Solutions for California, Visalia, California, U.S.A, April 18-19.
- Commodity Year Book*. 1991. New York: Commodity Research Bureau.
- Conservation News*. 1978. National Wildlife Federation, Washington, D.C., 43:1.
- Cutler, Rupert. 1980. The Peril of Vanishing Farmlands. *New York Times*, (July 1).
- Dovring, Folke. 1987. *Land Economics*. Boston, Massachusetts: Breton Publishers.
- Found, William C. 1971. *A Theoretical Approach to Rural Land-Use Patterns*. New York: St Martins's Press.
- Fravega, Elizabeth M. 1970. Farm Land Abandonment - Problem or Polemic? *Southeastern Geographer* 10(1): 55-62.
- Furuseth, Owen J. & Pierce, John T. 1982. *Agricultural Land in an Urban Society*. Washington, D.C.: Association of American Geographers (AAG).
- Griffin, Keith B. 1972. *The Green Revolution: An Economic Analysis*. Geneva: United Nations Research Institute for Social Development.
- Gottlieb, M. & Pavlu, J. 1987. Changes and Consequences Related to the Transformation of Small Villages into Rural Cities in Czechoslovakia. In *Land Transformation in Agriculture*, M.G. Wolman and F.G.A. Fournier eds. New York: John Wiley & Sons.
- Hall, P. 1966. *Von Thunen's Isolated State*. London: Pergamon Press.
- Hart, J.F. 1964. Abandonment of Farm Land in Kentucky. *The Southeastern Geographers (AAG)* 6: 1-10.
- Hart, J.F. 1968. Loss and Abandonment of Cleared Farmland in the Eastern United States. *Annals, Association of American Geographers (AAG)* 58: (3): 417-440.

- Hart, J.F. 1976. Urban Encroachment on Rural Areas. *The Geographical Review* 66(1): 1-17.
- Hill, Berkeley & Ray, Derek. 1987. *Economics for Agriculture: Food Farming and the Rural Economy*. U.K.: Macmillan Education.
- Hitam, Samsudin. 1986. Land Abandonment in Peninsular Malaysia: A Case Study of the Malay Rubber Smallholdings in the District of Ulu Selangor. PhD. Dissertation, Land Resources Programme, Institute of Environmental Studies, University of Wisconsin - Madison.
- Hovarth, R.J. 1969. Von Thunen's Isolated State and the Area Around Addis Ababa, Ethiopia. *Annals, Association of American Geographers (AAG)* 59: 309-323.
- Jackson, R. 1972. A Vicious Circle? - The Consequences of von Thunen in Tropical Africa. *Area* 4(4): 258-261.
- Jackson, Richard H. 1983. Land Use in America: The Dilemma of Changing Values. In *Land Use Issues of the 1980s*, J.H. Carr and E.E. Duensing eds. News Brunswick, New Jersey: Centre for Urban Policy Research, Rutgers University.
- Jonasson, O. 1925. Agricultural Regions of Europe. *Economic Geography* 2: 277-314.
- Malaysia, Government of. 1981. *Laporan Pemulihan Tanah Sawah Terbiar*. Pasukan Petugas Tanah Terbiar, Kementerian Pertanian Malaysia, Kuala Lumpur.
- Malaysia, Government of. 1986. *Fifth Malaysia Plan, 1986-1990*. Economic Planning Unit, Kuala Lumpur: Government Printer.
- Malaysia, Government of. 1991. *Economic Report, 1991-92*. Ministry of Finance, Malaysia, Kuala Lumpur: Jabatan Percetakan Negara.
- Malaysia, Government of. 1991. *Sixth Malaysia Plan, 1991-1995*. Economic Planning Unit, Kuala Lumpur: Government Printer.
- Mamat, Sahak. 1984. Poverty Eradication in the Rice Sector in Malaysia: A Study of Six Villages in the MUDA Irrigation Scheme. PhD. Dissertation, Land Resources Programme, Institute of Environmental Studies, University of Wisconsin-Madison.
- Manning, Edward W. 1987. Sustainable Use of Canada's Rural Land Resources: Relating Research to Reality. In *Demands on Rural Lands: Planning for Resource Use*, Chris Cocklin, Barry Smit and Tom Johnston eds. Boulder, Colorado: Westview Press.
- Mohd Amin Hj Yaakub. 1991. Beras: Dari Perspektif Keselamatan Makanan Negara. Paper presented at the Seminar Segemal Padi Sekunca Budi, Akademi Pengajian Melayu, Universiti Malaya, Kuala Lumpur (August 6-7).
- Moore, E.H. & Barlowe, R. 1955. *Effects of Suburbanization Upon Rural Land Use*. Michigan State University Agricultural Experimentation, Technical Bulletin 253 (September).
- OECD. 1976. *Land Use Policies and Agriculture*. Paris: Oversea Economic Corporation and Development.

- Plaut, T.R. 1980. Urban Expansion and the Loss of Farmland in the U.S.: Implications for the Future. *American Journal of Agricultural Economics (AJAE)* 23 (April): 363-384.
- Postel, Sandra. 1988. Controlling Toxic Chemicals. In *State of the World*, Lester R. Brown et al. eds. A Worldwatch Institute Report on Progress Toward a Sustainable Society, Washington D.C. New York: W.W. Norton & Company.
- Sinclair, Robert. 1967. Von Thunen and Urban Sprawl. *Annals, Association of American Geographers (AAG)* 57(1): 72-87.
- Tempelman, Gert-Jan. 1982. Off-Farm Employment: A Barrier to Agricultural Development - A Case Study from Terengganu, Peninsular Malaysia. *Malaysian Journal of Tropical Geography* 6: 50-60.