Population Pressures and Land Use Changes in Southeast Asian Countries: Recent Evidences

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1.1 Introduction

Land and people are the most important natural resources that are mutually inter-related and inter-dependent for their sustainable development. Land is an important resource of any country for the sustenance of the people. Though it is a fixed, scarce, tangible and immovable resource, it is a degradable and transferable entity that could be sustainable only if properly used by the human population.

The use of land is very wide and intense and the demand for land has been increasing for its various use over time. In fact, there are competing uses such as forests, agriculture, industry, housing, infrastructure, services and recreation. As such, the land use pattern is highly influenced by the various deliberate interventions by the people and has been undergoing changes significantly (Lee et.al:1988, World Bank:1984).

The issue of land use changes is very important in the context of increasing population pressure. When the pressure on land by man increases, it would lead to both extensive and intensive use of land. Such a change in the use pattern is not just easy and simple, but is highly complex. It is highly shaped by agro-climatic, demographic, socio-economic, political and institutional factors either independently or jointly. The questions are: What are the changes in land use pattern? To what extent, the changes in land use pattern differ across regions or countries? To what extent, the population pressure influences the land use pattern? The present paper attempts to examine these questions in the context of South Asian Countries in a comparative perspective.

1.2 Human Populations and Its Density in South East Asian Countries:

The data on human population are obtained from the FAO yearbook and their electronic data base SOFA2000. Generally, these data are compiled, adjusted and published in the United Nations Demographic Yearbook by the United Nations Statistical Office.

Human population in the Southeast Asian Countries together has shown a steady increase during the last three decades. In 1972, the total population was estimated as about 301 million that increased to 503 million by 1998, recoding an increase of 67 percent. Though in absolute numbers the total population has increased significantly,

in terms of growth rates, a declining trend could be observed. The growth rate of population was about 2.5 per cent by early seventies that has declined to about 1 per cent by late nineties (Table 1).

Table 1
Trends in Human Population Among the South East Asian Countries (1972-1998)

Particulars	Country	1972	1975	1980	1985	1990	1995	1998
Total Human Population in 000	Indonesia	126305	135666	150958	167332	182812	197464	206338
	Vietnam	44767	48030	53711	59898	66689	73866	77562
	Philippines	39764	43010	48317	55668	60687	68354	72944
	Thailand	37967	41359	46718	51146	55595	58610	60300
	Myanmar	28412	30441	33821	37544	40520	42877	44497
	Malaysia	11407	12258	13763	15677	17945	20108	21410
	Cambodia	7114	7098	6498	7385	8652	9982	10716
	Laos	2845	3024	3205	3594	4152	4773	5163
	Singapore	2153	2263	2415	2709	3016	3321	3476
	Brunei	142	161	193	223	257	294	315
	TOTAL	300876	323310	359599	401176	440325	479649	502721
Percentage Share to the Total	Indonesia	41.98	41.96	41.98	41.71	41.52	41.17	41.04
	Vietnam	14.88	14.86	14.94	14.93	15.15	15.40	15.43
	Philippines	13.22	13.30	13.44	13.88	13.78	14.25	14.51
	Thailand	12.62	12.79	12.99	12.75	12.63	12.22	11.99
	Myanmar	9.44	9.42	9.41	9.36	9.20	8.94	8.85
	Malaysia	3.79	3.79	3.83	3.91	4.08	4.19	4.26
	Cambodia	2.36	2.20	1.81	1.84	1.96	2.08	2.13
	Laos	0.95	0.94	0.89	0.90	0.94	1.00	1.03
	Singapore	0.72	0.70	0.67	0.68	0.68	0.69	0.69
	Brunei	0.05	0.05	0.05	0.06	0.06	0.06	0.06
	TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: FAO Year book
SOFA 2000

Among the Southeast Asian Countries, Indonesia accounted for about 41 per cent of the total human population; Vietnam, Philippines and Thailand about 10-15 percent; Myanmar, Malaysia and Cambodia about 2 to 10 per cent; and Laos, Singapore and Brunei about less than 1 percent. This unequal distribution of population across Southeast Asian countries indicated the variation in the size and the base of the countries (West and Rose:1964, Myint:1972, Kantner and Lee: 1975, ESCAP:1993, Pearce et.al:1990)

Across the Southeast Asian countries, a divergent trend in the growth rates of population could be observed (table 2). The annual average percentage growth of population between 1972 and 1998 was the highest in Brunei (4.51 per cent) followed by Malaysia (3.25 per cent), Philippines (3.09 per cent) and Laos (3.02 per cent), and the lowest in Cambodia (1.88 per cent) followed by Myanmar (2.10 per cent) and

Thailand (2.18 per cent). An analysis of the growth rates during the sub-periods of 1970's, 80's and 90's revealed differential growth pattern. In counties such as Indonesia, Vietnam, Philippines, Thailand, Myanmar and Brunei a steady decline in the growth of population could be observed from 70's onwards. Where as in the remaining countries, except Laos, the growth rate has declined during 90's only. In Laos, the population growth is steadily increasing over time. It is worth noting that the decline in the population growth was sharp in Indonesia, Thailand, Myanmar and Brunei.

Table 2
Growth Rates in Population by Sub-periods in the Southeast Asian Countries

Country	1972-80	1980-90	1990-98	1972-98
Indonesia	2.44	2.11	1.61	2.35
Vietnam	2.50	2.42	2.04	2.71
Philippines	2.69	2.56	2.52	3.09
Thailand	2.88	1.90	1.06	2.18
Myanmar	2.38	1.98	1.23	2.10
Malaysia	2.58	3.04	2.41	3.25
Cambodia	-1.08	3.31	2.98	1.88
Laos	1.58	2.95	3.04	3.02
Singapore	1.52	2.49	1.91	2.28
Brunei	4.49	3.32	2.82	4.51
TOTAL	2.44	2.24	1.77	2.48

Source: The same as for Table 1

With the changes in human population, the land use pattern would also change and such a change is inevitable. We shall examine the trends in the land use pattern in the Southeast Asian Countries in the next section.

1.2 Land Use Pattern in South East Asian Countries:

The land use information compiled and provided by the FAO is the only available data that facilitates any time series analysis of land use changes across countries. FAO provides data on total area (TA), land area (LA), arable land (AL), land under permanent crops (LUPC) and non-arable and non-permanent crops (NANPC). **Total area** refers to the total geographical area of the country, including area under inland water bodies such as rivers and tanks. **Land area** is the total area excluding the area under inland water bodies. **Arable land** includes land defined by the FAO as land under temporary crops (double cropped areas are counted only once), temporary meadows for mowing or pasture, land under market or kitchen gardens and land temporally fallow (less than five years). Land abandoned as a result of shifting cultivation is excluded. **Land under permanent crops** refers to land cultivated with crops that occupy the land for long periods and need not be replanted after each harvest, such as cocoa, coffee and rubber; this category includes land under flowering shrubs, fruit-trees, nut-trees and vines, but excludes land under trees grown for wood or timber. **Non-arable land and non-permanent crops** refer to items such as permanent meadows and pastures,

forests and woodland, barren land and built-up areas – residential, recreational, and industrial lands, and areas covered by roads and other fabricated infrastructure This is also referred as 'land not available for cultivation'.

Based on the above information, World Bank (1999) analysed the land use changes by classifying the land area into three categories such as (a) arable land, (b) permanent cropland and (c) other land. Though an analysis based on World Bank classification would provide a broad understanding on land use pattern, we reclassified the categories differently to suit our purpose of analysis. For this purpose, we relied on the FAO's electronic data files SOFA 2000 and obtained the data on area under forests and pastures. Based on this information, land uses are classified into three categories such as (a) arable area and permanent crops, (b) forest and pasture land and (c) land not available for cultivation. The first category includes the arable land defined by FAO and permanent cropland, excluding forest and pasture land. The second category includes area under natural or planted stands of trees and pastureland. The last category includes uncultivated land, grassland not used for pasture, barren land, built-up areas – residential, recreational and industrial lands, and areas covered by roads and other fabricated infrastructure

This revised classification to understand the changes in the land use pattern has significant relevance for our present analysis so as to capture the impact of population pressure on land cover changes, attempted in the next section. We shall examine below the changes in the land use pattern in the Southeast Asian Countries during the period between 1972 and 1998 (Table 3).

The data on the table 3 show that the land use patterns are changing in the Southeast Asian Countries between the seventies and the nineties. The share of arable land and permanent crops (that represent the extent of crop cultivation and its expansion) increased steadily from 16.58 per cent to 21.28 per cent between 1972 and 1990. During the nineties, it remained almost unchanged at 21 per cent. The share of forest and pasture area that accounts for 56.67 per cent by 1998 has marginally declined from its earlier position of 62.07 per cent by 1972. The share of land not available for cultivation (that represent the non-agricultural use of land) showed a marginal increase from 21.34 per cent to 22.38 per cent between 1972 and 1998 with minor fluctuation during the eighties.

The table also indicated major differences in resource endowments and uses among countries. According to the data for the year 1998, in Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar and Philippines about 50 per cent and above of the total area is accounted by forests and pastures. The share of arable and permanent cropland occupied the dominant position in Thailand (40 per cent). 'Land not available for cultivation' accounted for a lion share to the total land area in Singapore (98.36 per cent) and Vietnam (46.11 per cent).

Table 3
Trends in Land Use Pattern in South East Asian Countries (1972-1998)

Particulars	Country	Years						
		1972	1975	1980	1985	1990	1995	1998
Share of Arable Land and Permanent Cropland to the Total Land Area (%)	Indonesia	14.35	14.35	14.35	15.18	17.65	16.66	17.11
	Vietnam	18.97	19.17	20.18	19.73	19.61	20.76	22.27
	Philippines	25.48	28.00	32.29	32.70	33.14	33.20	33.54
	Thailand	28.87	32.65	35.82	38.85	44.24	39.95	39.88
	Myanmar	15.88	15.19	15.24	15.31	15.31	15.38	15.43
	Malaysia	13.79	14.24	14.61	16.83	21.00	23.14	23.15
	Cambodia	10.59	10.88	11.73	13.43	21.50	21.57	21.57
	Laos	2.90	2.90	2.99	3.77	3.68	3.68	3.69
	Singapore	18.03	13.11	13.11	8.20	1.64	1.64	1.64
	Brunei	2.28	2.28	1.52	1.33	1.33	1.33	1.33
	TOTAL	16.58	17.15	17.97	18.95	21.28	20.63	20.95
Share of Forest and Pasture Land to the Total Land Area (%)	Indonesia	74.38	74.23	71.54	68.81	68.94	68.21	67.87
	Vietnam	42.93	42.47	37.60	30.73	29.91	30.66	31.62
	Philippines	54.65	48.02	45.12	49.50	49.97	49.90	49.90
	Thailand	41.59	37.27	33.64	30.96	30.82	29.95	29.95
	Myanmar	49.48	49.48	49.30	49.53	49.82	49.79	49.82
	Malaysia	65.11	65.13	65.16	68.53	68.56	68.57	68.58
	Cambodia	78.06	78.01	77.84	78.18	77.75	77.61	77.61
	Laos	66.29	64.99	62.98	63.82	62.39	57.84	57.95
	Singapore	4.92	4.92	4.92	4.92	4.92	0.00	0.00
	Brunei	86.53	86.53	86.53	86.53	86.53	86.53	86.53
	TOTAL	62.07	60.94	58.69	57.37	57.33	56.73	56.67
Share of Land Not Available for Cultivation to the Total Land Area (%)	Indonesia	11.26	11.42	14.11	16.01	13.41	15.13	15.03
	Vietnam	38.10	38.36	42.22	49.55	50.47	48.59	46.11
	Philippines	19.87	23.98	22.59	17.80	16.89	16.89	16.56
	Thailand	29.53	30.08	30.54	30.19	24.93	30.10	30.17
	Myanmar	34.64	35.34	35.46	35.16	34.87	34.83	34.75
	Malaysia	21.10	20.63	20.23	14.64	10.44	8.28	8.27
	Cambodia	11.34	11.11	10.44	8.40	0.75	0.82	0.82
	Laos	30.81	32.11	34.03	32.41	33.93	38.47	38.35
	Singapore	77.05	81.97	81.97	86.89	93.44	98.36	98.36
	Brunei	11.20	11.20	11.95	12.14	12.14	12.14	12.14
	TOTAL	21.34	21.90	23.34	23.67	21.39	22.65	22.38

Source: The same as Table 1.

An analysis of trends in land use pattern between 1972 and 1998 based on the combined data of the Southeast Asian Countries indicated a steady increase in the share of arable and permanent cropland from 1972 to 1990 and thereafter remained unchanged; the share of forest and pasture land declined steadily from 62 per cent to 57 per cent between 1972 and 1998; and, the share of 'land not available for cultivation' increased from 21 to 24 per cent between 1972 and 1985 and thereafter, it fluctuated at about 22 per cent.

The trends in land use pattern across countries indicated divergence. They are:

- In Vietnam, Malaysia and Philippines, the share of arable and permanent cropland increased steadily during the reference period, whereas, there was no change in it in Myanmar; and, steady decline in Singapore. In Cambodia and Indonesia, it increased up to mid-eighties and thereafter unchanged; in Laos, it increased up to early eighties and thereafter, remained unchanged; and, in Brunei the share declined during mid-seventies and remained unchanged from mid-eighties onwards.

- The share of forest and pasture land declined steadily in Thailand and Laos; increased marginally during eighties and remained unchanged further in Malaysia; and it remained unchanged throughout in Cambodia, Brunei and Myanmar. In Singapore, the share of forest and pastures declined sharply from nineties; and in Indonesia, Vietnam and Philippines, its share declined during mid-seventies and remained unchanged thereafter.

- The share of area 'not available for cultivation' increased steadily in Singapore, Indonesia and Laos during the entire period. On the contrary, in Cambodia, Malaysia and Philippines, it declined steadily. In Thailand and Myanmar, this share remained unchanged. In both Vietnam and Indonesia, it increased initially up to the mid-eighties, and thereafter remained unchanged.

The above changes in land use pattern in the Southeast Asian Countries raise certain important questions. What is the linkage between population growth and land use pattern? To what extent, the land use changes are shaped by population pressure? Why differential pattern of land use is observed in the Southeast Asian Countries? We shall discuss on this aspect in the next section.

1.3 Population Pressure and Land Use Changes:

The effect of population growth on land is direct in nature. When the population grows, its pressure on land increases, as land is limited, fixed and scarce. The pressure on land operates on various directions, as land has different uses. As discussed earlier, the land use pattern is categorized in to three – for cultivation (arable + permanent crops), for nature and environment (forest + pasture), and for non-agricultural purposes (barren+ uncultivated + infrastructure + build-up areas). When population pressure on

land increases, its effect is getting reflected in the land use pattern and it changes accordingly. Needless to state that the effects of population pressure on each land use categories are different and that is being shaped by various economic and non-economic factors that are country / region specific. The effect of population pressure on agriculture (arable and permanent cropland) is well discussed at various levels (Boserup:1965 and 1981, Kantner, John F and McCaffrey, Lee: 1975, Simon:1977, FAO:1977, Ahemad, Alia:1984: Lee :1991). But, studies on the effect of population on the other uses of land are very limited. However, there are a few studies discussing the changes in land use pattern in general and with particular reference to population growth (Kalipeni, Ezekiel: 1994, Ravichandran, Veena :1997, Nandi and Rao: 1999, World Bank: 1999, Harrison, Paul and Fred Pearca:2000). A review of the above studies provided a conceptual framework for our analysis of establishing the linkage between population pressure and land use changes.

The relationship between population growth and land use pattern can be postulated in the following manner: When the human population pressure increases, attempts are made to increase the area under cultivation (arable land) so as to meet the growing needs of the human population. At the same time, the area `not available for cultivation' will also increase since the demand for land for buildings, roads, etc. also grows up. Since there are possibilities of reclamation of land under the category `not available for cultivation', the influence of population pressure on land use will have differential impact on land use. Accordingly, when the human population increases, attempts will be made as a first stage to bring maximum area under cultivation by reducing the areas of forests and pastures, cultivable waste and the other ‘areas not available for cultivation’. However, scope for such expansion is limited because of the less suitability of these lands for cultivation on the one hand and the growing demand for land for non-agricultural purposes on the other. Therefore, as a second stage, the land not available for cultivation increases. At higher levels of population density, if the extension of cultivation cannot meet the growing food requirements of the population, changes will be made in cropping pattern in favour of food grains and increase in cropping intensity. During this stage, demographic pressure will also induce technological and institutional changes necessary for increasing the land productivity. With this background, the experiences of Southeast Asian Countries are examined based on the recent evidences.

The trends in population pressure on land in the Southeast Asian Countries could be examined both in a broad and narrow sense. In broader sense, population pressure could be estimated by dividing the human population by total geographical area (land area). In a narrow sense, population pressure could be estimated by dividing the human population by area of agricultural land (arable + permanent cropland), and, this would indicate the population pressure on agriculture and the process of expansion (extensification) of cultivation.

As the total geographical area is unchanged, the growth in the population would lead to an increase in the density of population per hectare of land area. This is clearly evident in the density figures given in table 4.

Table 4
Trends in Population Pressure in Southeast Asian Countries (1972 to1998)

Particulars	Country	Population per hectare						
		1972	1975	1980	1985	1990	1995	1998
Population Per Land Area (ha)	Indonesia	0.70	0.75	0.83	0.92	1.01	1.09	1.14
	Vietnam	1.38	1.48	1.65	1.84	2.05	2.27	2.38
	Philippines	1.33	1.44	1.62	1.87	2.04	2.29	2.45
	Thailand	0.74	0.81	0.91	1.00	1.09	1.15	1.18
	Malaysia	0.35	0.37	0.42	0.48	0.55	0.61	0.65
	Myanmar	0.43	0.46	0.51	0.57	0.62	0.65	0.68
	Cambodia	0.40	0.40	0.37	0.42	0.49	0.57	0.61
	Laos	0.12	0.13	0.14	0.16	0.18	0.21	0.22
	Singapore	35.30	37.10	39.59	44.41	49.44	54.44	56.98
	Brunei	0.27	0.31	0.37	0.42	0.49	0.56	0.60
	TOTAL	0.69	0.74	0.83	0.92	1.01	1.10	1.16
Population Per Arable Area + Permanent Cropland	Indonesia	4.86	5.22	5.81	6.08	5.72	6.54	6.66
	Vietnam	7.25	7.70	8.18	9.33	10.45	10.93	10.70
	Philippines	5.23	5.15	5.02	5.71	6.14	6.90	7.29
	Thailand	2.57	2.48	2.55	2.58	2.46	2.87	2.96
	Malaysia	2.52	2.62	2.87	2.83	2.60	2.64	2.82
	Myanmar	2.72	3.05	3.37	3.73	4.02	4.24	4.39
	Cambodia	3.80	3.70	3.14	3.12	2.28	2.62	2.81
	Laos	4.25	4.51	4.64	4.13	4.88	5.62	6.06
	Singapore	195.73	282.88	301.88	541.80	3016.00	3321.00	3476.00
	Brunei	11.83	13.42	24.13	31.86	36.71	42.00	45.00
	TOTAL	4.18	4.34	4.60	4.87	4.76	5.35	5.52

Source: The same as table 1.

In all the countries, the population per land area has shown a steady upward trend. However, the rate at which it increases is highly influenced by the growth rates of population that vary significantly across countries, as observed earlier. The interesting aspect of examining the population pressure is from the point of view of extensification. By extensification, Harrison, Paul and Fred Pearce (2000) referred to the expansion of arable land. In our discussion, we included both arable land and permanent cropland to understand the agricultural expansion and population pressure in a narrow sense. Accordingly, we could observe that the pressure of population on agriculture land has been steadily increasing in the Southeast Asian Countries together. However, the extent and trends of its pressure varies significantly across countries. The pressure of population on agricultural land is the highest in Singapore; very much high in Brunei and Vietnam; and very low in Cambodia, Malaysia and Thailand. As far as the trends in the population pressure, diversified pattern could be observed. Indonesia, Vietnam, Myanmar, Laos, Singapore and Brunei have experienced a steady increase in the population density, where as, in Cambodia, a steady fall in the density could be observed up to the early nineties. In Philippines, the density has been declining up to

the early eighties and thereafter increasing steadily. In Malaysia, while a general increase is observed, there was a fall during early nineties. In Thailand, the pressure of population remained almost unchanged up to early nineties, and thereafter increased slowly

What does the observed trends in density of population on agricultural land indicate? How does expansion of agricultural land takes place and how does the population pressure influences the land use changes? These are some of the important questions that need further explanation. It could be argued that extensification, that is, the expansion of land for agriculture has been a response to a fast growing population. With the increase in population, the demand for food for sustenance also increases. The growing demand for food could be met either by extensification (by bringing more area under cultivation) or by intensification (cultivating a same land intensively) and or by both. The process of its operation begins with extensification (Phase-I), then intensification and / or by both (Phase-II), and at the end, only by intensification (Phase-III). It is worth mentioning that Phase I has certain limitations to continue limitless as the demand for non-agricultural land use also expands along with food demands. The evidence of Southeast Asian Countries supports the above argument and provides an explanation to the question raised earlier (see, table 1 and 3). Further, by tracing out the movement of land from one category to the other, the pattern of shift in the land uses could be captured. This is presented in table 5.

Table 5
Southeast Asian Countries Classified by Shift in Land Categories

Area Shifted		During the seventies and early Eighties	During the late eighties and Nineties.
From	To		
Forest and Pasture Land	Arable and Permanent cropland	Thailand, Vietnam, Indonesia, Laos, Cambodia, Philippines	Thailand, Cambodia, Laos, Philippines
	Land Not Available for Cultivation	Thailand, Vietnam, Indonesia, Laos	Singapore, Laos
Arable and Permanent cropland	Forest and Pasture Land	Myanmar	
	Land Not Available for Cultivation	Singapore, Brunei	Singapore
Land Not Available for Cultivation	Forest and Pasture Land	Malaysia	Vietnam, Malaysia, Philippines
	Arable and Permanent cropland	Cambodia, Malaysia	Thailand, Cambodia, Indonesia, Malaysia, Myanmar, Philippines

Source: Based on Table 3

The extensification is possible by bringing more land under cultivation either by shifting land from forest + pastureland or from land not available for cultivation or by both means. Generally, shift from forest and pastureland to cultivation is possible and easier. This aspect of change could be observed in Thailand, Vietnam, Indonesia, Laos and Philippines during the seventies and early eighties. The shift from 'land not available for cultivation' to arable land is found very much during late eighties and nineties in all these counties. Forests and pasturelands are getting shifted to non-agricultural uses in Thailand, Vietnam, Indonesia and Laos during the early phase and in Singapore and Laos in the latter phase. Land not available for cultivation is getting shifted to forests and arable areas in Malaysia during the entire period. In Vietnam and Philippines, forest areas are added and in Thailand, Cambodia, Indonesia, Myanmar and Philippines, shifting land from 'land not available for cultivation' extends arable and permanent croplands during the late eighties and nineties. In Singapore, arable and permanent croplands are getting shifter for non-agricultural uses.

Thus, the above discussion revealed that the effect of population pressure on land use differ significantly across Southeast Asian Countries, though it has a systematic pattern of operation. It also revealed the role of human population pressure in shaping the land use changes as observed from the recent evidences of Southeast Asian Countries.

1.4 Summary and Conclusion

The paper is concerned with the consequences of population growth and its increasing density on land use pattern and its changes. For this purpose, the empirical evidences are drawn from FAO statistics with reference to Southeast Asian Countries. The paper attempted to provide both a regional and comparative perspective in understanding the relationship between population growth and land use changes.

The study observed a steady growth in the human population during the last three decades, though the growth rate has declined during the nineties. The unequal distribution of population in terms of its size and growth was observed among the Southeast Asian Countries. The analysis indicated changes in land use pattern towards 'arable and permanent cropland' and 'land not available for cultivation'. However, such a trend varied across Southeast Asian Countries significantly.

The effect of population pressure on land use changes are examined both in a broad and narrow sense, which indicated growing population pressure on land, particularly on agricultural land resulting extensification. It is observed that extensification is made possible by shifting land from forest and pastureland, and also by shifting from 'land not available for cultivation. The variations in the effect of population pressure on land use changes are observed across Southeast Asian countries.

To conclude, the paper leaves several questions unanswered. What are the driving forces that determine the land use pattern and its changes? How far the land use changes are sustainable? These issues call for further in-depth analysis.

References:

Ahamad, Alia (1984), Agricultural Stagnation Under Population Pressure: The Case of Bangladesh, Vikas Publishing House Private Limited, New Delhi.

Bilsborrow, R.E. (1987), Population Pressures and Agricultural Development in Developing Countries: A Conceptual Framework and Recent Evidence, World Development Vol.15.2.

Boserup, Easter (1965), Conditions of Agricultural Growth: The Economics of Agrarian Change Under Population Pressure, George Allen & Unwin, London.

Boserup, Easter (1981), Population and Technological Change: A Study of Long Term Trends, University of Chicago Press, Chicago.

ESCAP (1993), The Fourth Asian and Pacific Population Conference, 19-27, August 1992, Bali, Indonesia, Selected Papers, Asian Population Studies Series No.124, Economic and Social Commission for Asia and the Pacific, United Nations.

FAO (1977), Population and Agricultural Development: Selected Relationships and Possible Planning Uses, Food and Agricultural Organisation of the United Nations, Rome.

FAO (2001), FAO Yearbook – Production 1999, Vol.53, Food and Agriculture Organisation of the United Nations, Rome.

Harrison, Paul and Fred Pearce:(2000), Atlas of Population and Environment, University of California Press, Berkeley and American Association for the Advancement of Science, Washington.

Kalipeni, Ezekiel (1994), Population Growth and Environmental Degradation in South Africa, Lynne Rienner Publishers, Colorado.

Kantner, John F and McCaffrey, Lee (1975), Population and Development in Southeast Asia, Lexington Books, London.

Lee, Ronald E, Arthur W.B, Kelley, A.C, Rodgers G and Srinivasan T.N. (1991): Population, Food and Rural Development, Clarendon Press, Oxford.

Myint.H (1972), Southeast Asia's Economy: Development Policies in the 1970's, Penguin Books, England.

Nandi, Rajib and G.N.Rao (1999), Population and Environment in Developing Countries: The Macro Scenario and Select Case Studies, Research Monograph Series Vol.1, Centre for Development Studies, Thiruvananthapuram, India.

Ness, Gayl D and Hirofumi Ando (1984), The Land is Shrinking: Population Planning in Asia, The John Hopkins University Press, Baltimore and London.

Pearce D, Barbier E and Anil Markandya(1990), Sustainable Development: Economics and Environment in the Third World, London Environmental Economics Centre, Edward Elgar Publishing Ltd, England.

Ravichandran, Veena (1997), Regional Land Cover Changes, Sustainable Agriculture and Their Interactions with Global Change- with Focus on South Asian Countries. Proceedings of the International Workshop held in Chennai, India, 16-19 December 1996, Costed

Simon, Julian (1977), The Economics of Population Growth, Princeton University Press, Princeton.

West A.J.F and J.Rose (1964), South-East Asia with Malaya, University of London Press Ltd, London.
World Bank (1994), Population Change and Economic Development, Oxford University Press, New York.
World Bank (1999), World Development Indicators: 1999, The World Bank, USA.