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POPULATION PRESSURE ON LAND IN KERALA

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Abstract

The paper examines how Kerala, a demographically and socially well advanced state in India, responded to the high population pressure during the 30 year period from 1975-76 to 2005-06. Indices of population pressure like density of population and size of operational holdings were used besides computing a coefficient using available land and the absolute minimum land required per person. The paper also examined the changes in land utilization pattern in the state covering a period. The study found that the population pressure in Kerala has been increasing persistently over the years but the state found ways and means to get around this problem and bring about some economic advancement. This was achieved without intensification or extension of agriculture.

Key Words: Kerala, population pressure, land utilization.

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1. Introduction

"The power of population is indefinitely greater than the power in the earth to produce subsistence for man. Population, when unchecked, increases in a geometrical ratio. Subsistence increases only in an arithmetical ratio" (Malthus, 1798). These are the words of Thomas Robert Malthus made in late 18th century. It was a time when revolutions in agriculture, industry or technology were not even thought of. It was a time when man's existence was limited by the available resources. It was a time when the modern contraceptive methods were not available to limit the birth rate. Thus Malthus reasoned that unchecked population growth can be checked only by hunger, disease or war which will raise the death rate (positive checks) or by postponement of marriage or celibacy which will lower the birth rate (preventative checks). His was the first notable warning about the problems that can arise due to unchecked population increase. Though his theory was not accepted unquestioned, it marked the birth of a new population predicament that attracted the attention of many scholars. Almost all arguments since then took Malthus' work as the reference point. The world has progressed much in every aspect of life since the origin of Malthusian theory. But there appears to be a lingering truth in the idea of Malthus in many societies, particularly in the least developed regions. "Whereas more people once meant more ingenuity, more talent and more innovation, today it just seems to mean less for each" (Engelman, 2009). According to Nobel laureate Henry W. Kendall "If we don't halt population growth with justice and compassion, it will be done for us by nature, brutally and without pity - and will leave a ravaged world"[1]. In the words of Nasif Nahle (2003), some "ordinary mechanisms are sequentially put in action as soon as the populations break their limits. Some of these mechanisms are wars, increase of crime, hunger, emergent and re-emergent illnesses, etc. .... The populations collapses as a reflex action. There is no need of control of natal rates, neither of family planning".

Today in this technological age, it is hard to believe that the human carrying capacity of a given area is set, and cannot be exceeded. There are

scholars who believe that population growth *per se* is an incentive for economic growth (Clark , 1967). Here special mention must be made of Ester Boserup who severely criticized Malthus in her book *The Conditions of Agricultural Growth: The Economics of Agrarian Change under Population Pressure (1965).* She argued that population growth determines agricultural growth and not the other way around as Malthus reasoned. In today's world there are several options to avoid population pressure that Malthus failed to foresee. To increase production the methods of production can be changed, cultivation can be extended to previously uncultivated area, adopt high yielding varieties of crops, adopt crop rotation etc. Simultaneously, population growth can be curbed by limiting the number of births through adoption of any means of available family planning methods. Also population growth rate within a given society can be reduced by out migration. But these options can work only within the limit provided by the knowledge of these matters, nature of society, customs and norms governing the society, etc. (Clark , 1967) which vary widely across societies today.

Many countries with rapid population growth are trying to cope with that by adopting one or more of the above mentioned means, with degrees of differences in attaining the desired success. India is one such country that has been experiencing rapid population growth and has been trying to reduce it through adoption of a number of family planning methods to reduce birth rate and simultaneously to increase production through planned development programmes. However, she is not out of the wilderness yet. Without forgetting the achievements made by India in the past several decades, it should be mentioned that illiteracy, unemployment, and poverty continue to be a matter of great concern for the country.

Population growth can also affect the land use pattern. In India, due to rapid increase of population, a negative growth trend was noticed in the area under forest, barren and uncultivable land, cultivable waste land, permanent pastures and grazing lands, miscellaneous trees not included in net sown area, fallow land other than current fallow (Satihal and Bhargava, 2007). But being a large country accommodating a large population of diverse characteristics (in every possible manner), regional differences are observed.

This paper relates to the existing situation with respect to population and land related aspects in Kerala, a state located in the south western region

of India. The peculiarity of this state lies in the fact that it has experienced demographic transition which is comparable to that in many of the western countries but unaccompanied by equivalent level of economic development or urbanization. The state is considered as the demographic 'sweet thump' of India. A caveat is in order here as the population-agriculture nexus is a very complicated phenomenon. The present paper has a limited scope of covering only those aspects which will give a general idea of land-population relation in Kerala.

2. About the state

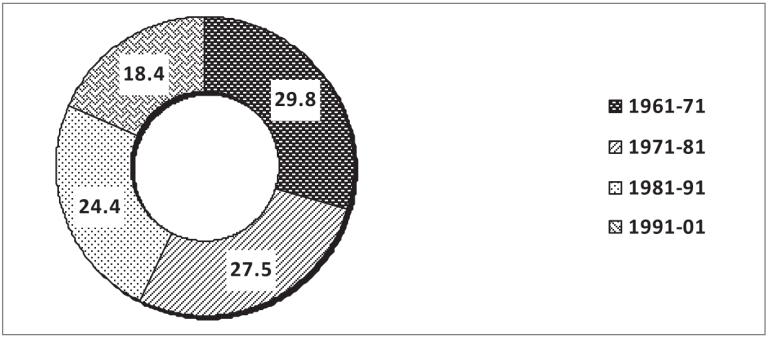
Kerala in its present form was born in November 1956 when state boundaries were demarcated on the basis of language. Two of her boundaries are natural ones: Western Ghats on the Eastern side and Arabian Sea on the western side. The diverse physical characteristics of the state led to the natural classification of its 38863 sq. km area into three regions: high land (the ghat region), low land (western coastal region) and midland (the area between the high and the low land). Kerala has a hot and humid climate and the temperature ranges between 80 and 90 degree Fahrenheit.

The State has a wide network of backwaters, rivers and streams which can facilitate agricultural production to a large extent. The staple food of the people of Kerala is rice and paddy is the main food crop produced here. Coconut has the highest share in area under cultivation. Next to rice as a food crop is tapioca, cultivated mainly in the drier regions. The major cash crops of the state are rubber, pepper, coffee, cardamom, tea, cashew and areca nut[2]. Spices like cardamom, cinnamon, clove, turmeric, nutmeg and vanilla are also grown. Kerala also grows banana and other plantains.

3. Population scenario of Kerala in brief

Kerala state, which accounts for a mere 1.18 per cent of the total land area of India, accommodates 3.1 per cent of the Indian population. In 1961, the state's population was 16.9 million which increased to 31.8 million in 2001, an addition of 14.9 million population over the 40 year period. The contribution made by the four decades towards this increase of 14.9 million is noteworthy. In percentage terms, there is a consistent decline in the contribution made by each decade: from 29.8 per cent during 1961-1971 to 27.5 per cent in 1971-1981 to 24.4 per cent in 1981-1991 to 18.4 per cent during 1991-2001 (Figure 1).

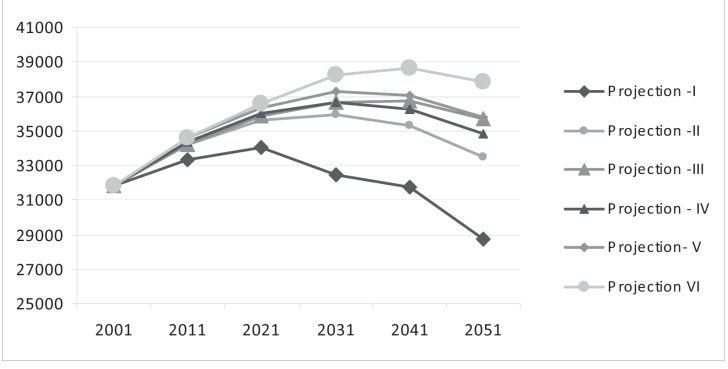
Figure 1: Percentage share of each decade in the additions made to the population of Kerala during the 1961-2001 period



Source: Calculated from published census data.

Several projections till 2051 are available for Kerala's population and a few of such projections are given in Figure 2.

Figure 2 Projected population of Kerala: 2001-2051

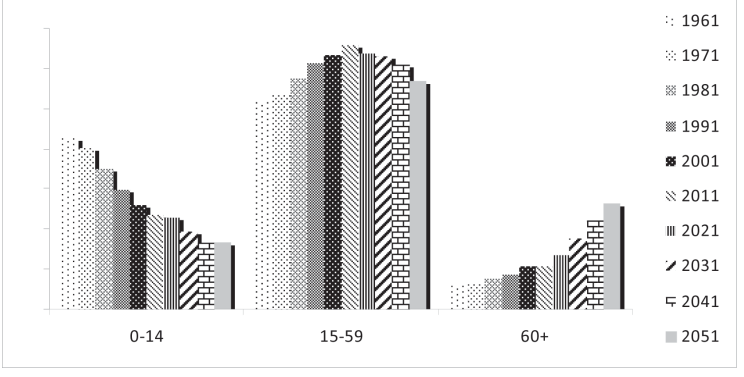


Source: Projection I, II & III - Kerala, 2005.
Projection IV - Zachariah *et.al*, 2009
Projection V - Mahmood and Kundu, 2006
Projection VI - India, 2006 and Parasuraman, 2009

Projection I, II and III are made by the Government of Kerala under three alternate courses of fertility trends (Kerala, 2005). Even according to projection III where the fertility is assumed to increase after a stage the population will reach only 35.7 million by 2051. That is during the entire fifty year period Kerala will add only 3.9 million persons to its 31.8 million in 2001 showing that the population growth in Kerala will be entirely different in the next fifty years compared to the same during the last fifty years. It should also be noted that

according to all the projections the population of Kerala will start declining latest by 2041. This is inevitable considering the change in the age structure of the population in the state where the percent share of older people (age sixty years and above) is increasing very fast and that of child population is declining simultaneously (See Figure 3). Whereas in 1961 there was only 6 per cent of the population aged at least 60 years of age, the share of this category is expected to reach almost 27 per cent by 2051.

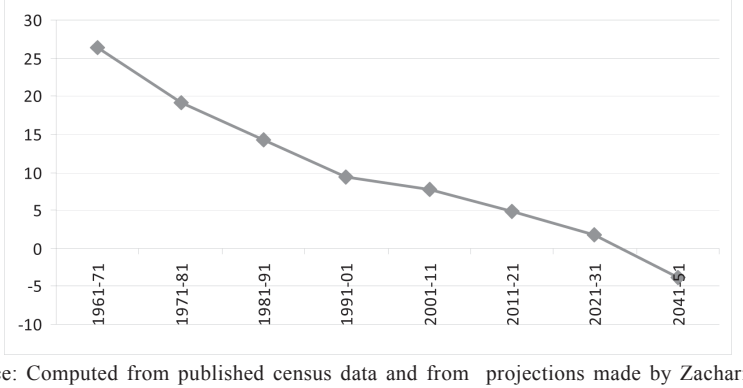
Figure 3: Percentage distribution of population by broad age group: 1961-2051



Source: Same as that for Projection IV in Figure 2.

Figure 4 shows the growth rate of population from 1961 to 2051. The negative growth starts sometime between 2031 and 2041. These figures indicate that Kerala's population growth has lost much of its momentum.

Figure 4: Decadal growth rate of population of Kerala: 1961-2051



Source: Computed from published census data and from projections made by Zacharia *et al,* 2009.

4. Components of population change

In view of the fast changing age structure of the population of Kerala, a few words about the components of population change seem to be appropriate. The total fertility rate has recorded a steady decline from 5.0 in 1961-1971 to 2.1 in 1988[3], a decline of almost three children in about two decades. In 1994, the TFR reached 1.7 after which it has stagnated around 1.8[4]. Mortality level in Kerala also touched the lowest rate of 6 per one thousand population in 1991 mainly due to the high level of literacy and better health care facilities available and utilized. But since 1991 the crude death rate has shown a tendency to increase to reach 6.4 in 2005 (India, 2008). It is likely to increase further as is the case in many developed countries. The change is attributed to the steady increase in the percent share of older persons in the population. As for the third component (migration), emigration of Keralites to other countries remains strong, with a study conducted by Centre for Development Studies (CDS) in 2004 showing that the number of emigrants went up from 13.6 lakhs to 18.4 lakhs (an increase of 35%) during the 1999-2004 period. According to the latest study by CDS, international migration has remained stationary during 2003-2007 and it was 18.5 lakhs in 2007 (Kerala 2009).

5. Population pressure

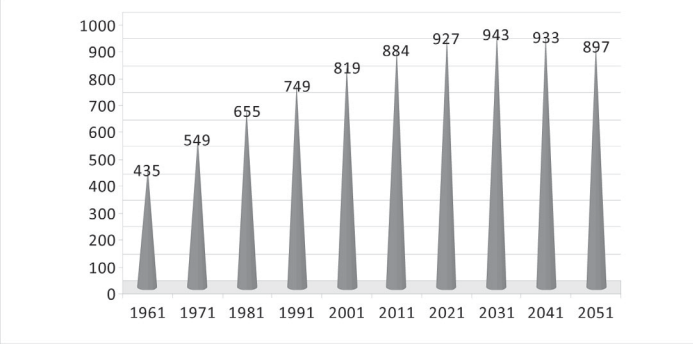
Population pressure is defined as the force exerted by a growing population upon its environment, resulting in dispersal or reduction of the population. Concern with population pressure is dominant in many countries. Rapid population growth has often been held responsible for population pressure. According to Edward O. Wilson (1992), the raging monster upon the land is population growth and in its presence, sustainability (i.e. sustainable development) is but a fragile theoretical construct. A policy document from the World Bank affirms that the causes of environmental degradation are as varied as its manifestations. But rapid rate of population growth is at the heart of the problem in many developing countries (Quoted in Banuri & Marglin, 1993). However, one is not really sure about the role of population growth in slowing down improvement of any society. At best, this could only be one of the many reasons in bringing about retarded growth. This study may throw some light on these aspects.

6. Population pressure indices

6.1. Density of population

Density of population is a simple index that shows the relation between a population and the area in which it lives. It is a measure obtained by dividing the total population by the area of the territory and is expressed here as persons per square kilometre. Figure 5 gives the density of Kerala population from 1961 to 2051.

Figure 5: Population density of Kerala: 1961-2051



Source: Same as in Figure 4.

Lutz and Holm (1993) described the density of 590 per square kilometre in Mauritius, as "one of the highest population densities of any sovereign territory in the world". Going by this standard, the density of Kerala is very high which has increased from 435 persons per square kilometre in 1961 to 819 in 2001, an increase of 384 persons per square kilometre over a period of 40 years. From 2021 onwards the density is expected to go beyond 900 persons per square kilometre in Kerala and this could easily be one of the highest densities in the world. Therefore, going by this index, Kerala is having a serious problem of population pressure.

6.2. Size of operational holdings

Another way of looking for evidence of population pressure is the size of operational holdings. An operational holding is defined as "all land, which is used wholly or partly for agricultural production and is operated as one technical unit by one person alone or with others without regard to title, legal form, size or location" (India, undated a). In Kerala, sub-division and fragmentation of

holdings is very common. The average size of operational holdings in 2001 was just one-fourth of a hectare. The average size of operational holding in 1976-77 was 0.49 which has declined to 0.23 in 2005-06.

The percentage share of each type of holding in the total area under operation shows that the share of marginal holdings had been increasing while that of large and medium holdings had been decreasing. The share of small and semi-medium holdings is remaining more or less constant (Table 1). That is, in Kerala, the operational holdings are getting sub-divided and fragmented again and again.

Table 1: Percentage distribution of operational holdings by size class

Operational holdings	Size class (in hectares)	Percent of area						
		1976-77	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06
Marginal	<1.00	40.0	41.6	46.0	48.2	53.4	53.2	57.6
Small	1.00-1.99	22.3	22.1	21.6	21.4	20.2	20.4	18.3
Semi-medium	2.00-3.99	17.9	18.3	15.3	14.2	13.9	14.2	11.5
Medium	4.00-9.99	10.9	10.8	7.4	6.4	6.1	6.1	5.1
Large	10.00+	8.9	7.2	9.7	9.9	6.5	6.0	7.5
TOTAL		100.0	100.0	100.0	100.0	100.0	100.0	100.0
				Percent of holdings				
Marginal	<1.00	87.7	89.2	91.5	92.6	94.0	95.2	95.6
Small	1.00-1.99	8.0	7.0	5.8	5.2	4.2	3.4	3.1
Semi-medium	2.00-3.99	3.2	2.9	2.1	1.8	1.5	1.1	1.0
Medium	4.00-9.99	0.9	0.8	0.5	0.4	0.3	0.2	0.2
Large	10.00+	0.1	0.1	0.1	0.1	0.0	0.0	0.0
TOTAL		100.0	100.0	100.0	100.0	100.0	100.0	100.0
Av. Size of operational holdings		0.49	0.43	0.36	0.33	0.27	0.24	0.23

Source: George (1986), Kerala (2001) and http://agcensus.nic.in/cendata/statesummarytype.aspx

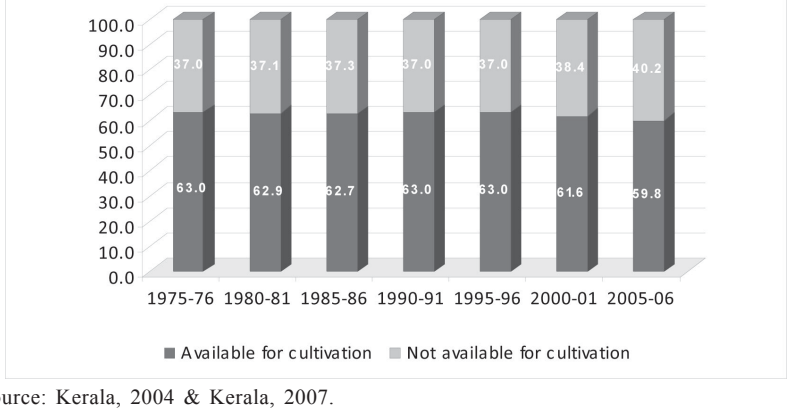
The percentage distribution of operational holdings by size class gives more clarity to the situation. It may be noted that the size of 96 per cent of the total holdings works out to be less than one hectare[5] and that the share of holdings of at least 2 hectares is absolutely negligible. Increasing number as well as increasing marginalization of holdings could be mainly due to implementation of land reform legislations particularly land ceiling; disintegration of joint family system and the consequent break-up of holdings. It is also

possible that the development of new agricultural technology might have prompted owner cultivation in small pieces of land (India, 2005). With this, if population exerts pressure on land the result could be further subdivision and fragmentation of holdings. This is coming out clearly from Table 1 with the continued increase in the marginal holdings.

6.3. Land use pattern in Kerala

Yet another way of looking at the situation with respect to population pressure is by examining the changes in land use pattern. Increase in population pressure can lead to expansion of agricultural land and intensification of cultivation and after a stage, it can cause conversion of agricultural land into residential and industrial area. To start with, the total land area in this state is divided into two major categories viz. land available for cultivation and land not available for cultivation. The category "land available for cultivation" includes net sown area (NSA), cultivable waste (CW), current fallow (CF), fallow other than current fallow (OF) and land under miscellaneous tree crops not included in net sown area (MTC). The sub-categories of "land not available for cultivation" are land put to non-agricultural use, barren & uncultivable land and permanent pastures and other grazing land besides forest area. In Figure 6 these two major categories are given for a period of 30 years from 1975-76 to 2005-06 and it shows that the change over the years in the share of these categories is not substantial.

Figure 6: Percent of area available and not avaialble for cultivation in Kerala:1975-76 to 2005-06



Source: Kerala, 2004 & Kerala, 2007.

The percent share of NSA and forest in the total land area of the state is given in Table 2. These two categories together accounts for about 84 to 86 per cent of the total land area in Kerala leaving out only very little land for other uses.

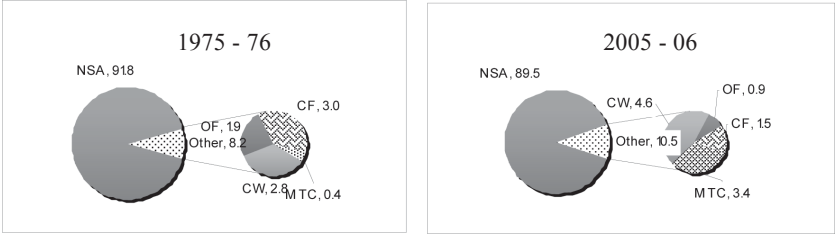
Table 2: Percent share of net sown area and forest in the total land area of the state

Year	Net Sown Area	Forests	Sub-Total	Other	TOTAL
1975-76	56.3	27.8	84.2	15.8	100.0
1980-81	56.1	27.8	83.9	16.1	100.0
1985-86	56.4	27.8	84.2	15.8	100.0
1990-91	57.8	27.8	85.7	14.3	100.0
1995-96	58.3	27.8	86.1	13.9	100.0
2000-01	56.8	27.8	84.6	15.4	100.0
2005-06	56.1	28.4	84.5	15.5	100.0

Source: Calculated by the authors

Land available for cultivation and land not available for cultivation with their subcategories are given in Figure 7 and 8 respectively. Figure 7 shows clearly that around 90 per cent of the land available for cultivation is already under cultivation (NSA).

Figure 7: Land available for cultivation: 1975-76 and 2005-06



Source: Same as in Figure 6
Note: NSA = Net Sown Area; CW = Cultivable Waste; CF = Current Fallow; OF = Fallow Other than current fallow
MTC = Land under Miscellaneous Tree Crops not included in the net sown area

Even though the NSA remains more or less constant during the 30 year period under consideration, the use to which this area is put has changed. A drastic reduction in the area under paddy production is noted (from 884,969

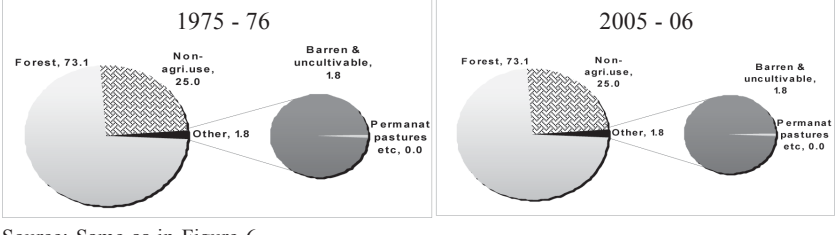
hectares in 1975-76 to 275,742 hectares in 2005-06), a decline to the tune of 69 per cent. The percent share of area under paddy production in total area under food crops has declined from 45.36 per cent to 20.91 per cent during the same period indicating a shift in cultivation. But the yield of rice from one hectare has increased from 1,542 kilogram to 2,285 kilogram during the above mentioned period.

In 1975-76 the area under paddy cultivation was 30 per cent of the total cropped area. This share has declined to 9 per cent in 2005-06. Unabated massive conversion of paddy fields for building houses, destruction of hillocks and the filling up of low-lying lands, paddy fields, water bodies and deforestation has been widespread in the state causing serious ecological and environmental problems and complex feedback effects on agricultural production. The recent spurt in real estate prices began taking its toll on paddy fields in Kerala, which forced the state government to pass a bill banning any other commercial activity on the paddy fields"[6] (India, Undated b).

Also to be noted is the fact that during this period, Kerala was slowly shifting to commercial crops. Today, Kerala produces more than 90 per cent of all the rubber produced in the country and the area under its production has increased from 206,700 hectares in 1975-76 to 597,610 hectares in 2005-06, an increase of 189 per cent.

Figure 8 shows that a major chunk of the land not available for cultivation is under forests. But in this case a two percentage point decline in the share of forests and an almost seven percentage point increase in the land under non-agricultural use are noted.

Figure 8: Land not available for cultivation: 1975-76 and 2005-06



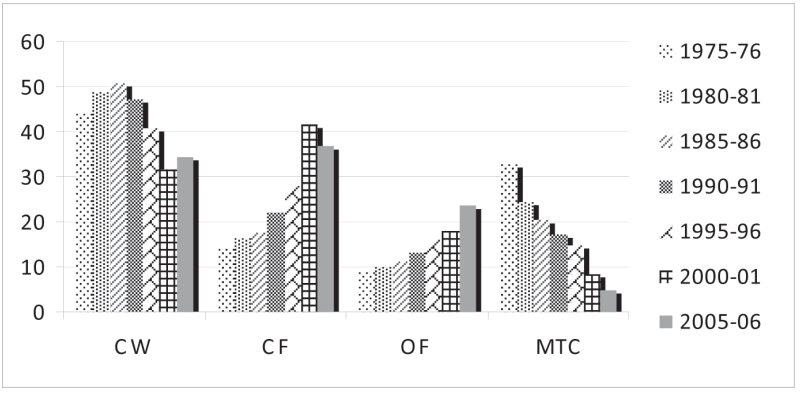
Source: Same as in Figure 6.

The forest land in Kerala forms only 28 per cent of the total land area, less than the national goal of having forest cover of at least one-third of the

total land area[7]. However, as for the share of forest area in the state remaining constant, there are differences of opinion. While the Government maintain that there is no change in the forest area in the state over the years, differing views are heard from scholars. It is said that "the absence of recurrent surveys of the area classified as forest" is the reason for the Government's view. In fact, it is claimed that there has been a decline in forest area from 27.8 per cent of land under forest in 1965 to 17.1 per cent by 1973, to 14.7 per cent by 1983. Field-level observations also indicate the conversion of forestland to cropland" (George and Chattopadhyay, 2001). But according to the reports of the Kerala Forests and Wildlife Department, "the actual forest area in the State during 2003-04 was 9,400 sq. km which forms 24.19 per cent of the total geographic area of the State" (India, Undated c). The annual rate of deforestation in Kerala is said to be at the rate of 1.4 per cent of the total forest cover (Kumar B.M, 2005). This gives the impression that extent of area covered by forests in this state is not yet clear. But a decline in its share has been indicated.

Coming to the changes in the subcategories in each major category, Figure 9 where the subcategories of land available for cultivation excluding NSA are given, indicates continuous decline in the land under MTC. The general trend with respect to cultivable waste is one of decrease and that of fallow is one of increase as indicated by Figure 9.

Figure 9: Percentage share of sub-categories in the area available for cultivation (excluding NSA): 1975-76 to 2005-06

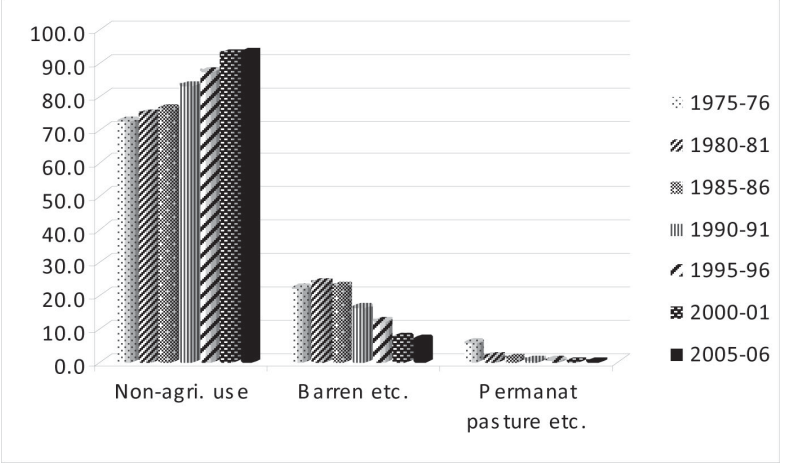


Source: Same as in Figure 6

With population pressure one would expect a decline in all these categories in an attempt to extend cultivation. But this is clearly not seen here except in the case of MTC. It should also be noted that the share of all these categories of cultivable land is utterly minimal and what is kept as such could even be the absolute minimum required. Also the decline in the MTC should not be interpreted as the result of extension of cultivation as it could easily be used for construction purposes. In short, it appears that the effect of population growth on cultivable land appears to be minimal during the study period.

Excluding forests, the percent share of subcategories of land not available for cultivation is calculated and presented in Figure 10. The trend shows a consistent increase in the land used for non-agricultural purposes. The share of this category in the land not available for cultivation has increased from 72.5 per cent in 1975-76 to 93.3 per cent in 2005-06 mainly due to growing needs of residential houses, industry and transportation. These could be the combined result of population pressure, change in industrial scenario, change in the socio-economic status of persons and the increasing proportion of nuclear family units.

Figure 10: Percent share of sub-categories in the area not available for cultivation (excluding forest): 1975-76 to 2005-06



Source: Same as in Figure 6.
Note: Non-agri. Use = land put to non-agricultural use; Barren etc. = Barren and uncultivable land; Permanent pasture etc. = permanent pastures and other grazing land.

The other two categories of land viz., barren land and permanent pasture have been decreasing consistently. If the same trend continues there will hardly be any barren and uncultivable land or permanent pastures and other grazing land. This trend can be viewed as the effect of population pressure which led to the increased use of all available land.

6.4. Availability of land in relation to population

With a given land area, population growth has the effect of reducing the man-land ratio and it can be eased by making full utilization of the available resources. When resources are limited, even when it is fully utilized, the problem of population pressure will continue unless other means of reducing population size is adopted. Reduction in population growth can be achieved by increasing the death rate, by reducing the birth rate or by encouraging emigration. No civilised society will deliberately attempt to increase death rate which leaves only the other two options. If any society deliberately tries to reduce birth rate or encourage emigration, it suggests that the state of affairs as such (including availability of land) in that society is not acceptable to the population[8].

In this paper, concentration is on land which is the most important aspect for sustenance of the population. Each person has needs for food, water, shelter, transportation etc. all having its impact on land. The area of arable land per capita reflects the population pressure on land and is an indicator of land stress. It is difficult, however, to decide how much land area a person requires for sustenance, without considering the characteristics of the land like soil fertility, climate, water supply, intensity of cropping etc. Further, the need will also differ by economic conditions, technological support services available, technical mechanisms to provide water and electrical utilities, etc[9]. In addition, whether a person is a vegetarian or a non-vegetarian also is important in this respect. There's a lot of nutritional value in meat, but it also takes a lot more area to feed the livestock that will feed you (Leckie, 1999).

Some standards have been worked out by different scholars to give an idea of the sufficiency of land to meet the needs of the population. According to East[10], a minimum of 2.5 acres of land per capita is indispensable for countries in Asia. This was not accepted by Mukerjee (1938) who felt that East's calculations are based on the requirements observed in Europe and America.

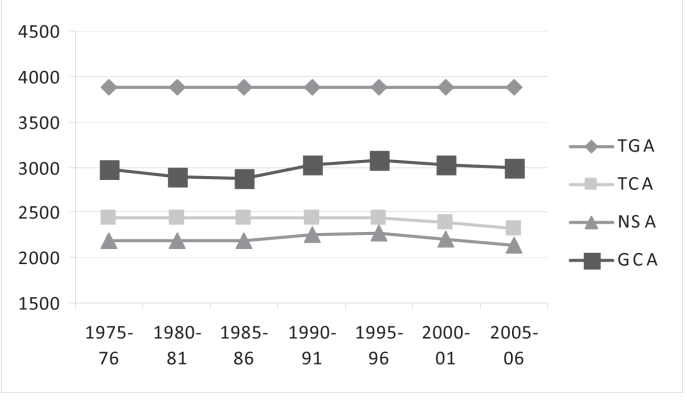
He argues that in India one acre of land (which is equivalent to 0.4 hectare of land) per capita is indispensable, "for the nourishment of man". Meadows and others (1972), also is of the opinion that 0.4 hectares of per capita arable land is necessary for sustenance. The minimum amount of agricultural land necessary for sustainable food security, with a diversified diet similar to those of North America and Western Europe (hence including meat), is 0.5 hectares per person, said Norman Myers (1999). Since the calorie intake of people in the western countries is much more than that in India and since they require only 0.5 hectares of land per person, the arguments put forward by Mukerjee, Meadows and others should be acceptable in the case of Kerala. Hence, in this paper, one acre of arable land, which is equivalent to 0.4 hectare, is taken as the absolute minimum requirement per person.

Mukerjee (1938) has suggested a coefficient for determining the pressure of population on land using the absolute minimum requirement per person, viz. one acre of land (0.4 hectare). It is a simple calculation where the land required per person is divided by the per capita availability of arable land. If the coefficient is unity, the land has optimum population. A coefficient of more than one indicates over-population and higher the deviation from unity, greater is the pressure of population on land. If the coefficient is below unity, it indicates that there is scope for further increase in population from the point of view of land availability.

This coefficient is calculated in this paper taking per capita NSA as surrogate for arable land. Considering the fact that the intensity of cultivation in this state is changing only marginally, the use of NSA appears to be meaningful. However, gross cropped area (GCA) also is used. Also used as proxy for arable land is total cultivable area (TCA). Even total geographical area (TGA) is considered just to show the degree of intensity of the problem.

Before going into the calculation of the coefficient, it is imperative to show what is happening to the different categories of area defined above. Figure 11 gives the trend in the different classes of area from 1975-76 to 2005-06. A slight decline in TCA, NSA and GCA can be seen from 1995-96 onwards.

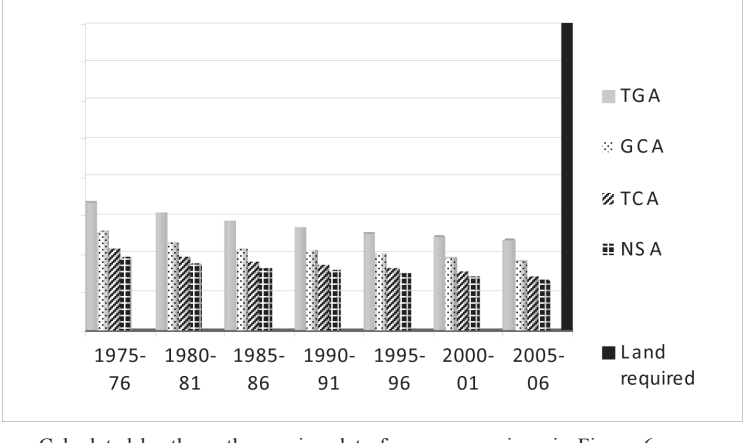
Figure 11: Changes in different classes of land area in Kerala(in 000 hectares):1975-76 to 2005-06



Source: Same as in Figure 6.

Figure 12 gives the per capita availability of land for years from 1975-76 to 2005-06. For inter-censal period the projected population given in Kerala (1988) and Kerala (2007) is used. Because of the use of projected/estimated population instead of actual enumerated population, the information given will provide only a general picture which in itself is very revealing.

Figure 12: Per capita land available and required (hectare): 1975-76 to 2005-06



Source: Calculated by the authors using data from source given in Figure 6.
Note: TGA = Total Geographical Area; GCA = Gross Cropped Area;
TCA = Total Cultivable Area; NSA = Net Sown Area.

Note that the per capita land in all categories is declining and that available land falls very short of requirement even when the total geographical area of the state is taken as the land unit. In spite of the fact that the population of Kerala is growing at a slow rate, the pressure of population on land is very high.

Using the per capita land, the relative coefficient of over population is calculated and provided in Table 3 below. All the figures are above one for all the units indicating population pressure and there is consistent increase in the coefficient in almost all the units signifying the worsening of population pressure over the years.

Table 3: Relative coefficient of over population

Land unit	Relative coefficient*						
	1975-76	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06
TGA	2.39	2.62	2.81	3.00	3.16	3.28	3.40
GCA	3.12	3.53	3.81	3.85	4.00	4.22	4.42
TCA	3.80	4.17	4.48	4.76	5.02	5.32	5.68
NSA	4.24	4.67	4.99	5.18	5.42	5.77	6.19

Source: Calculated by the authors.
TGA = Total Geographical Area; GCA = Gross Cropped Area; TCA = Total Cultivable Area; NSA = Net Sown Area.
* Per capita land required (0.4 hectares) is divided by the per capita land available.

7. Discussion of findings and conclusions

Population pressure in developing countries is often discussed in the context of high population growth rate. But the situation is different in Kerala where the growth rate of population has come down significantly over the decades and has reached 9.42 per cent during 1991-2001 as against the Indian average of 21.34 per cent. Even by the conservative projections, population growth in Kerala is expected to witness a negative growth latest by 2041. This was achieved partly through a consistent decline in total fertility rate from 5.0 in 1961-1971 to around 1.8 since early 1990s and migration of population to the tune of 5.4 per cent of the state's population to other countries[11] and 2.3 per cent to other parts of India[12]. In spite of the continuing inflow of migrant workersfrom other parts of the country to Kerala, the population growth is likely to fall in the coming decades.

Kerala, which has a share of 1.2 per cent of the land area of the country, accommodates 3.1 per cent of the Indian population. Kerala has the third highest population density of 819 persons per square kilometre in 2001 among the states in India following West Bengal (903) and Bihar (880). Only seven countries in the world have a density of population more than that of Kerala of which all but one viz., Bangladesh have smaller area and lesser population[13].

One expected impact of population pressure on land is the fragmentation of agricultural holdings, the average size of which has come down from 0.49 hectares in 1976-77 to 0.23 hectares in 2005-06 in Kerala. The share of marginal holdings in the total area under cultivation showed an increase while the shares of large and medium holdings decreased. In addition to the population pressure, land reform legislations, disintegration of joint family system and development of new agricultural technology could be the reasons for the fragmentation of holdings.

Apart from the fragmentation of agricultural holdings, the period also witnessed a marginal decline in the area available for agricultural purposes. The intensity of cultivation in Kerala did not show any significant improvement. (1.36 in 1975-76 to 1.40 in 2005-06). With population pressure, one would expect a decline in land classified as cultivable waste, fallow and those under miscellaneous tree crops in an attempt to extend cultivation. But in Kerala, only the land under MTC declined consistently, which might have been used for non-agricultural purposes. Thus, it appears that there was no/very little effect of population growth on the total extent of cultivable land and intensifying its use during the study period from 1975-76 to 2005-06. But the use to which this land is put has changed. The shift from food crops to non-food crops was the most visible one. The cultivation of paddy, the most important staple food crop of the state, covered 30 per cent of the total cropped area in 1975-76. In spite of the insufficiency in food production in the state, it came down to just 9 per cent by 2005-06. At the same time, there was an increase in the area under cash crops, area under rubber cultivation being the most spectacular. It increased by 189 per cent during the same period. That is, in 2005-06, rubber cultivation has been extended to 597,610 hectares of land from 206,700 hectares in 1975-76. The shift to rubber cultivation has affected almost all crops.

Of the land not available for cultivation (excluding forests), the share of land put to non-agricultural uses increased consistently from 72.3 per cent in

1975-76 to 93.3 per cent in 2005-06 mainly due to increasing demand for residential houses, industry and transportation. It is interesting to note that the utlisation of land for housing is high in Kerala compared to other parts of India. The average per-capita floor area of the houses in Kerala was 14.50 square metres in 2007-08, the highest among the Indian states. The national average is only 8.67 square metres. The difference between rural (14.32 square metres) and urban areas (15.012) is minimal in Kerala (India, 2010).

During the same period, there was decline in the share of barren and uncultivable land, permanent pastures and other grazing land. Its share has become negligible over the years. Another expected change in the land use pattern due to population pressure is a decline in the area under forests. This has happened in Kerala though conflicting opinion makes it difficult to assess the extent of decline. The mismatch is observed even in the statistics provided by different government departments and demonstrates the dearth of good dependable data on forest land.

The coefficient of the pressure of population on land was beyond acceptable limits even in the 1970s. Taking NSA as a proxy to arable land, the coefficient increased from 4.0 in 1975-76 to 6.4 in 2005-06 indicating the high intensity of the pressure. The study finds that it is the size of the population rather than the growth in population that matters. Once a region reaches a situation of high population density, it takes several decades to ease population pressure. It is clear that, in spite of steady decline in population growth, there is significant population pressure on land in Kerala but its effect was found mainly on land put to non-agriculture uses rather than on extending agriculture to fallow land and cultivable waste. That such cultivable land not used for cultivation was low in Kerala even in the 1970s may be an indication of the fact that the extension of cultivation to such areas happens as a natural corollary to population pressure. It may be noted that the erstwhile Travancore state and Malabar region of the Madras Presidency (both these regions are part of the present Kerala state) witnessed considerable expansion of area under cultivation in the first half of the twentieth century (Tharakan, 1984). But once such an option was exhausted, the region became less dependent on agriculture and tried other options.

It appears that the state started exploring other options from the 1970s onwards. The total fertility rate has come down from 5.0 in 1961-1971 to below

replacement level even in early 1990s. Large scale out-migration to Middle Eastern countries also started in the seventies. The migration of Keralites to other states in India also remained strong. Within agriculture, in their bid to maximize returns, a shift to relatively more profitable cash crops was noted. The state policies on industrialization changed from industries which require large tracts of land to small and medium enterprises. There was large expansion of the service sector, the share of which has increased from 37 per cent to 59 per cent during 1975-76 to 2005-06. Probably because of the above responses, the economy began to make a turnaround from stagnation to growth by the middle of the 1980s even when the population pressure continued to increase. The Kerala example brings out the diversity of options available to reduce the impact of population pressure on land other than intensification or extension of agriculture. It should also be mentioned here that the chances of extension of agriculture is negligible in Kerala where the human settlement pattern is such that each family has separate homesteads with relatively bigger houses often surrounded by a small area of land[14].

The Malthusian model essentially characterises population pressure as having a dampening effect on economic growth. The above analysis, however, implies that high population pressure need not be a deterrent to economic growth if other conditions such as high educational levels, willingness and ability to migrate[15] and to shift to non-agricultural sectors as also from crops with lower profitability to those with higher profitability are available. The study also finds that Boserup's viewpoint that population pressure will automatically lead to increased land intensification or shortening fallow need not necessarily happen in a sub-national context like that in Kerala. But her viewpoint is partially true as the region responded by increase in migration and reduction in population growth. Also the shift to more profitable non-food crops occurred which paid for import of food materials from outside.

End Notes

[1] Overpopulation, http://www.nndb.com/people/037/000099737/ accessed on 12 November 2009.

[2] Kerala has a share of 91 per cent of the natural rubber production in India. The other crops in which the state has a major stake include pepper (96% of Indian output), cardamom (72%) and nutmeg (98%).

[3] Kerala is the first state in India to achieve the replacement level fertility rate of 2.1 in as early the year 1988.

[4] The reasons for the decline in fertility could be several. The desired family size has long been below 2 children in Kerala. The female age at marriage is also high with only 6.8 per cent of the total marriages (conducted during the three years prior to the survey) reporting to be below 18 years of age according to the District Level Household and Facility Survey, 2007-2008 (International Institute for Population Sciences, 2010). Further, the share of female population in the most fertile age group of 20-24 years has been declining steeply since 1981 (from 12.1% in 1981 to 9.3% in 2001). It is estimated to come down further to 5.3 per cent by 2051. A decline is observed in the next age group (25-29 years) since 1991 (from 9.4% in 1991 to 8.9% n 2001). The share of this group is estimated to come down to 5.6 peer cent by 2051. At the same time, the percent share of contraceptive users among the currently married women age 20-24 was 35.5 percent and that for age 25-29 was 55.4 percent (*ibid*). The contraceptive prevalence rate in Kerala among currently married women in the 15-49 age group as per the National Family Health Survey (NFHS-3) held during 2005-06 (International Institute for Population Sciences, 2007) is found to be 69 percent.

[5] A detailed examination has shown that three-fourths of the holdings in this group are of the size 0.02 to 0.50 hectare.

[6] This became an Act in July 2008 known as the "Kerala Conservation of Paddy Land - Wetland Act 2008".

[7] http://indiacurrentaffairs.org/one-third-land-area-under-forest-cover-as-national-goal/ accessed on 13 November 2010.

[8] It can be argued that wide spread public health, maternal and child health facilities, land reforms, high literacy level and high status of females, implementation of family planning programme etc. are the reasons for reduction in fertility instead of the felt population pressure. Without denying this argument we would like to point out that Kerala is not a highly developed state economically and as such the population has taken advantage of the above said factors to reduce the family size to a manageable level.

[9] http://web.rollins.edu/~jsiry/space.html accessed on 2 October 2010.

[10] Quoted in Mukerjee R.K. (1938), p.20.

[11] Kerala (2009) for the number of emigrants and Kerala (2008a) for mid-year population.

[12] NSSO (2010) for the estimate of the number of migrants to other parts of India. The source of population figure is the same as that for emigrants.

[13] According to World Bank (2003), Bahrain, Bangladesh, Bermuda, Maldives, Malta and Monaco and Singapore have registered higher density of population in 2001. Of them, only Bangladesh had a larger area and more population than Kerala.

[14] In most of rural India one finds clusters of houses unlike those in Kerala where houses are scattered.

[15] Remittance from emigrants is equivalent to one-fifth of the state income (George K.K. and Remya S., 2008).

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