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CONTENTS

DEMOGRAPHIC TRANSITION IN SRI LANKA : A SPATIAL PERSPECTIVE

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Demographic transition theory is a major focus of population research, but geographers have tended to avoid research in this area due to the lack of suitable measures for spatial analysis of fertility. The Coale fertility indices are applied here to provide a spatial view of fertility in Sri Lanka. Fertility, in turn, is linked to past mortality and to the incidence of malaria. Sri Lanka's Dry Zone exhibits a pattern of linkages among mortality, malaria, and fertility with important implications for demographic transition theory and for public policy.

Demographic transition theory involves a lagging fertility transition induced by a leading mortality transition. The mechanism by which these two processes are initiated, and the linkages between them, constitute themes of inquiry for a large portion of the demographic literature (Notestein, 1945; Davis, 1963; Caldwell, 1978). Population geographers, however, have tended to ignore demographic transition theory in both their research and in their texts; with the exception of Woods (1982). Demographic transition has served geographers mostly as a pedagogic model.

One of the major reasons why geographers have eschewed demographic transition as a research focus is that those who collect relevant data do so for purposes quite different from those that geographers have in mind. Thus, while it is easy to conceive waves of mortality and fertility change sweeping over a landscape, it is quite another matter to describe or measure these processes. Geographers have, of course, used standard demographic data, but in order to provide an areal perspective, they have been forced to rely upon relatively unsophisticated measures. What has emerged has been a treatment in which, inevitably, pattern has remained hidden and process not illuminated. Conversely, some geographic approaches have been so sophisticated that the data needed to fuel resulting analyses can seldom be found in developing countries, precisely the areas where demographic transition is a contemporary reality.

This article focuses on the linkage between the mortality and fertility transitions in Sri Lanka. It will discuss the measurement of areal fertility, demonstrate the use of a measure not commonly used in population geography, and show areal association between past mortality and recent fertility. Because malaria is intrinsically linked with past mortality in Sri Lanka, this disease must also be considered. Emphasis is placed throughout on the measurement of fertility, rather than of mortality or morbidity, principally because existing data permit only this emphasis. In a sense, this is a convenient data constraint because there is much greater research concern with fertility than with historic mortality and morbidity.

Fertility and its Measurement

The measurement of human fertility involves two basic considerations: population structure and fertility behaviour. Structural influences include the distribution of age, sex, and nuptiality within a population, whereas behavior refers ultimately to the tendency of a woman to bear children during her fecund years. Structure and behavior can influence fertility either positively or negatively. The Republic of Ireland, for example, with both a high age at marriage and a low incidence of nuptiality, has a very low proportion of married people in its population, providing a negative effect on fertility. On the other hand, high marital fertility more than counterbalances the negative influence of structure (Coward, 1978).

Wilson (1978), responding to a study by Jones (1975), argued that population scholars are interested primarily in fertility behavior and should seek to remove structural influences from their analyses. Wilson was correct, but also profoundly wrong. Population scholars, perhaps as a result of their funding sources, seek short-term policy implications. Hence, structure-free measures of fertility tend to identify targets of high marital fertility[1] which presumably respond to intervention, especially family planning programs. Structural influences are seldom amenable to policy intervention, yet age at marriage and the incidence of nuptiality (as in Ireland), or the imbalance of sexes (as in frontier areas), result also from human behavior. One is hard-pressed to decide whether a decline in marital fertility or an increase in the incidence of nuptiality would indicate a more profound change in the social behavior of the Irish. Wilson should have argued that it is important to keep separate behavioral and structural influences in an analysis of fertility without, *a priori*, imputing greater importance to either component.

In a spatial analysis of fertility, however, it may be difficult to separate structure from behavior. Although data for sophisticated fertility measures are often available at the national level, they may not be obtainable for smaller units of observation, especially in the developing world. It is therefore common to find geographers mapping fertility through the use of such unsophisticated measures as the crude birth rate (Jones, 1977). When measures are used that permit spatial fertility to be decomposed into structural and behavioral components, the focus is invariably a developed country where the requisite data can be obtained with relative ease (Wilson, 1978).

This dilemma is largely overcome by the use of the Coale, or Princeton, fertility indices (Coale, 1965) These measures allow a reasonably good view of structural and behavioral aspects of fertility, but

1. This assumes that births occuring outside of marriage are a negligible contribution to total fertility, a reasonable assumption in many countries.

utilize data that are more widely available. Despite this advantage, there has been only one previous use of the Coale measures by a geographer and, in that instance, only for a developed country (Coward, 1978).

The Coale indices were designed to examine exactly the problem set forth here: what is the contribution of structure (more precisely, nuptiality) to total fertility, and what is the contribution of marital fertility? The indices are denoted by I_f, I_g, and I_m, all of which are based on the fertility of the Hutterite population in 1930. The Hutterites, by virtue of a strong pronatalist ideology, have the highest fertility observed among contemporary human populations. The Coale measures for the 22 districts of Sri Lanka are shown in Figure 1.

Coale's I_f index relates the number of births occurring in a population to the number which would have occurred if that population had the age-specific fertility rates of married Hutterite women. A value of 1.00, the highest possible (if Hutterite marital fertility is the highest possible, and it is certainly close), would indicate a population where women gave birth at a rate equal to the highest ever reliably recorded. Even the Hutterites, however, had an I_f value of only 0.70 because some females were unmarried during a portion of their child-bearing years.

Coale's I_m index uses the sum of the weighted proportions married at each age, the weights being the Hutterite age-specific marital fertility rates. Thus, this measure gives most importance to those ages where fertility potential is the highest. Values of I_m in Coale's original article range from 0.88 in India in 1960 to 0.31 in Ireland in 1870; these indicate the proportion of the potential effect of marriage on fertility which has actually been achieved by the population under study (Coale, 1965). For the maximum positive effect, the population would have to have 100 per cent married in all the fecund ages.

Coale's third measure, I_g, relates the actual births in the population (assuming no illegitimacy, which is a sound assumption for Sri Lanka) to the number of births which would have occurred if all of the married women in that population had the age-specific fertility of married Hutterite women. I_g is thus a measure of the ratio of actual to highest potential fertility *within* marriage. Values of I_g cited by Coale range from 1.00 for the 1930 Hutterites (by definition) to 0.24 for Sweden in 1960 and Bulgaria in the same year (Coale, 1965).

I_m provides a view of the influence of population structure on fertility, whereas I_g is essentially structure-free and offers a perspective on marital fertility. I_f is total fertility, the combined influence of both structure and behavior. Through these three measures we can compare the fertility of two or more populations or we can look at one or more populations over time. Of particular interest is the fact that two populations can have the same level of I_f, overall fertility, but reach it through different means : one may have a high proportion married but low fertility, while the other may have a lower proportion married but higher fertility for those who are married. Fertility transition in Western Europe (if there ever was a typical pattern) might follow a pattern of falling I_f, brought about by falling I_m with I_g remaining fairly high, followed by falling I_g as simpler means of controlling fertility in marriage were developed. Finally, I_f might stay low but I_m could rise, balanced by low I_g values.

Studying any population variable for its own sake is an effete undertaking. In order to give meaning to the Coale indices for Sri Lanka, it is necessary to consider the context in which fertility occurs.

Sri Lanka's Demography

Sri Lanka attracted a good deal of attention from demographers in the late 40's and 50's. Taueber (1949) looked to Sri Lanka as the ideal demographic laboratory for the study of populations in developing countries, and a number of important studies focused on the precipitous decline in the crude death rate. For more than a decade, scholars debated the role of malaria eradication (although malaria was never really eradicated) as a factor in mortality decline Newman, 1965 and Meegama, 1967).

Although recent fertility decline has been less rapid than the post-war mortality decline, nevertheless Sri Lanka's crude birth rate in 1975 was the fifth lowest in Asia. This is particularly impressive because, as Fernando (1976) has noted, Sri Lanka's general level of development, ethnic diversity, and degree of urbanization are much more typical of the high-fertility South Asian region than they are of Japan, Hong Kong, Singapore, and Taiwan, the only Asian countries with lower fertility.

The combination of Sri Lanka's regional typicality and atypical fertility underline its importance as a focus of demographic research. In fact, however, it has not attracted the research attention that it deserves. With the exception of Fernando's (1972, 1974, 1975, 1976, 1977, 1979, 1982) contributions, surprisingly little work has been done on recent Sri Lankan fertility. This possibly can be explained by the fact that most of the fertility decline (as reflected in I_f) can be accounted for by structural changes in the population, or, specifically, by an alteration in nuptiality patterns (I_m). The age of female marriage has shown a slow but rel tively steady tendency to increase, and the proportion married in the most fertile ages has declined recently. The importance of these structural changes, as compared with the lesser impact of changes of actual reproductive behavior *within* marriage (I_g), probably has tended to dampen fertility research interest in Sri Lanka.

The depiction of fertility provided by Figure I shows that the spatial pattern of fertility is very similar for both structural (I_m) and behavioral (I_g) components. There are some exceptions to the congruence of pattern. Matale District, located in the centre of the island and Hambantota District, occupying the southeast coastal strip, both show low proportions married and high marital fertility. For the most part, though, low total fertility districts (I_f) show low I_m and low I_g; conversely high I_f districts have high I_m and high I_g. The similarities of pattern suggest a single process generating both structural and behavioral influences on fertility.

The line in Figure I which divides the southwest from the remainder of the country

FERTILITY PATTERNS, 1971

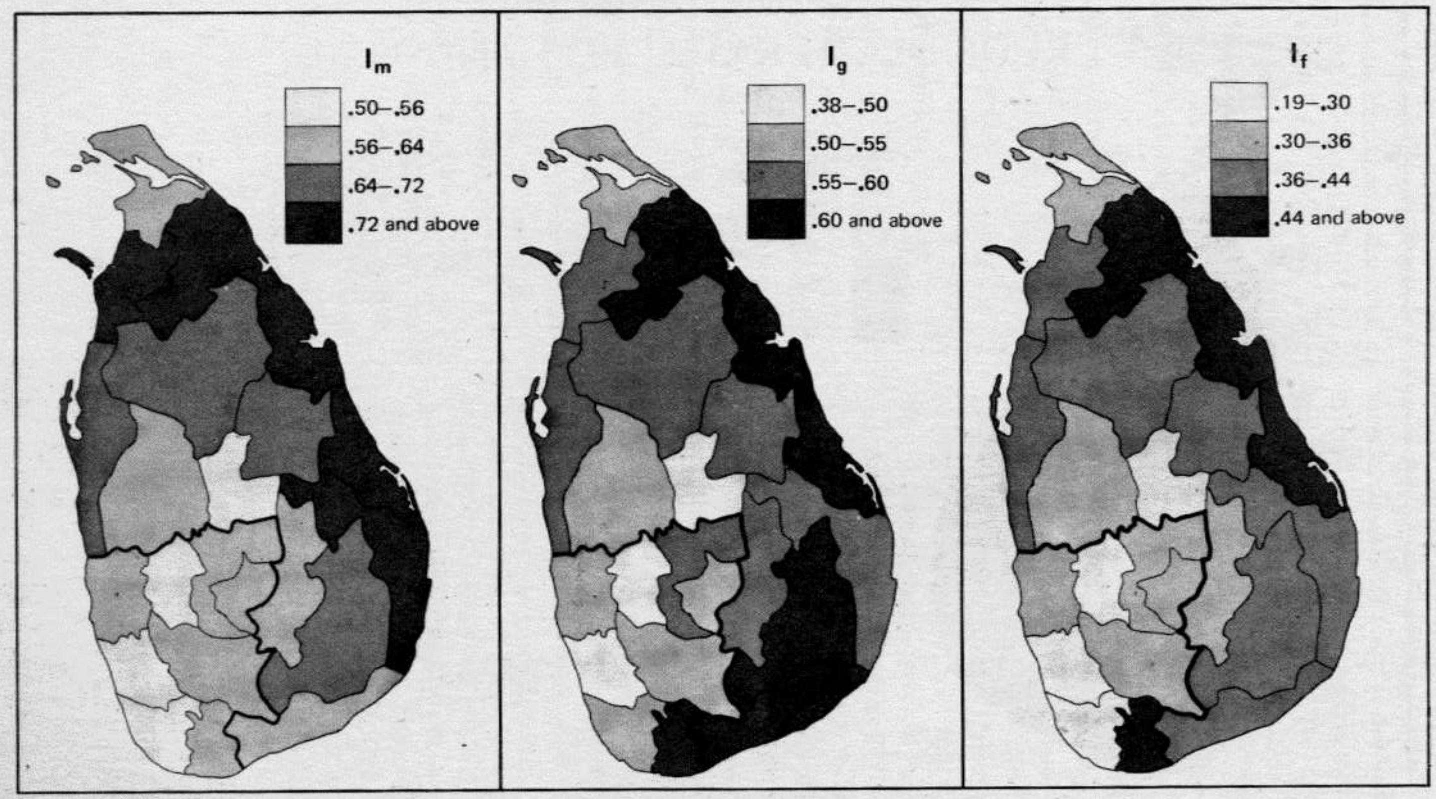

Figure 1

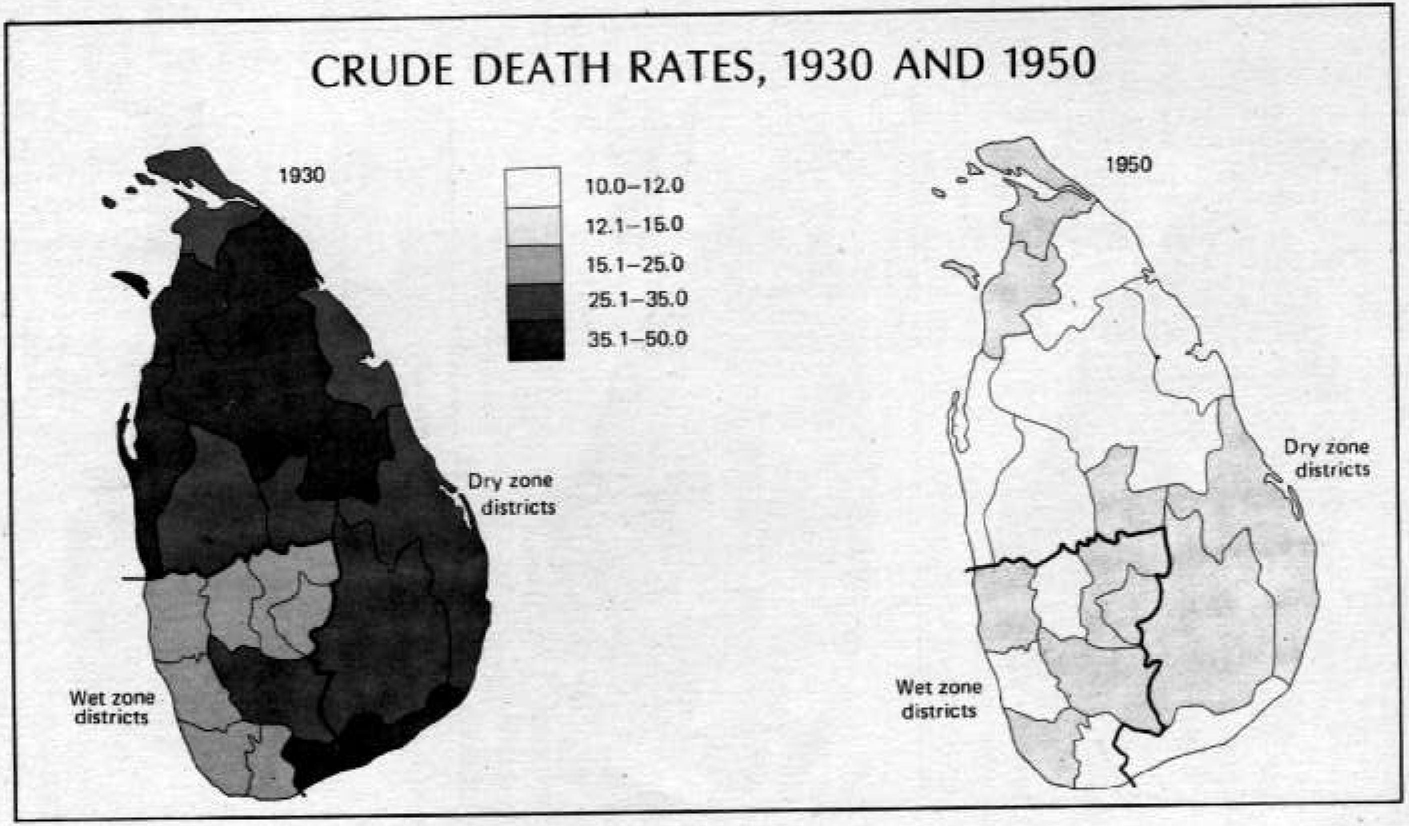
CRUDE DEATH RATES, 1930 AND 1950
1930
10.0–12.0
12.1–15.0
15.1–25.0
25.1–35.0
35.1–50.0
Dry zone districts
Wet zone districts
1950
Dry zone districts
Wet zone districts

Figure 2

is an approximation of the boundary dividing the Wet and Dry zones. The southwest is the Wet Zone, with rain throughout the year totalling from 250 to 500 cm. The Dry Zone generally has under 125 cm. of annual rain and is characterized primarily by a period of prolonged drought. The Wet-Dry dividing line in Figure I follows district boundaries and includes only those districts which fall entirely within the Wet Zone. In the context of this dicussion, the most important feature of the Wet-Dry boundary is that it divides high and low fertility areas with reasonable accuracy.

The Influence of Mortality on Fertility

To understand the Wet-Dry Zone influence on fertility, it is first necessary to understand the historical context of fertility behavior in Sri Lanka. The most basic conceptual contribution of the theory of demographic transition is that a lagging fertility transition is initiated by the perception of a leading mortality transition. That is, families seeking a particular number of children do so within the constraints of mortality, particularly infant and childhood mortality. Should mortality decline, families will exceed their family size goals until they perceive mortality decline and conclude that the new lower level of mortality is stable. At such a point, fertility decline will ensue. Sri Lanka is inevitably cited in discussions of mortality decline because of the precipitous drop in the crude death rate which occurred in 1946. When we look at fertility in 1971, we are in effect looking at the behavior of the first generation of fertile-aged women to grow up in a society that experienced mortality transition. Here is an experience shared by women across ethnic and other societal divisions; the degree of lowered mortality was certainly not equal for all, but mortality was lowered for the vast majority of Sri Lankan families. An examination of previous mortality patterns is, therefore, in order.

Sri Lanka experienced very high crude death rates in 1930[2] (Figure 2), and quite low rates in 1950 and in subsequent years. Certainly the decline was associated with, and perhaps due to the alleged eradication of malaria in 1946. Note that the mortality pattern for 1930 (which almost certainly was sustained until 1946) is very similar to the patterns of fertility for 1971 (Figure 1). That is, high mortality areas before generalized mortality decline had high fertility in 1971. Conversely, low mortality areas in 1930 became the low fertility areas of 1971. Notice, too, that the strong areal association between 1971 fertility and 1930 mortality (compare Figures 1 and 2) disappears when 1950 mortality is considered. Not only was mortality lower in 1950, but the Wet-Dry Zone pattern is not evident at all.

The evidence presented demonstrates an association between historic mortality and recent fertility, and that association can be linked deductively to demographic transition theory. There is, however, stronger evidence to fortify the link We need to consider the suppression of malaria as the principal influence on mortality and, in turn, connect that influence with fertility.

Scholars long have debated the cause of mortality decline in Sri Lanka (Newman, 1965;

2. The 1930 census is the one that most immediately precedes the 1946 malaria control effort.

Meegama, 1967; Gray, 1974). The debate continues for two basic reasons. First, malaria is best viewed as a social rather than a parasitic disease. It thrives among the poor, especially in rural areas, if there is sufficient population density to sustain the parasitic cycle. Controlling malaria means more than a once-over spraying; it requires basically an upgrading of social and economic conditions. Hence, any anti-malarial program brings broad change, and it is difficult to determine whether mortality decline is due mostly to malarial control, or mostly to other introduced change. Second, the parasite (genus: *Plasmodium*) is seldom lethal; even the most dangerous species, *P. falciparum*, is not normally fatal except perhaps among infants.

Among India's 50,000,000 annual malaria cases (where *P. falciparum* is common), perhaps fewer than 100 deaths are directly attributable to malaria. Instead, the weakened condition of an affected population tends to make them susceptible to a variety of infectious diseases. This in turn implies that eradication of malaria reduces mortality resulting from a number of immediate causes.

In 1930, malaria was endemic throughout most of the Dry Zone and hyperendemic[3] in several districts. At first blush, it seems strange that malaria should be concentrated in the Dry Zone. Most of the anepholine mosquitoes, including *Culicafacies*, the principal malaria vector in Sri Lanka, require standing water for breeding, and one might expect, therefore, greater breeding potential in a wet area. In fact, Sri Lanka's Wet Zone contains steep slopes, with rapid runoff and little ponding. The Dry Zone, however, experiences seasonal rainfall which collects in natural and man-made depressions, thus creating ideal breeding conditions. The ancient civilization of Ceylon, which may have supported a population four or five times greater than the present population of Sri Lanka, was concentrated in the Dry Zone and was dependent on storage tanks and irrigation networks. Remnants today provide ideal breeding conditions and give rise to speculation that the decline of the ancient culture was due in part to the introduction of malaria.

The relationship between human fertility and malaria has received only slight attention in the demographic and medical literature.[4] Newman (1965), however, noted a relationship in Sri Lanka between 1946 and 1960 that can be summarized as follows: 1) In those districts free of endemic malaria before 1946, the crude birth rate tended to decline following malaria eradication, 2) where there was some endemic malaria, the crude birth rate declined slightly, and 3) where malaria was common, the crude birth rate *increased* between 1946 and 1960. Newman argued that the presence of endemic malaria altered procreation patterns to the extent that conception was much more likely to occur when malaria was "out of season." Thus, the eradication of malaria eliminated a natural birth control method, leading to higher fertility. Newman's explanation is, of course, not the only possible explanation.

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3. The term "hyperendemic" means that essentially everyone in a given area has the disease.

4. There is, however, a substantial literature devoted to pregnancy and malaria; Kortmann (1972) provides the most comprehensive treatment.

Malaria could act as a suppressant on fecundity, rather than only on coital frequency, and it could influence structural as well as fertility behavior. For example, malaria induces morbidity, thus making more difficult the accumulation of a dowry or of the economic wherewithal to permit a male to take a wife.

Newman's observation concerning fertility increase is of considerable importance to demographic transition theory. Fertility increase is not a part of the general model; indeed, a significant and sustained increase in fertility following mortality decline is quite contrary to any interpretation of transition. This, of course, does not deny the possibility of fertility increase even in a post-transition society; most of the world experienced pronounced fertility increases in the post World War II years. Such increases, however, are explained by recourse to economic cycles, postponed fertility, or abnormal population structure. Newman's findings, however, suggest that mortality suppresses fertility, and that the reduction of mortality will cause fertility to rebound.

Gray (1974) was highly skeptical of Newman's findings and argued that a number of biases could exist in Newman's analysis, including improved birth registration and lower neo-natal mortality in the post-eradication years. Gray also suggested the existence of ecological fallacy, that is, selective socio-ecnomic changes in districts, quite unrelated to the incidence of malaria, might have brought about fertility increase. Gray also suggested the influence of the post-war baby boom on Newman's findings. Finally, Gray argued that there was no evidence from other malaria-prone countries showing fertility increase following malaria eradication or suppression.

Newman's (1964) case for fertility increase following mortality reduction has tended to be overlooked by demographers, probably because his thesis dealt principally with the causes of mortality decline; concern with fertility was minor. It is therefore useful to re-examine the case for fertility rebound in light of more recent evidence. Table 1 employs the three Coale indices developed earlier, the average spleen rate (1938-41) used by Gray (1974) as a measure of the incidence of malaria, and the 1970 crude birth rates by district. Spleen rates are notoriously unreliable measures of malaria, since their accuracy depends upon subjective medical judgment, complete reporting, and the presence of a patient population reasonably representative of an entire district. Gray's use of the average count over four years is certainly desirable, but the systemic error arising from measurement and recording may endure in an area beyond a four-year span. I converted the raw data to ordinal scale data on the grounds that the basic observations did not permit an accurate spleen-count metric among the districts, but that the rank order of the districts according to the incidence of malaria had a much greater chance of being accurate.

The Spearman rank correlation coefficients (r_s) derived from the analysis all show a significant positive relationship between pre-eradication malaria incidence and human fertility in 1970. The pattern of the coefficients, however, reveals the strongest relationship between malaria and nuptiality (I_m). This lends some evidence to the notion that structural influences on

Table 1

Rank Correlation of Spleen Rates and Fertility Measures

District*	Spleen rate** (1938—1941)	I_f (1970)	I_m (1970)	I_g (1970)	Crude birth rate
Amuradhapura	1	5	5	6	4
Badulla	10	10	9	10	6
Batticaloa	8	3	3	4	1
Colombo	17	17	18	14	13
Galle	16	16	16	17	17
Hambantutu	3	6	7	2	10
Kalutara	18	18	17	18	16
Kandy	15	13	13	13	11
Kegalla	12	14	15	16	18
Kurunegala	5	9	8	9	15
Mannar	9	8	4	8	5
Matale	7	3	3	4	7
Matara	11	4	10	5	12
Nuwara Eliya	14	12	12	12	14
Puttalam	4	7	6	7	8
Ratnapura	13	11	11	11	9
Trincomalee	6	2	2	3	2
Vavuniya	2	1	1	1	3

r_s (spleen rate and I_f) $=0.77$ $t=4.81$, significant at .001
r_s (spleen rate and I_m) 0.81 $t=5.56$, significant at .001
r_s (spleen rate and I_g) $=0.79$ $t=5.13$, significant at .001
r_s (spleen rate and CBR) $=0.63$ $t=3.25$, significant at .01

* Because of district boundary changes, only 18 of the 22 districts existing in 1970 were used.

** Spleen rates from Gray (1974).

fertility (such as delay of marriage) were more important than influences on marital fertility (such as coital frequency), as suggested by Newman (1964). Further, although the crude birth rate is also positively correlated with malaria incidence, the relationship is weaker, and the coefficient significant at a lower level. This finding illustrates the point that the crude birth rate is just what the name implies : a crude measure. More sophisticated measures may yield different results in an areal or spatial analysis, and that difference may be crucial in understanding relevant process.

Some of the objections Gray (1974) made against Newman's (1964) work are overcome by this analysis. Perhaps most important is the fact that fertility rebound has been shown extending ten years beyond the period that Newman observed. Thus, the suggestion that rebound is due to the post World War II "baby boom" is considerably less tenable. Similarly, Gray's argument that fertility increase was due to birth registration improvement is dubious. Of the districts with the five highest crude birth rates in 1970, three had higher rates in 1970 than they did in 1946, the year when registration improvement needed to have occurred for Gray's argument to be sustained.

Some of Gray's arguments still stand, however. The notion of data bias and ecological fallacy may be present in this analysis as well. Malaria's influence on human fertility needs to be observed at levels much smaller than the district; indeed, clinical findings and patient histories are needed for convincing results. To a considerable extent, Gray's objections apply to any district level fertility study in Sri Lanka, where the polyethnic setting confounds attempts to single out conventional socioeconomic variables. At an early stage of this research, I developed several multiple regression models, employing in total more than 80 different variables in order to seek a socioeconomic explanation of the district pattern of the Coale indices. The most successful combination involved measures of Budhism, literacy, and urbanization. These variables accounted for 37 per cent (r=.61) of the variance in I_g, but only negligable amounts of the variance in either Im or If. Fernando (1982), while noting exactly the problem described here, was able to examine the fertility of Sri Lankan Moors (one of six major enthnic groups) by recourse to census data at the minor civil division level. If the incidence of malaria had been recorded at the same level, then the Gray versus Newman argument could be settled.

Gray's most potent objection, however, is the lack of comparable evidence from other malaria-prone countries. To accept Gray's argument, however, is to assume that malaria is a single disease with a single vector and therefore to assume also that the human response to the disease is the same in all world areas. In fact, malaria is a complex disease with different parasites, different vectors, and different human responses. It may be that the human relationship with malaria in Sri Lanka is uniqne, and that therefore fertility rebound is also unique. Conversely, it may be that the data available in Sri Lanka on both fertility and malaria have permitted the illumination of a process in Sri Lanka that remains hidden elsewhere. Although much has been made in this article about the inadequacies of the data, it is doubtful that any malaria-prone country has data comparable to Sri Lanka's, concerning both malaria incidence and human fertility.

Implications

If fertility rebound is genuine, there are some important implications for demographic transition theory, particularly concerning the differences between European and non-Western transition. The classic transition model provides for only a modest and short term fertility increase after mortality has declined. That is, the period of high natural increase is accounted for almost entirely by a decline in the crude death rate. The evidence presented here suggests that the decline of mortality in Sri Lanka led to an increase in fertility in those areas where malaria had been concentrated.

From the standpoint of spatial approaches to demographic transition, Sri Lanka's experience suggests that there was not a smooth "geographical diffusion," as found by Demeny (1972) for Austria-Hungary, but rather two separate transitions, one for the Dry Zone, one for the Wet. The latter may have resembled the European pattern, but the former did not. Not only did fertility apparently increase in the Dry Zone following mortality decline, but high fertility has been sustained there for nearly thirty-five years.

There are important implications for contemporary Sri Lanka as well. All of South Asia, Sri Lanka included, have experienced a resurgence of malaria over the past decade or so. Malaria was never eradicated in Sri Lanka, despite the optimism that reigned in the post-war years. Malaria cases have increased nearly 50-fold in India in recent years (Dutt, *et al.*, 1980), and, although the situation is less severe in Sri Lanka, there are few authorities who now believe malaria will be eliminated soon. If malaria does serve to suppress fertility, then the lowered growth rates recently experienced in South Asia may not be due only to family planning, or to the development of new fertility norms, but at least partially to the effects of the increased incidence of malaria.

We have long known that public health measures and the introduction of medical technology increase population growth by lowering mortality. This research suggests at least the possibility that measures constituting malaria control or eradication also stimulate increased fertility. The clearest policy implication is that anti-malarial programs must be integrated with family planning; more difficult to deal with is the question of whether the demographic costs of malaria control exceed the benefits.

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SPURTS IN INDIA'S POPULATION GROWTH DURING THE TWENTIETH CENTURY A SPATIAL VIEW

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The years 1921 and 1951 have often been marked as the critical divides in India's population growth since the beginning of the present century. The veracity of this observation was tested not only for the country as a whole but also for its different parts. While the above generalisation did hold good at the all India level, it was found true for only one-third of the districts at the disaggregated level. The relevance of the demographic transition model to India was also examined. The model did apply, in its essence, to the Indian situation but its quantitative parameters, as derived from the Western experience, were not appropriate.

The 1981 Census of India recorded a total population of 684 million, a number which had nearly trebled from 238 million in 1901 and had almost doubled from an estimated 345 million at the time of country's Independence in 1947. The 1971-81 decade alone made a net contribution of 136 million, representing one-fifth of the total population at the last census. Concurrently density of population mounted from only 77 persons per km^2 in 1901 to 221 in 1981.

The years 1921 and 1951 have been recognised as the two critical points in the history of population growth in India during the current century (Gopalaswami, 1951; Gosal, 1962, 1974 and 1982; Krishan, 1975; and Mitra, 1978). A growth rate of 11 per cent during 1921-31 marked a conspicuous departure from that of −0.31 per cent during the preceding decade of 1911-21 (Table 1). Likewise a population growth rate of 21.51 per cent during 1951-61 was a distinct rise over that of 13.31 per cent during 1941-51. It seems that India entered the second stage of demographic transition around 1921 when a period of fluctuating birth and death rates ended and that of stable birth rates and consistently declining death rates started. The country moved into the explosive phase of the second stage around 1951 after which birth rates came down only marginally but death rates fell sharply. The explosive phase seems to have attained a plateau level during 1971-81 when the decadal growth rate of 24.75 was practically the same as 24.80 per cent during 1961-71.

Table 1

India : Population Growth, 1901-81

Census year	Population (in million)	Decadal growth rate (in percentage)	Difference in decadal growth rates (in per cent points)	Index number of population size (1901=100)	Decadal change in index numbers	Difference in decadal change in index numbers
1901	238			100		
					6	
1911	252	5.75		106		— 7
			—6.06		—1	
1921*	251	—0.31		105		—13*
			11.31*		12	
1931	279	11.00		117		5
			3.22		17	
1941	319	14.22		134		0
			—0.91		17	
1951*	361	13.31		151		16*
			8.20*		33	
1961	439	21.51		184		13
			3.29		46	
1971	548	24.80		230		11
			—0.05		57	
1981	684	24.75		287		

Source : Calculated from Census of India, 1981, *Series—1, Paper 1 of 1981.*

* Spurt points have been underlined.

Table 1 clearly confirms 1921 and 1951 as the two critical break points in India's population growth since 1901. The difference in decadal growth rates as well as the difference in decadal change in index numbers show a spurt after these years. Does the same hold good for different parts of India ? This issue has rarely been raised. The present paper intends to look into this question. Its purpose is to find out the specific timings of the two spurts in different districts of India and to identify the regional and sub-regional patterns on the basis of data processed at district level. It is hoped that such an exercise would lay bare the temporal-spatial dimensions of socio-economic trasformation in India as the critical break points in population growth, or more so in demographic transition, find a meaningful association with the overall social and economic change. Also it would help in discerning an underlying process behind regional variations in India's population growth during 1901-81 since the regions which experienced earlier spurts are expected to record higher overall growth rates. The spatial patterns of population growth in India during 1901-81 are represented in Fig. 1.

Demographic Transition Model and the Indian Experience

Before taking up the main investigation point of this paper, it may be useful to view the Indian demographic situation in the context of the traditional model of demographic transition.

A vast literature exists on the demographic transition model according to which all societies which have moved from a traditional agrarian stage to the modern level have also transited from a condition of high mortality and fertility to low mortality and fertility (Slotnitz, 1971, p. 30). Generally the demographic transition is seen as composed of three successive stages of high birth and death rates, of slowly declining birth rates simultaneous with rapidly falling death rates, and of low birth and death rates. Although these stages have frequently been described in qualitative terms yet their quantitative parameters have rarely been defined. In the light of the western experience, a birth rate of 35 and a death rate of 15 have been suggested as the separation points for classifying the different countries in terms of their demograpic transition status (Stockwell, 1963). But on the basis of functionally unified clusters emerging on scatter diagrams showing crude birth and death rates for different countries of the world, Chung (1970) adopted 30 and 15 as the critical threshold points for examining the space-time diffusion of the transition model in the world during the twentieth century. Heenan (1980) used the same threshold points to depict the 'transition pathway' on a quadrant graph. Adhering to the same break points, Clarke (1982) would like to substitute Heenan's 'transition pathway' by a 'broad transition route' since a variety of birth rate-death rate combinations are possible within the 35/15 framework. On the basis of Denmark's demographic experience over the years 1735-1977, Jones (1981) indicated that the popular critical threshold points of 35 and 15 or 30 and 15 were not strictly valid and had to be redefined through more of empirical studies.

Table 2

Components of the Demographic Transition

(a) Stockwell (1963)

Stage 1	Early transitional	Crude birth rate over 35 Crude death rate over 15
Stage 2	Mid transitional	Crude birth rate over 35 Crude death rate under 15
Stage 3	Late transitional	Crude birth rate under 15 Crude death rate under 15

(b) Chung (1970)

Stage 1	High birth rate High death rate	Crude birth rate over 30 Crude death rate over 15

Stage 2	High birth rate Rapidly declining death rate	Crude birth rate over 30 Crude death rate under 15
	Alternatively moderate birth rate	Crude birth rate over 15 Crude death rate over 15
Stage 3	Low birth rate	Crude birth rate under 15 Crude death rate under 15

(c) Jones (1981)*

Stage 1	High stationary stage	Crude birth rate around 30 Crude death rate over 20
Stage 2	Early expanding stage	Crude birth rate around 30 Crude death rate dropping to under 20
Stage 3	Late expanding stage	Crude birth rate around 30 Crude death rate around 15
Stage 4	Late stationary stage	Crude birth rate around 15 Crude death rate under 10

*Birth and death rates indicated against each stage have been inferred from the author's diagram.

Table 3
India : Estimated Birth and Death Rates, 1901—1981

Decade	Birth rate (per thousand)	Death rate (per thousand)
1901-11	49	43
1911-21	48	47
1921-31	46	36
1931-41	45	31
1941-51	40	27
1951-61	42	23
1961-71*	40	18
1971-81**	35	15

Source : S. Chandrasekhar (1971), *Infant Mortality, Population Growth and Family Planning in India*, George Allen and Unwin Ltd., London, p. 62.

* *India* : *1974*, Ministry of Information and Broadcasting, Government of India, New Delhi, 1974, p. 80.

** Straight averages for 1975 and 1976 taken as average for 1971-81. See Tim Dyson, "Preliminary demography of 1981 Census", *Economic and Political Weekly*, 16 (August, 1981), pp. 1349-1356.

An examination of India's birth and death rate data in the framework of the schemes illustrated above would suggest that the country continued to be in Stage 1 of demographic transition till 1971 as per specifications of Chung, Heenan and Clarke (Table 3). Stockwell would place India in the early transitional stage and Jones would reckon that the country entered the early expanding stage after 1961.

But these descriptions do not fit India. Rather the country had entered the Stage 2 of demographic transition around 1921. It attained the explosive substage of Stage 2 around 1951. The relevant data indicate that India's birth rate was around 45 and death rate around 35 when it transited from Stage 1 to Stage 2. Its crude birth rate had come down to around 40 and death rate dropped to around 20 when it experienced the explosive phase. Evidently the western specifications of the demographic transition models were not applicable to the Indian situation although its theoretical ingredients did hold good.

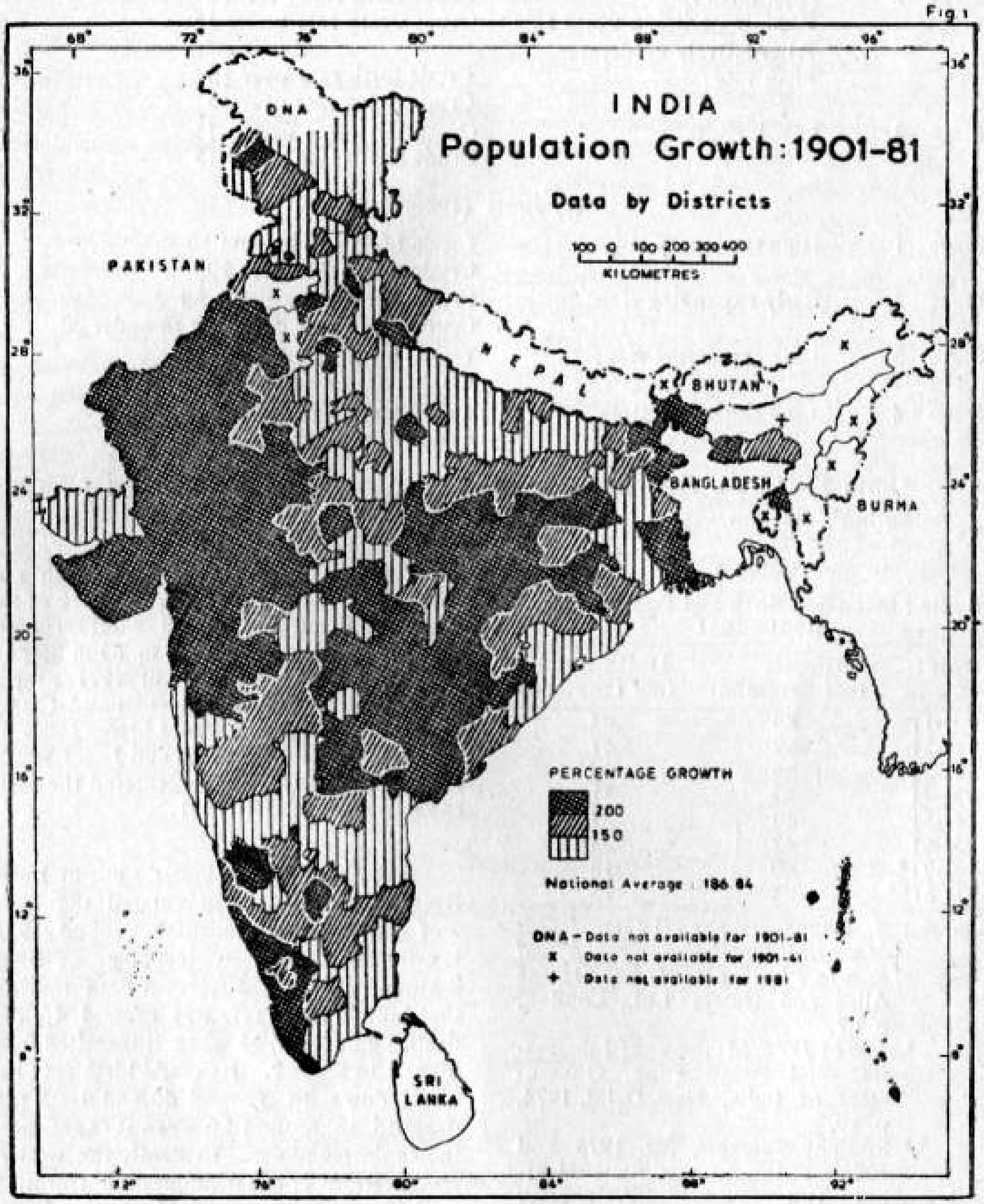


Fig 1
INDIA
Population Growth: 1901-81
Data by Districts
100 0 100 200 300 400
KILOMETRES
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
BURMA
SRI LANKA
DNA
PERCENTAGE GROWTH
200
150
National Average : 186.84
DNA - Data not available for 1901-81
X Data not available for 1901-41
+ Data not available for 1981

Temporal-Spatial Patterns of the Spurts in India's Population Growth

(a) Methodology :

Now we proceed to examine the regional variations in spurt occurrence in India. For this purpose districtwise population data recorded at all the nine decadal censuses from 1901 to 1981 were put into service. Incidentally the study covers a time period during which practically the entire population enumerated at the last 1981 census was born.

It is notable here that while in case of India the decadewise population growth rates are virtually identical with the respective natural increase rates, the role of immigration and emigration being negligible, the same could not be said in respect of the districts. Here the role of in-and out-migration also comes in. But in the context of relatively low mobility rate of India's population, natural increase has remained the dominant determinant of population growth in most of the districts. Hence the spurts in population growth in their case is fairly representative of their demographic transition behaviour.

A crucial problem was as to how to locate objectively the critical break points in population growth history of different districts. Taking a cue from the pattern of population growth in India, where 1921 and 1951 were noted as the critical divides, it was envisaged that the two comparable break points in individual districts would either coincide with 1921 and 1951 or occur in census years in their proximity. For that matter, the 1901-81 period was divided into two equal phases : pre-1941, containing the first break point and post-1941, containing the second break point. The population growth pattern of every district was examined within this temporal framework.

Tentatively a common sense method of identifying the break points was tried. It took into account the difference in growth rates over successive decades. The year after which the spurt in terms of the per cent points was of the highest order was reckoned as the critical divide point. This method was, however, not flawless. The base over which the growth rate was calculated varied with every decade and resultantly the growth rate during a particular decade was *statistically* not independent of what happened during the preceding decade. A sluggish growth rate during one decade could give a rapid growth rate during the next by providing a relatively small base. These statistical vagaries could be controlled somewhat by standardising the change with respect to a single base. This is illustrated by the case of Mathura district (Table 4 a).

Alternatively, the break point in population growth in each phase was noted from the behaviour of index numbers of population size of a district at different census years taking 1901 as base equivalent to 100 (Table 4b). The year after which the difference in change was of the highest order was adopted as the critical divide point, separately for the pre-1941 and the latter period. As such, every district had two break points : one falling in pre-1941 phase and the other coinciding with 1941 or occurring afterwards. With these districtwise break point data, Figs. 2 and 3 were prepared for discerning the spatial patterns of spurt occurrence in India's population growth.

Table 4

Mathura District : Identification of Spurt Points

(a) Difference in 'population growth rates' method

Census year	Population	Decadal growth rate (in percentage)	Difference in decadal growth rates (in per cent points)
1901	767,459		
		—13.97	
1911	660,283		8.27
		—5.70	
1921*	622,662		13.56*
		7.86	
1931	671,579		12.94
		20.80	
1941	811,251		—8.35
		12.45	
1951*	912,264		4.98*
		17.43	
1961	1,071,279		3.02
		20.45	
1971	1,290,307		—0.82
		19.63	
1981	1,543,568		

*Spurt years have been underlined. The 1921 spurt, as identified, could not be deemed as genuine. The 1921-31 decade recorded a growth rate of only 7.86 per cent. This marked a positive gain of 13.56 per cent points over the preceding decadal growth rate simply because the population had decreased by 5.70 per cent during 1911-21.

(b) Difference in 'index numbers' method

Census year	Population	Index number of population size (1901 = 100)	Decadal change in index number	Difference in decadal change in index number
1901	767,459	100.00		
			—13.97	
1911	660,283	86.03		9.07
			—4.90	
1921	622,662	81.13		11.28
			6.38	
1931*	671,579	87 51		11.82*
			18.20	
1941	811,251	105.71		—5.04
			13.16	
1951	912,264	118.87		7.56
			20.72	
1961*	1,071,279	139.59		7.82*
			28.54	
1971	1,290,307	168.13		4.46
			33.00	
1981	1,543,568	201.13		

*Spurt years have been underlined. Both are different from those identified in Table 4(a) above. Discrepancies of the kind mentioned above have been controlled.

There were 412 districts in India at the time of the 1981 census. Population data for all census years from 1901 to 1981 were available for only 361 districts. Districtwise data for most of the northeastern states and union territories, such as Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura and Maghalaya, could not be compiled for the pre-Independence census years because all of them had seen formation of their districts only afterwards. Likewise, the districtwise census data for the pre-Independence period did not exist for the former Pepsu area of Punjab. Also the 1981 census could not be conducted in Assam due to the prevailing disturbed conditions arising from an agitation against the illegal foreign nationals. Understandably the analysis in the present paper had to be confined to 361 districts for which the data for the entire 1901-81 period could be procured.

(b) Discussion

Among the 361 districts, for which the requisite data were available, 267 or almost three-fourths of the total recorded the first spurt after 1921, and 158 or nearly two-fifths of the total recorded the second spurt after 1951. A combination of the 1921 and the 1951 spurts took place in only 119 or one-third of the total districts. Three conclusions immediately follow from this : (i) the post-1921 spurt was observed in a majority of the districts which was not true of post-1951 spurt; (ii) the post-1921 spurt was more widespread than the post-1951 spurt; and (iii) only one-third of the districts faithfully followed the all India pattern of experiencing spurts in both 1921 and 1951. It may be added that Calcutta and Bolangir (Orissa) were the two exceptional districts which experienced only one spurt each. After having recorded a spurt in 1931, Calcutta exhibited a consistent decline in its growth rate since then, and Bolangir had a continuously declining population till 1951 after which its population grew regularly.

(i) First spurt (Fig. 2) : The 1921 spurt was more ubiquitous because most parts of the country were at the same low developmental level and displayed a high degree of similarity in their demographic behaviour. It was a time when a large majority of the districts was moving from the first stage of demographic transition to the second one. By 1951, some parts of the country had relatively progressed in agriculture, industry, transport and health facilities, thus crystallising a pattern of regional disparities. Associated with this process were the emerging differences among different areas in respect of their entry into the explosive phase of population growth. The onset of this phase depended on a sharp decline in death rate which in its own turn was a function of relative development level and available medical infrastructure.

It is notable that 19 districts, sporadically scattered over different parts of India, had recorded the first spurt before 1921. Most of them had escaped the ravages caused by the 1918 influenza epidemic and a few of them had experienced some inflow of migrants to their fast growing towns.

The first spurt was delayed to 1931 in 74 districts. A majority of them was located in the more backward areas of Uttar Pradesh, western Tamil Nadu, northern districts of West Bengal and hill districts of Himachal Pradesh and Uttar Pradesh. Some districts on the Calcutta-Delhi railway route and a few with prominent cities, such as Calcutta, Ahmedabad and Hyderabad, also recorded the spurt after 1931 as a consequence of accelerated in-migration.

Fig 2

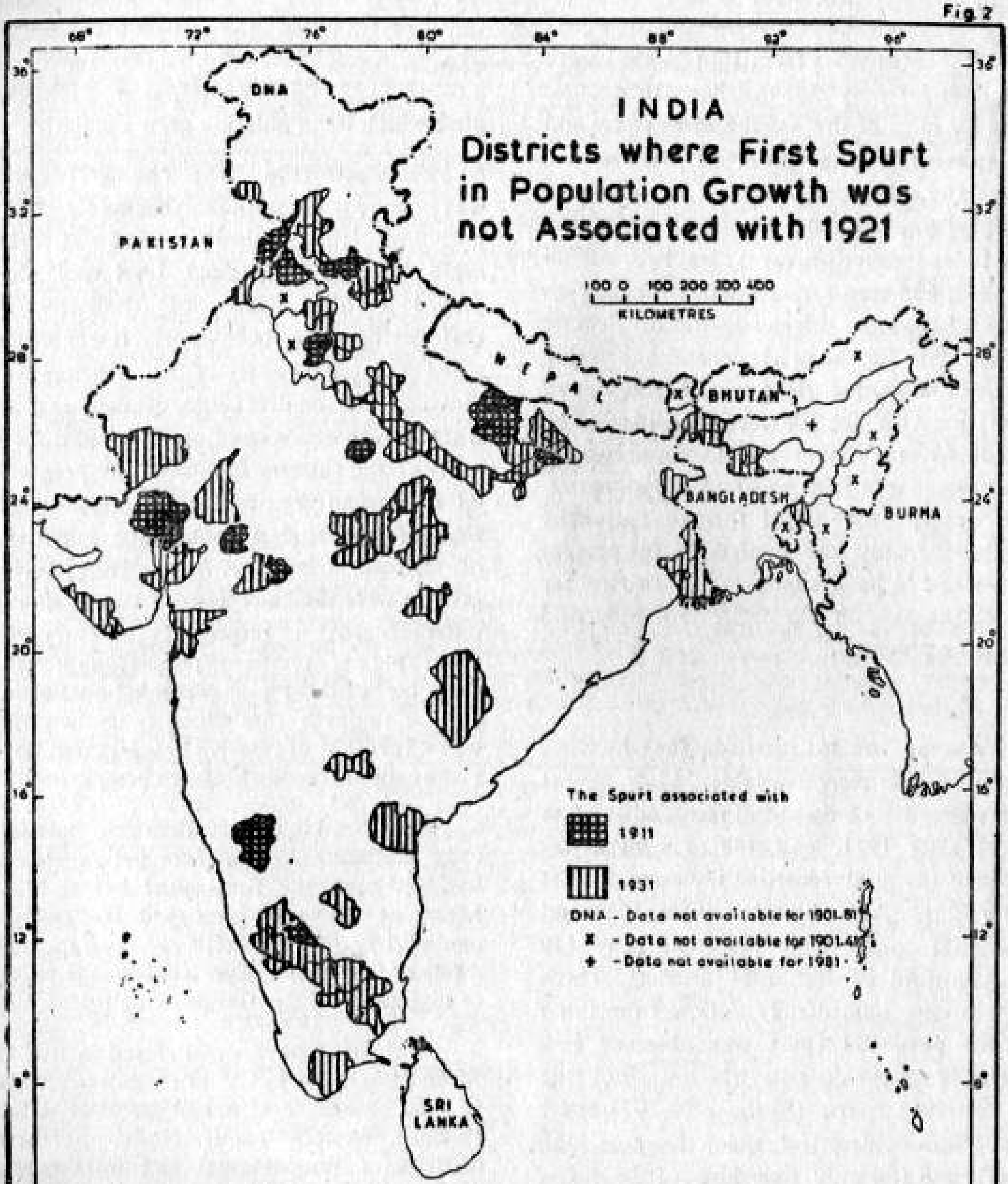
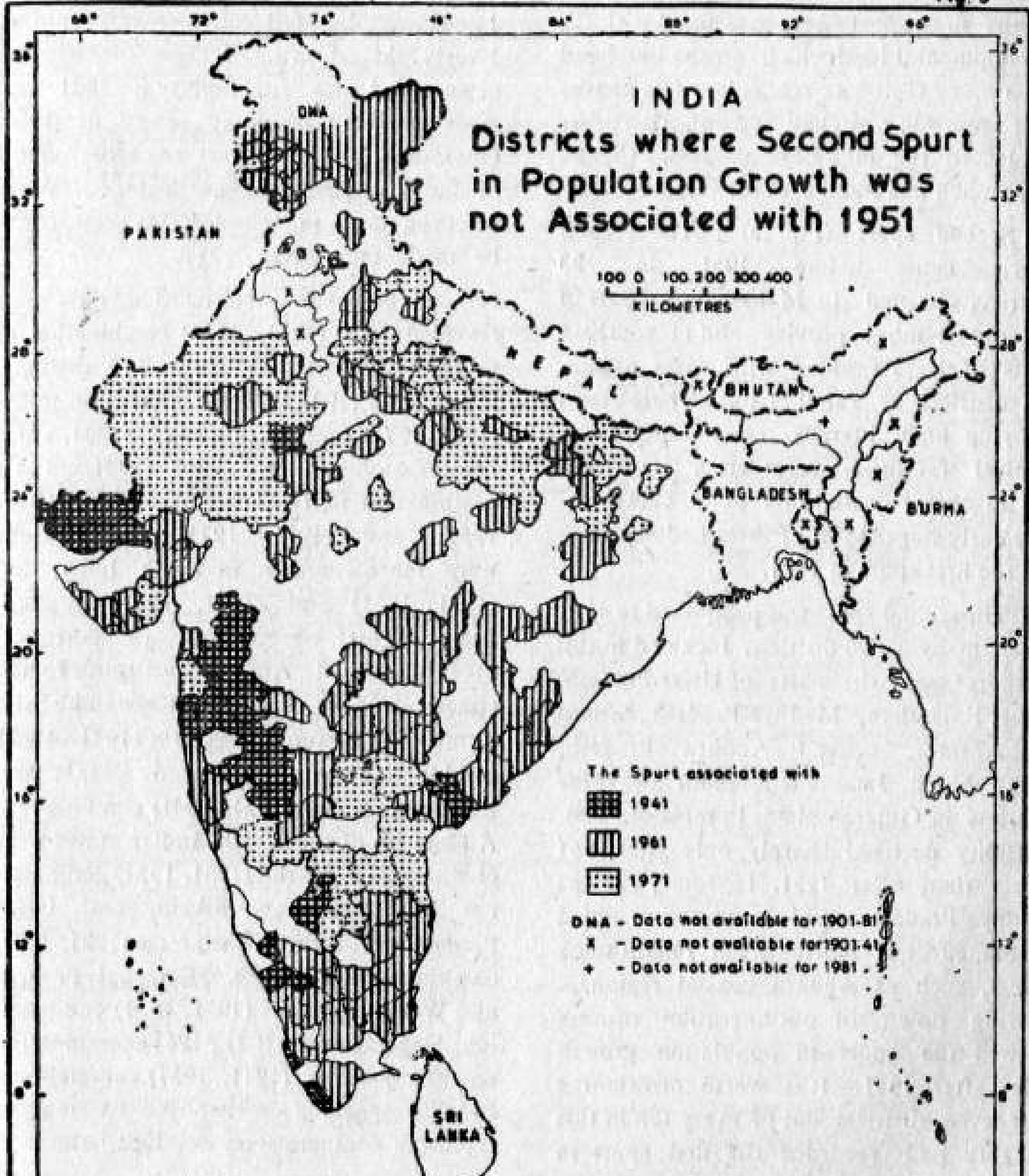

INDIA
Districts where First Spurt in Population Growth was not Associated with 1921
PAKISTAN
DNA
NEPAL
BHUTAN
BANGLADESH
BURMA
SRI LANKA
KILOMETRES
The Spurt associated with
1911
1931
DNA - Data not available for 1901-81
X - Data not available for 1901-41
+ - Data not available for 1981

Fig. 3


INDIA
Districts where Second Spurt in Population Growth was not Associated with 1951
PAKISTAN
DNA
NEPAL
BHUTAN
BANGLADESH
BURMA
SRI LANKA
100 0 100 200 300 400
KILOMETRES
The Spurt associated with
1941
1961
1971
DNA - Data not available for 1901-81
X - Data not available for 1901-41
+ - Data not available for 1981.
72°
76°
80°
84°
88°
92°
36°
32°
28°
24°
20°
16°
12°
8°

It follows that the temporal variations in the first spurt were associated with the developmental level which on the one hand determined the onset schedule of a consistent mortality decline and on the other influenced the migration process, though in a much less significant manner.

(ii) Second spurt (Fig. 3) : The second spurt came before 1951 in 23 districts located in Maharashtra part of the old Bombay province and in southern parts of Kerala along with some adjoining districts in Tamil Nadu. These areas, enjoying high literacy rates and better medical facilities, recorded a significant cut in their death rate at a comparatvely early stage. Most of them had experienced the first spurt in 1921.

The second spurt was postponed to 1961 in as many as 96 districts. Included in this category were the parts of Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh, eastern Maharashtra, coastal Andhra Pradesh, Tamil Nadu, Jammu & Kashmir and some districts in Gujarat plain. In most of them, mortality declined sharply only after 1961 rather than after 1951. In some, such as Madhya Pradesh, sizable in-migration added to the effect of mortality fall. In still some others, such as Andhra coastal region, a slowing down of out-migration process allowed the spurt in population growth only after 1961. It is worth mentioning that seven districts out of every ten in this category had recorded the first spurt in 1921.

The second spurt got delayed upto 1971 in 82 districts. Included in this category were 33 out of 56 districts in Uttar Prdesh 14 out of 26 districts in Rajasthan, and 12 out of 31 districts in Bihar. Southern districts of Andhra Pradesh and the northern ones in Karnataka fell in the same group. Nearly three-fourths of these districts had experienced the first spurt in 1921 and most of the remaining ones in 1931. Obviously the 1971 spurt was more typical of the less developed north Indian states where a dent in the mortality rate could be made only after 1971.

(iii) A composite picture : The data also revealed that (1921, 1951) combination of spurts was true of only 119 districts, followed by (1921, 1961) combination in 69, (1921, 1971) combination in 60, (1931, 1971) combination in 30, and (1921, 1941) combination in 19 (Table 5). The (1921, 1951) and (1921, 1971) combinattons were more common in north India, and (1921, 1961) and (1921, 1941) in south India. This observation is corroborated by Fig. 4. Among the south Indian states, Andhra Pradesh, Karnataka and Tamil Nadu were noted for (1921, 1961) combination of spurts and Kerala and Maharashtra for (1921, 1941) combination. A majority of the north Indian states were characterised by the (1921, 1951) combination but Rajasthan, Sikkim and Uttar Pradesh were distinguished for a (1921, 1971) combination; Haryana, Himachal Pradesh and West Bengal for (1931, 1951) combination; Nagaland for (1921, 1961) combination and Punjab for (1911, 1951) combination. Broadly speaking, earlier spurts were more typical of comparatively developed states.

A strong relationship between the early occurrence of the spurts and overall population growth rate in different districts was observed (Table 5 and Fig. 1). This was particularly true of those districts which experienced the first spurt in 1921 or 1931.

Fig. 4

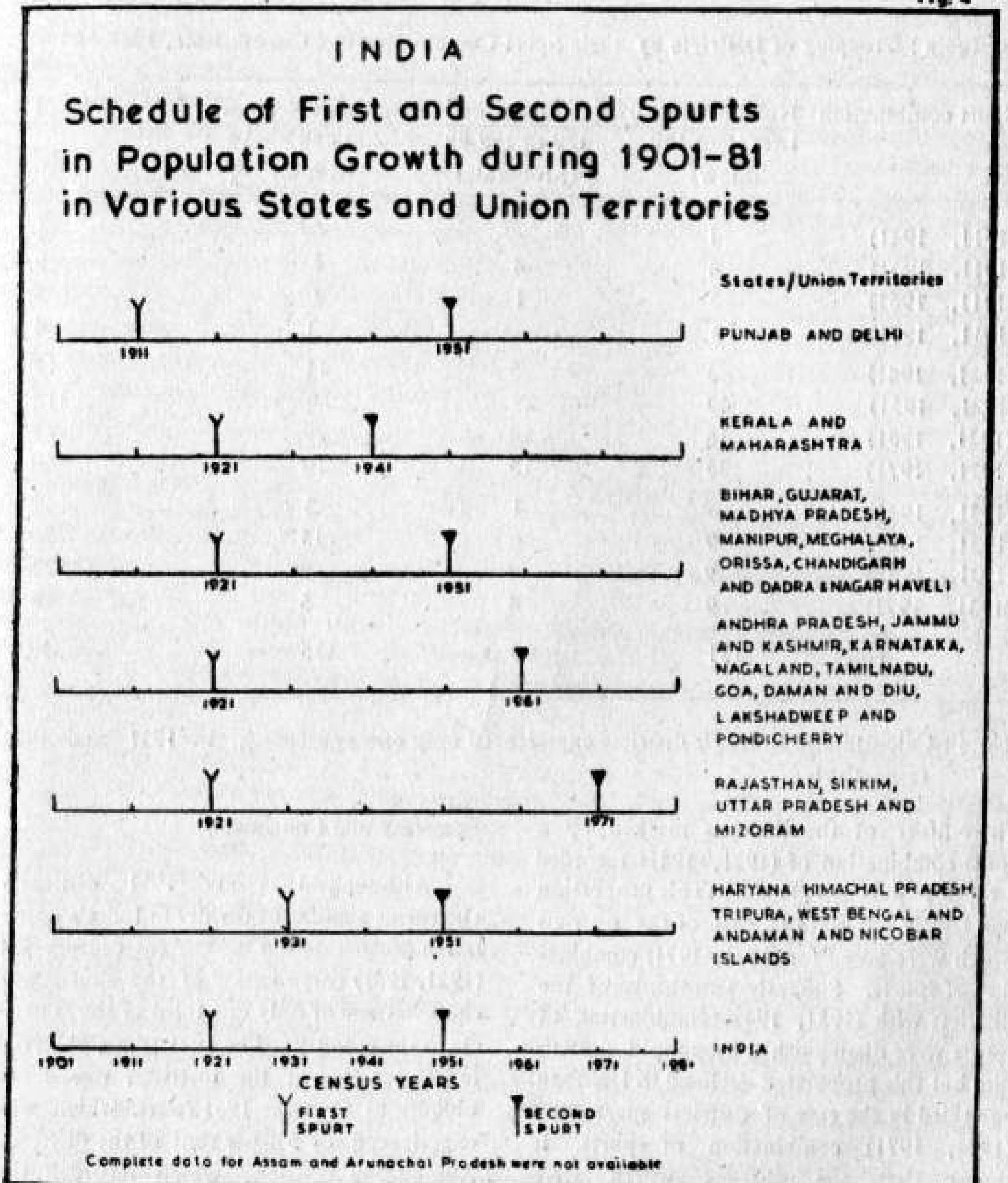

INDIA
Schedule of First and Second Spurts in Population Growth during 1901-81 in Various States and Union Territories
States/Union Territories
1911
1951
PUNJAB AND DELHI
1921
1941
KERALA AND MAHARASHTRA
1921
1951
BIHAR, GUJARAT, MADHYA PRADESH, MANIPUR, MEGHALAYA, ORISSA, CHANDIGARH AND DADRA & NAGAR HAVELI
1921
1961
ANDHRA PRADESH, JAMMU AND KASHMIR, KARNATAKA, NAGALAND, TAMILNADU, GOA, DAMAN AND DIU, LAKSHADWEEP AND PONDICHERRY
1921
1971
RAJASTHAN, SIKKIM, UTTAR PRADESH AND MIZORAM
1931
1951
HARYANA HIMACHAL PRADESH, TRIPURA, WEST BENGAL AND ANDAMAN AND NICOBAR ISLANDS
INDIA
1901
1911
1921
1931
1941
1951
1961
1971
1981
CENSUS YEARS
FIRST SPURT
SECOND SPURT
Complete data for Assam and Arunachal Pradesh were not available

Table 5

India : Grouping of Districts by their Spurt Combination and Growth Rate, 1980—81

Spurt combination	Number of districts with a growth rate (in percentage) of			Total
	Less than 150 (Slow)	150 to 199.99 (Moderate)	200 and above (Rapid)	
(1911, 1941)	1	—	—	1
(1911, 1951)	4	4	1	9
(1911, 1961)	2	1	2	5
(1911, 1971)	3	—	1	4
(1921, 1941)	3	5	11	19
(1921, 1951)	40	29	50	119
(1921, 1961)	16	24	29	69
(1921, 1971)	35	15	10	60
(1931, 1941)	—	1	2	3
(1931, 1951)	9	6	15	30
(1931, 1961)	9	4	9	22
(1931, 1971)	9	4	5	18
Total	131	93	135	359

Note : Calcutta and Bolangir districts experienced only one spurt each, in 1931 and 1951 respectively.

Three-fifths of the districts marked by a spurt combination of (1921, 1941) recorded a rapid population growth. This proportion was hardly one-sixth in case of the districts which were noted for (1921, 1971) combination of spurts. Similarly two-thirds of the districts with (1931, 1941) combination of spurts were distinguished by a rapid growth rate but this proportion declined to less than one-third in the case of districts marked by (1931, 1971) combination of spurts. It shows that the districts which were ahead in terms of demographic transition were still persisting in the explosive substage and were yet to slide into the late phase of the second stage.

Summary and Conclusion

Althuogh 1921 and 1951 distinctly emerge as significant divides in India's population growth during the current century yet (1921, 1951) combination of the spurts was characteristic of only one-third of the districts in the country. The 1921 spurt, observed in 75 per cent of the districts, was more ubiquitous than the 1951 spurt, which was experienced by 57 per cent of the districts. Among 268 districts, which recorded the first spurt in 1921, only 119 recorded the second spurt in 1951. In many among them, the second spurt was postponed to 1961 and even to 1971.

The spurt timings indicated the schedule of the development process in different parts of India. Disregarding the distortions introduced by migration, earlier spurts were generally associated with an earlier onset of the modern development process which played a crucial role in mortality decline. Data revealed that (1921, 1951) and (1921, 1971) combinations of spurts were more common in north India while (1921, 1941) and (1921, 1961) combinations were more typical of south India. It suggests that the development process in the modern sense made an earlier start in the south than in north India.

The exercise also revealed that the western specifications of the demographic transition model, with threshold points of 35 and 15 for birth rate and death rate respectively, were not applicable to the Indian situation. India's birth rate was around 45 and death rate around 35 when it transited from Stage 1 to Stage 2, and its birth rate dropped only marginally to around 40 and death rate sharply to around 20 when it attained the explosive substage of the demographic transition. No part of India had entered Stage 3 of the demographic transition.

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MIGRATION OF SCHEDULED CASTE POPULATION IN RURAL BIST DOAB (PUNJAB)

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and

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Based on primary data collected from five villages in the Bist Doab, this study attempts to analyse migrational patterns of the scheduled caste population in the rural areas of this region of Punjab. The rate of in-migration of scheduled castes was found to be quite low except in one village which has recently experienced considerable expansion of area under cultivation. By and large, rural—rural migration among the scheduled caste people within the region is uncommon. Out-migration, on the other hand, showed inverse correlation with economic health of the villages. The scheduled castes have been found to be lagging behind the non-scheduled castes in terms of rate of spatial mobility as well as distance of migration.

The scheduled caste segment of rural population of Punjab (numbering 3,666,372 in 1981) stands conspicuous not only with respect to its socio-economic attributes but also in demographic dynamism. During 1971-81, the rural scheduled caste population recorded a growth rate of 28 37 per cent as compared to the corresponding growth rate of 13.32 per cent among the rural non-scheduled castes. This sharp difference in their growth rates suggests, among other things, that they perceive and respond differentially to the economic opportunities resulting in wide variations in the magnitude and patterns of their migration. Thus, with a view to having a clearer comprehension of migration taking place in the state, there is a need to make an in-depth study of migration amongst the scheduled caste population in one of its major regional units. The Bist Doab, more than any other region of the state, has had a long and varied experience of migration among various sections of its population. Hence the choice of his region for the present study.

The study is based on primary data for five villages which were collected during 1980-82*. As this study relates to the scheduled caste population, the villages were so selected that in each one of these the scheduled caste persons should constitute more than 50 per cent of the total population. It was assumed that scheduled caste people in such rural settlements would experience large-scale out-migration, and only a limited in-migration, as the agricul-

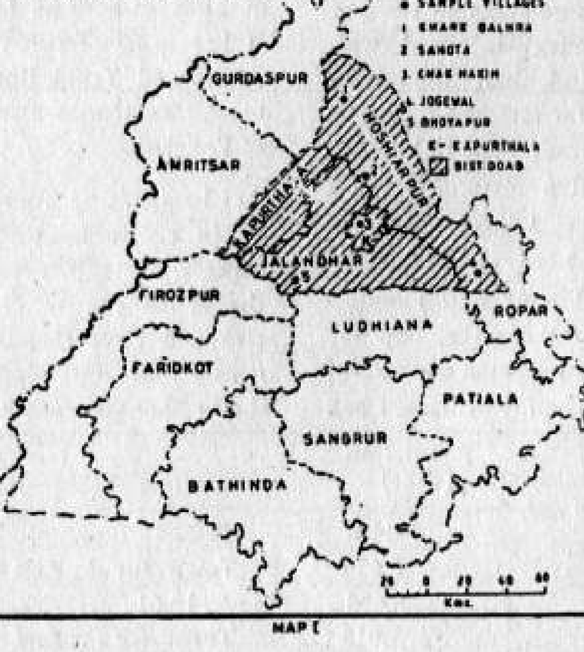
* These villages were a part of 35 villages surveyed in connection with an U.G.C. sponsored study; Migrational Trends in Bist Doab"'

ture-based village economy would not be able to hold such a large population in view of the weakening of the *jajmani* system on the one hand and the opening up of employment avenues for them, both in the secondary and the tertiary sectors**, on the other.

As in previous decades so during 1971-81 the growth rate of rural population in this region was considerably lower (13 per cent) than that for the state as a whole (17.48 per cent). The rural scheduled caste and non-scheduled caste persons in the region recorded net growth rates of 23.73 per cent and 7 per cent respectively which were much lower than the corresponding state averages of 28.37 per cent and 13.32 per cent respectively. It may be noted that whereas the net growth rate of the scheduled caste persons closely corresponds to the natural growth rate, in the case of the non-scheduled castes it is far lower, suggesting massive loss of population through out-migration from among them.

Three of the five villages surveyed for this study are from Hoshiarpur district, and one each from Kapurthala and Jalandhar districts (Map 1). Out of a total of 316 households in these villages, 228 belonged to the scheduled castes and all of these were surveyed for the present study.

The study villages have quite diverse locations. Khark Balhra is about 3 kilometres to the east of an indifferently growing small town of Mukerian; Jogewal lies in the *cho*-infested undulating foot-hill



MAP I

** In all government jobs there there is 25 per cent statutory reservation for the scheduled castes in Punjab.

Table 1

The Study Villages

Village (Hadbast number)	Tahsil	District	Number of households		
			Scheduled castes	Non-scheduled castes	Total
Khark Balhra (274)	Dasuya	Hoshiarpur	18	38	56
Chak Hakim (75)	Phagwara	Kapurthala	111	15	126
Sahota (115)	Hoshiarpur	Hoshiarpur	27	16	43
Bhoyapur (273)	Nakodar	Jalandhar	44	5	49
Jogewal (194)	Balachaur	Hoshiarpur	28	14	42
		Total	228	88	316

Source : Fieldwork.

tract at a distance of about 3 kilometres to the east of a small and stagnant town of Balachaur; Sahota village is gifted with better agricultural land than the other two settlements but is far removed from any major town, the nearest (about 10 kilometres) being the stagnating town of Hariana. All the above three villages fall in Hoshiarpur district. Bhoyapur village lies in the flood-plain of river Satluj and is located quite close to the river, and the nearest town (Shahkot) is at a distance of about 6 kilometres. The fifth village, Chak Hakim, can be said to be the more fortunate in terms of both its location and situation. It lies in the fertile tract and is located on the Grand Trunk Road, about 2 kilometres to the northwest from the industrial town of Phagwara.

In the first four villages, proximity to urban centre has not materially affected aspects of their population geography as the urban centres are of small to medium size and have themselves been witnessing considerable out-migration associated with their rather stagnant economic base*.

*Urban Centre	Population (1981)	Net growth rate		
		1971-81	1961-71	1951-61
1. Mukerian	14,454	+ 32.16	+ 26.06	+ 15.79
2. Balachaur	6,630	Town for the first time in 1981		
3. Hariana	5,633	+ 12.61	+ 11.95	— 5.44
4. Shahkot	7,018	Town for the first time in 1981		
5. Phagwara	75,618	+ 38.08	+ 45.04	+ 48.21

Table 2

Some Demographic Characteristics of the Sample Villages

Village	Population			Sex ratio				Percentage of the	
	Total	Scheduled caste	Non-scheduled caste	Total	Scheduled caste	Non-scheduled caste	Scheduled caste	Sikhs	Hindus
Khark Balhra	263	139	124	1007	1138	879	52.85	78.71	21.29
Chak Hakim	836	739	97	896	895	902	88.40	94.85	5.15
Sahota	290	191	99	847	802	941	65.86	100.00	0.00
Bhoyapur	287	251	36	739	685	1250	87.46	87.81	12.19
Jogewal	268	172	96	740	755	714	64.18	64.18	35.82
Total	1944	1492	452	855	847	883	76.75	88.17	11.83

Source : Fieldwork.

The population of the sample villages ranges from 263 in Khark Balhra to 836 in Chak Hakim (Table 2). Similarly, the proportion of the scheduled caste population showed striking inter-village variations from 52.85 per cent in Khark Balhra to 87.46 per cent in Bhoyapur. The Sikhs and the Hindus are the only two religious communities, accounting for 88.17 per cent and 11.83 per cent of the total population respectively. Relatively high proportion of the Hindus was found in Jogewal (35.82 per cent) and Khark Balhra (21.29 per cent) which lie close to the Shiwalik range.

Pattern of In-migration

It was found that the rate of in-migration of the general population was quite low in the sample villages. The scheduled castes were no exception. This is understandable in the context of rural areas which have failed to register any worthwhile diversification in their agricultural economy, so essential to accommodate additional workers. Only in areas where acreage under rice cultivation has expanded and agriculture in general is experiencing intensification, farm labourers come in from outside.

At the time of the survey, there were 382 scheduled caste in-migrants (75 males and 307 females). The respective rates of male and female in-migration were 9.28 and 44.88 per cent (Table 3). The preponderance of females among the in-migrants is almost wholly connected with marriage migration as under the "prevailing system of patrilocal matrimonial residence it is the wife who moves and in the process becomes a migrant" (Gosal and Krishan, 1975).

It becomes clear from Table 3 that the rate of scheduled caste in-migration is low

Table 3

Pattern of In-migration

Name of the village		Total in-migration			Rate of in-migration*		
		Persons	Males	Females	Persons	Males	Females
Khark Balhra	Scheduled castes	29	1	28	20.86	1.54	37.84
	Non-scheduled castes	36	9	27	29.03	13.64	46.55
Chak Hakim	Scheduled castes	160	7	153	21.65	1.79	43.84
	Non-scheduled castes	48	18	30	49.48	27.27	51.72
Sahota	Scheduled castes	38	0	38	—	—	—
	Non-scheduled castes	37	8	29	37.37	15.69	60.42
Bhoyapur	Scheduled castes	119	64	55	47.41	42.95	53.92
	Non-scheduled castes	19	9	10	52.78	56.25	50.00
Jogewal	Scheduled castes	36	3	33	20.93	3.06	44.59
	Non-scheduled castes	54	29	25	56.25	51.79	62.50
Total	Scheduled castes	382	75	307	25.60	9.28	44.88
	Non-scheduled castes	194	73	121	42.92	30.42	57.08

Source : Fieldwork.

*In-migrants as per cent of total/male/female population.

in all the villages except in Bhoyapur which lies in the Satluj flood plain and which came under effective cultivation as recently as the sixties. The frontier nature of agricultural development here made for the in-migration of a large number of scheduled caste agricultural labourers and cultivators.

It is worth noting that the rate of in-migration was higher among the non-scheduled caste population in all the villages. As expected, male in-migration has been primarily due to economic reasons, such as purchase or inheritance of land. Female in-migration occurred due largely to the change in the marital status of females. It is only in the *bet* village of Bhoyapur, characterised by large scale reclamation of agricultural land in recent years, that a majority of females had in-migrated due to economic reasons, including increased demand for female labourers in rice cultivation (Table 4). Among the determinants given under the column 'others', the partition of the country in 1947 has been the prime cause of in-migration. Under the rehabilitation programmes undertaken by the state government after 1947, displaced persons from Pakistan were resettled in villages from where Muslims had been evacuated earlier. As the *bet* tracts had experienced relatively greater exodus of Muslims, these were also the recipient of larger number of displaced persons.

No wonder, a large part of the scheduled caste in-migrants arrived during 1948-60 when various phases of the rehabilitation programme were completed. It is only in the case of Bhoyapur that about 44 per cent of male in-migrants came during 1961-71. The female in-migration in all the villages continues to be related with marriage.

Table 4

Determinants of In-migration

Name of the village	Marriage		Economic		Others	
	Males	Females	Males	Females	Males	Females
Khark Balhra	—	96.43	100.00	3.57	—	—
Chak Hakim	—	98.04	85.71	—	14.29	1.96
Sahota	—	100.00	—	—	—	—
Bhoyapur	—	38.18	73.44	52.73	26 56	9.10
Jogewal	—	100.00	—	—	100 00	—
Total	—	87.62	72 00	9.77	28 00	2.61

Source : Fieldwork.

Table 5

Rate of Out-migration

Name of the village		Number of out-migrants			Rate of out-migration*		
		Persons	Males	Females	Persons	Males	Females
Khark Balhra	Scheduled castes	12	2	10	8.63	3.08	13.51
	Non-scheduled castes	27	9	18	21.77	13.64	31.03
Chak Hakim	Scheduled castes	63	8	55	8.53	2.05	15.76
	Non-scheduled castes	55	27	28	56.70	52.94	60.87
Sahota	Scheduled castes	22	8	14	11.52	7.55	16.47
	Non-scheduled castes	15	12	3	15.15	23.53	6.25
Bhoyapur	Scheduled castes	16	2	14	6.37	1.34	13.73
	Non-scheduled castes	1	1	0	2.78	6.25	—
Jogewal	Scheduled castes	25	5	20	14.53	5.10	27.03
	Non-Scheduled castes	8	4	4	8.33	7.14	10.00
TOTAL	Scheduled castes	138	25	113	9.25	3.09	16.52
	Non-Scheduled castes	106	53	53	23.45	22.08	25.00

Source : Fieldwork

*Out-migrants as per cent of total/male/female population.

Pattern of Out-migration

There were 138 scheduled caste out-migrants (males 25, females 113) giving an out-migration rate of 9.25 per cent; the respective rates for males and females come to 3.09 per cent and 16.52 per cent (Table 5). It is significant to note that the rate of scheduled caste out-migration was notably high in relatively less developed villages of Sahota (7.55 per cent) and Jogewal (5.10 per cent) as compared to the more developed and better situated village of Chak Hakim (2.05 per cent). Very low rate of out-migration was recorded in Bhoyapur (1.34 per cent),which has experienced considerable in-migration of agriculturists associated with reclamation of large areas of farm land in recent years. A comparison of Tables5 and 2 clearly shows that there is no correlation between the rate of out-migration and the proportion of scheduled castes to total population. Owing to marriage migration, the rate of female out-migration was higher in all the five villages.

Table 5 also reveals that in all the villages the scheduled caste males have out-migrated at a far slower pace than their non-scheduled caste counterparts. Significantly, the highest out-migration rate of non-scheduled castes was recorded in Chak Hakim (52.94 per cent) where the corresponding figure for the scheduled castes was only 2.05 per cent. The low rate of out-migration of both the caste-groups in Bhoyapur village suggests that areas of recent extension and intensification of agriculture experienced lower rates of out-migration.

Thus, the above discussion on out-migration refutes the popular notion that the scheduled caste rural population should be more migratory than the non-scheduled castes as the former has only a little economic stake in their native places. In fact, better economic resources and higher literacy and consequently wider awareness among the non-scheduled caste people are the crucial determinants of out-migration differentials between these two population groups.

It emerges from Table 6 that economic reasons in the case of males and marriage in the case of females are almost the only two determinants of out-migration. So far no female has moved out for economic reasons from any of the five villages. Female out-migration among the scheduled castes continues to be wholly associated with change in marital status.

Table 6

Determinants of Out-migration

Name of the village	Marriage		Economic		Others	
	Males	Females	Males	Females	Males	Females
Khark Balhra	—	100.00	100.00	—	—	—
Chak Hakim	—	100.00	100.00	—	—	—
Sahota	—	100.00	100.00	—	—	—
Bhoyapur	—	100.00	100 00	—	—	—
Jogewal	—	85.00	80.00	10.00	20.00	5.00
TOTAL	—	97.35	96.00	1.77	4.00	0 88

Source : Fieldwork

Table 7

Out-migrants by Place of Birth

	Per cent of out-migrants born within/in															
	Village		Tahsil		District		Bist Doab		Punjab		Other parts of India		Pakistan		Other Countries	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
Khark Bahlra	100.00	100.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Chak Hakim	75.00	69.09	—	2.63	—	21.05	—	10.53	12.50	5.25	—	—	12.50	—	—	5.26
Sahota	100.00	100.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Bhoyapur	—	21.43	100.00	71.43	—	—	—	—	—	—	—	—	—	7.14	—	—
Jogewal	100.00	90.00	—	5.00	—	—	—	—	—	5.00	—	—	—	—	—	—
TOTAL	84.00	73.45	8.00	10.62	—	7.08	—	3.54	4.0	2.65	—	—	4.0	0.88	—	1.77

Source : Fieldwork.

Table 8

Distribution of Out-migrants by Destination

		Per cent of out-migrants shifting within/to																			
		Tahsil		District		Other districts of the Bist Doab		Other districts of Punjab		Other states of India		Canada		United Kingdom		Arab countries and Iran		Other countries	
		Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
Khark	SC*	—	50.00	—	20.00	—	—	50.00	30.00	—	—	—	—	—	—	50.00	—	—	—
Balhra	NSC**	11.11	55.56	—	22.22	11.11	—	11.11	5.56	44.44	16.67	—	—	—	—	—	—	22.22	—
Chak	SC	—	12.73	12.50	—	—	54.55	—	16.36	—	1.82	37.50	1.82	25.00	12.73	12.50	—	12.50	—
Hakim	NSC	—	—	—	—	—	—	—	—	—	—	48.15	17.86	25.93	39.29	14.81	—	11.11	42.86
Sahota	SC	—	85.71	—	7.14	—	—	25.00	—	62.50	7.14	—	—	—	—	12.50	—	—	—
	NSC	8.33	66.67	—	—	—	33.33	25.00	—	41.67	—	8.33	—	—	—	16.67	—	—	—
Bhoyapur	SC	—	42.86	—	7.14	50.00	14.29	—	28.57	50.00	7.14	—	—	—	—	—	—	—	—
	NSC	—	—	—	—	—	—	—	—	100.00	—	—	—	—	—	—	—	—	—
Jogewal	SC	—	50.00	—	15.00	—	25.00	—	—	100.00	10.00	—	—	—	—	—	—	—	—
	NSC	—	25.00	25.00	25.00	—	—	—	—	75.00	50.00	—	—	—	—	—	—	—	—
TOTAL	SC	—	35.40	4.00	6.19	4.00	32.74	8.00	11.50	48.00	7.08	12.00	0.88	8.00	6.19	12.00	—	4.00	—
	NSC	3.77	24.53	1.89	9.43	1.89	1.89	7.55	1.89	24.53	9.43	26.42	9.43	13.21	20.75	11.32	—	9.43	22.64

Source : Fieldwork.

SC* stands for Scheduled Castes

NSC** stands for Non-scheduled Castes

Most of the persons who moved out were born in the village from where they out-migrated. Bhoyapur presented a different case where a large majority of the out-migrants had earlier come primarily from other parts of the tahsil at the time of colonisation of the *bet* land (Table 7). Similarly, one-fourth of the male and 31 per cent of the female out-migrants had earlierlly migrated to this village.

The distribution of out-migrants by their destination presents a very interesting picture. Scheduled caste males and females differ from each other not only in terms of the motives of migration but also in respect of the distance of the move (Table 8). As compared to preponderance of short-distance migration among the females, males experienced relatively long-range migration. For example, 35 percent of females migrated to places within the tahsil whereas no male moved out to any destination located within this area. The share of females moving to other tahsils within the district is considerably lower than that of migrating to places within the tahsil on the one hand and those moving to other districts of the Bist Doab. This leads to the conclusion that the distance of marriage links is duo-modal : there are more frequent moves within the tahsil as well as outside the district of enumeration. This pattern is quite understandable. Rural people generally prefer matrimonial alliances at short distances for various reasons. But those with larger information field and extensive network of relationships usually prefer to ignore the factor of proximity in favour of various qualities and socio-economic position of the prospective groom, resulting in inter district matrimonial alliances. The pattern of marriage migration of the scheduled castes broadly resembles that of the non-scheduled castes. However, in the case of the latter, the second area of large number of marriage links after the tahsil is that lying outside Punjab, signifying much wider marriage allowances among them (Table 8).

The role of awareness, as reflected through matrimonial linkages, is well illustrated by Chak Hakim village which is famous for a long history of out-migration, including emigration. About 88 per cent of female out-migrants from this village have moved out of the district of enumeration and about 15 per cent have gone abroad. Similarly, all the scheduled caste male out-migrants had their destination in foreign countries. Interestingly, both male and female out-migrants from amongst the non-scheduled caste persons have all gone to foreign countries. Field enquiries pertaining to the similarity of destinations of the scheduled and non-scheduled caste male emigrants revealed that information remitted by the non-scheduled castes who emigrated earlier and their subsequent occasional visits to the village influenced the emigration process of the scheduled castes as well and they chose the same destinations (Canada, United Kingdom and Arab countries). Thus, early emigration not only generated more emigration but also strongly influenced the direction of migration streams which tended to be drawn towards the same destinations. It was also gathered that within their country of emigration, (both scheduled and non-scheduled caste) were largely concentrated in the same towns. However, scheduled caste and non-scheduled caste difference is widest in terms of gross emigration. Emigration among the scheduled castes is small in volume and more recent in origin. This is directly related to their meagre incomes, low literacy rates, and lack of awareness of the opportunities.

Conclusions

The scheduled caste people were found as recording relatively less spatial mobility as compared to the non-scheduled castes. This was true in respect of both in- and out-migration, including emigration.

Whereas male migration among the scheduled caste people occurred due primarily to economic reasons, female migration was almost entirely connected with marriage. As a result, females made an overwhelming majority among both in-migrants and out-migrants.

Expectedly, all the sample villages recorded low rates of in-migration, except one which experienced extension of agriculture in recent years. By contrast, out-migration and economic health of the villages were found to be inversely correlated, with less developed villages experiencing higher rates of out-migration.

The scheduled caste persons recorded relatively short-distance migration as compared to their non-scheduled caste counterparts. Although female migration was of relatively short-distance type, it varied directly with the distance of male migration.

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POPULATION GROWTH AND DISTRIBUTION VERSUS AGRICULTURAL CHANGE -AN ANALYSIS OF THE WARLI TRIBAL COMMUNITY IN DAHANU AND TALASERI TALUKAS OF THANE DISTRICT (MAHARASHTRA)

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JEDDAH, KINGDOM OF SAUDI ARABIA

Population growth and agricultural change are two important factors which have a direct bearing on the economic development of most tribal communities. This aspect is analysed at village level for the Warlis, the largest tribal community in Thane district. The Warlis are widespread in this district and are regarded as neither backward nor developed in economic terms. This paper tries to highlight the relationship that exists between the two factors and the relative changes in the structural character of the two factors. It also focuses on the complications brought about by the juxtaposition of a market economy of the nontribals on the subsistence peasant agriculture of the Warli tribals. Methcdology is empirical, Suitable statistical aids have been used on available census material, subtantiated with fieldwork.

In recent years there has been some new thinking in explaining population growth, population pressure and agricultural development. Though still a controversial idea, studies by Boserup (1965) and Grigg (1976) reveal that population growth rate is likely to be an important determinant in farm change for it increases both demand and labour supply, the two major functions in peasant agriculture (Newby. 1978) The aim of this paper is to highlight the relationship of these two factors (population and agricultural change) in the Warli tribal areas of Thane District and to understand the implications of these changes in the tribal community in terms of their agricultural system.

Methodology and Data Base :

The study on population has been attempted from a broad regional level (Western India) to district level and then drawn to taluka and village level. The data from 1901 to 1971 have been drawn from census reports. Agricultural change has been analysed chiefly from the angle of landuse change between 1901 and 1971 at village level. The revenue resettlement report for Dahanu Taluka and Umbergaon Petha proved an invaluable source of data for 1901.

Population Distribution and Growth 1901-1971 :

The Warlis inhabit a wide area of Southern Gujarat, Daman, Diu, Thane and Nasik districts of Western India (Footnote 1). The population growth of the Warlis has to be viewed critically against the growth of non-tribal and other scheduled tribes of the area. Generally the nontribal population (here presented by total population figures) in the whole area has grown positively and consistently, till 1941. After 1941, the nontribal population has been rapid in its growth rate till 1961. The decade after 1971 once again saw higher growth rates compared to 1961-71. The Warlis growth rate though positive in general, had sharper decline, specially during the influenza epidemic of 1911-21 and due to famine during 1941-51 decades. The scheduled tribe growth rates reflected similar trends except for the last decade (1961-71) where it records declining percent growth rate compared to that of the Warlis in the region. Prior to 1961, the Warlis growth rate appeared to be higher in the Surat-Bolsar district of Gujarat than in Thane district of Maharashtra (Map No. 1), mainly due to administrative changes in the district boundaries. From Dangs district data which has not undergone such changes, it is estimated that population growth of the Warlis till 1961 in southern Gujarat and in Thane district, Maharashtra, was steady.

In Thane district, the Warlis formed 13 percent of the total population and nearly 51 percent of scheduled tribe population in the 1901-1911 decade. They also registered a percent growth rate of 25 percent as against a much lower 8.42 percent of the nontribal population. The following decade saw a drastic decline (due to an epidemic of influenza) from 25 percent to 3.35 percent whereas the nontribals declined from 8.42 percent to 7.30 percent. Again in the decade between 1941-51 drought reduced Warlis growth rate from 10 percent to 5 percent whereas the nontribals registered only a positive 11 percent growth rate. In the decade 1961-71 the Warlis grew at 21.27 percent whereas the growth rate of non-tribals was 27.45 percent. After 1941, the growth rate of nontribals increased rapidly due to inmigration of Sindhis and Punjabis from Pakistan. The post —1971 increase of nontribal growth rate is due to industrialization and spillover of Bombay's suburban population.

With respect to other scheduled tribes namely, Dublas, Dhodia, Kathodi in Gujarat, Warlis' share in population growth showed a decline relatively due to greater growth rate of the other tribal communities. They rose by 38 percent in Surat, Bulsar, by 32 percent in Dangs district. In Thane Warlis growth rate was 21 percent against only 15.75 percent of other scheduled tribes namly Katkarris, Koknas, Malhar Kolis, Thakurs etc.

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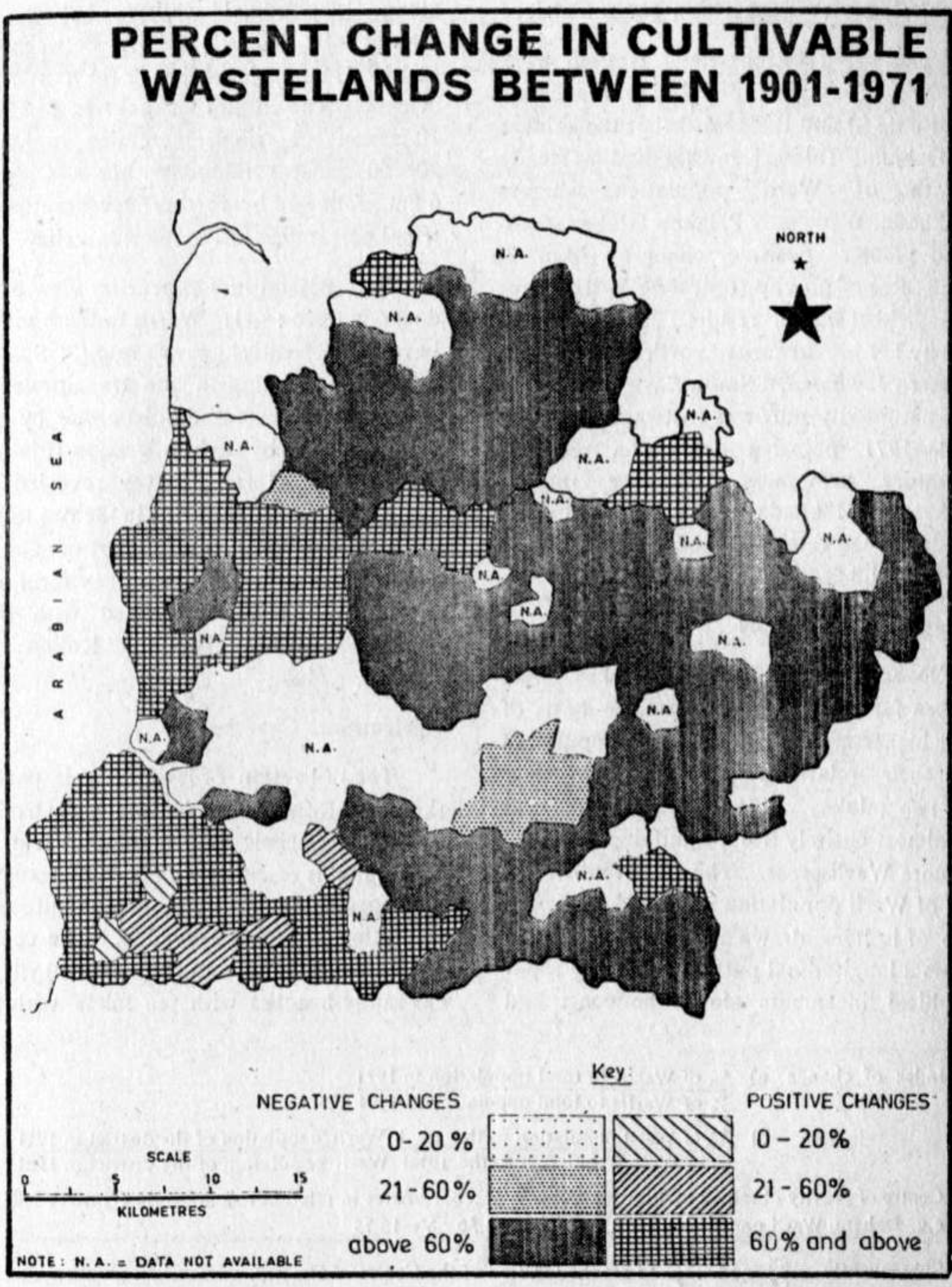
1. Specific Warli talukas are Talaseri, Dahanu, Jawhar, Mokhada, Palghar, Bassein, Vada, Shahpur and Greater Bombay in Thane district ; Peint and Surguna in Nasik district; Bulsar district, Bansda in Surat district, Dangs district


PERCENT CHANGE IN CULTIVABLE WASTELANDS BETWEEN 1901-1971
NORTH
ARABIAN SEA
N.A.
Key
NEGATIVE CHANGES
POSITIVE CHANGES
0-20 %
21-60 %
above 60%
0 - 20%
21 - 60%
60% and above
SCALE
0 5 10 15
KILOMETRES
NOTE : N. A. = DATA NOT AVAILABLE

Population Movement within Thane district

The index of change was used as a measure of relative population movement (foot note 2) and it revealed that the talukas of Dahanu, Talaseri, Jawhar had a steady growth of Warli population whereas Mokhada, Wada and Palghar talukas registered greater positive changes (Map 2) The centre of gravity (foot note 3) technique also yielded similar results. The centre of gravity lay in an area north of Palghar, Western Jawhar and South Eastern Dahanu. The net gravity shift was eastwards between 1901—1971 pointing out to a probable migratory movement into the interior talukas of Mokhada, Wada and a Gradual steady growth rate in Dahanu, Talaseri and Jawhar talukas.

Village Level Analysis

Dahanu and Talaseri talukas were chosen for detailed analysis on the basis of their highest percentage of Warli population and their relatively steady growth rate. The two talukas of Dahanu and Talaseri are almost entirely tribal signifying that they are core Warli areas. The relative distribution of Warli population identified with the help of isolines drawn at 10 percent interval shows a longitudinal pattern following topographical lineaments along the coast and along longitudinal valleys between the interior hills (Maps 3 and 4). Between 1961 and 1971, no major shifts in the pattern are evident. The coastal villages had less than 10 percent as tribal, increasing rapidly to 20—50 percent inland within a width of 6 km., followed by further accentuation of tribal percentage in the interior valley.

Two possibilities appear in view of the above pattern : (1) Warlis in these villages have had a positive growth rate (2) Spatially they are increasing in the transitional belt (between the coast and hills) either by natural increase or by slight migration (foot note 4). A personal field survey revealed that Warlis were the major tribe in the two talukas except in the South-eastern part of Dahanu Taluk (Kasa Block-5) where they form only 30-40 percent being intermixed with other scheduled tribes like the Koknas and Malhar, Kolis.

Agricultural Changes

The utilization of land in this part of the north Konkan belt is largely determined by characteristic physiographic features. The region is essentially a series of estuarine lowlands separated by numerous hill ranges projecting from the Sahyadris. The coastal stretch covering around 18 (eighteen) villages has sandy beaches with sea inlets with frin

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2. Index of change a) $\dfrac{\text{\% of Warlis to total population in 1971}}{\text{\% of Warlis to total population in 1901}}$

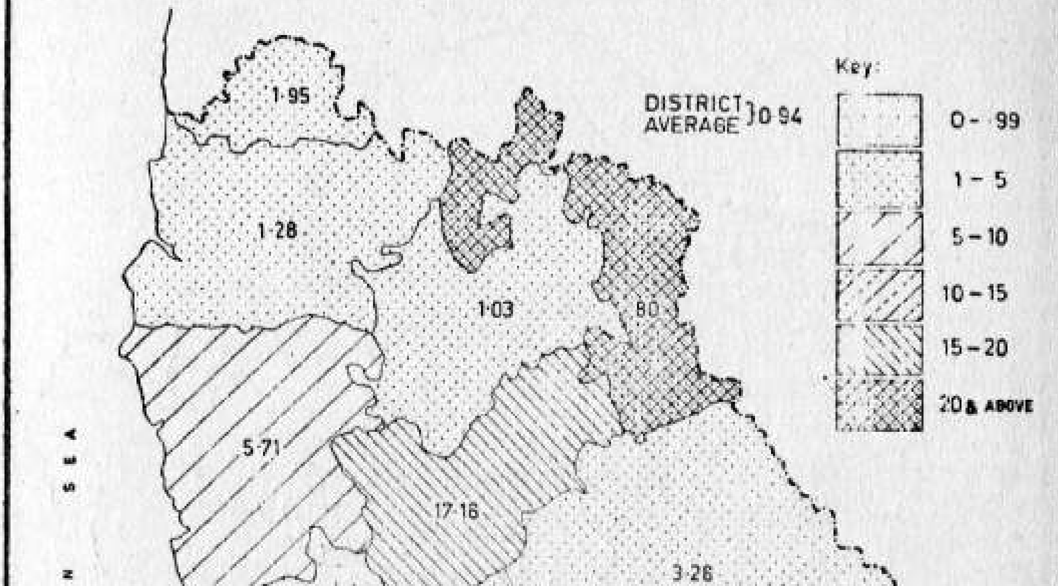
b) $\dfrac{\text{\% of Warli population to the total Warli population of the district in 1971}}{\text{\% of Warli population to the total Warli population of the district in 1901}}$

3. Centre of gravity obtained by Plotting 'X' any 'Y' coordinates in relation to a arbitrary centre of villages. e.g. Dahanu Warli population (f) 23344 X=2.50 Y=10.75

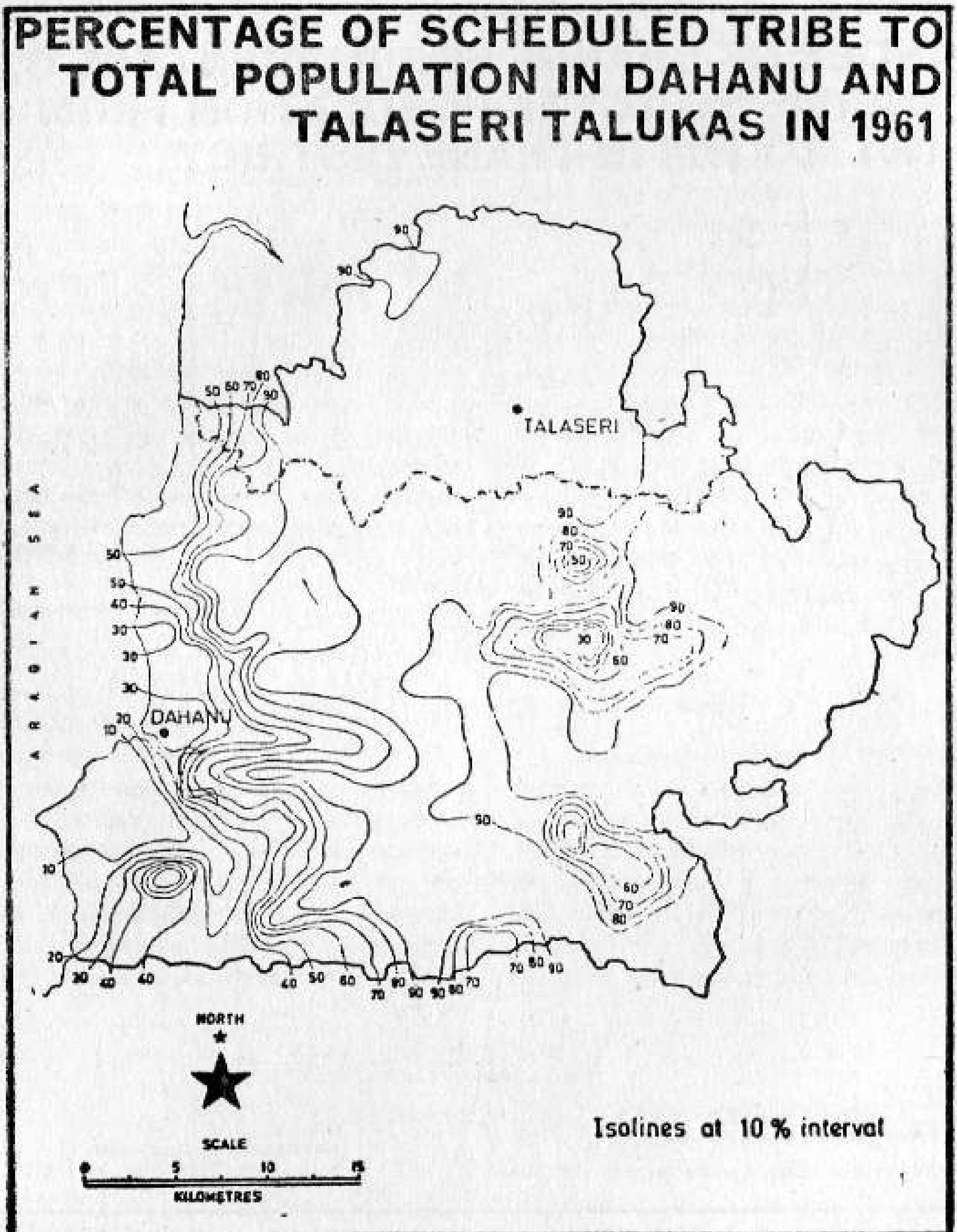
Subsequently $\frac{\varepsilon x}{\varepsilon f}$ and $\frac{\varepsilon y}{\varepsilon f}$ to get the location of the Centre of Gravity.

4. Percent change analysis $\frac{f2-f1}{f2} \times 100.$

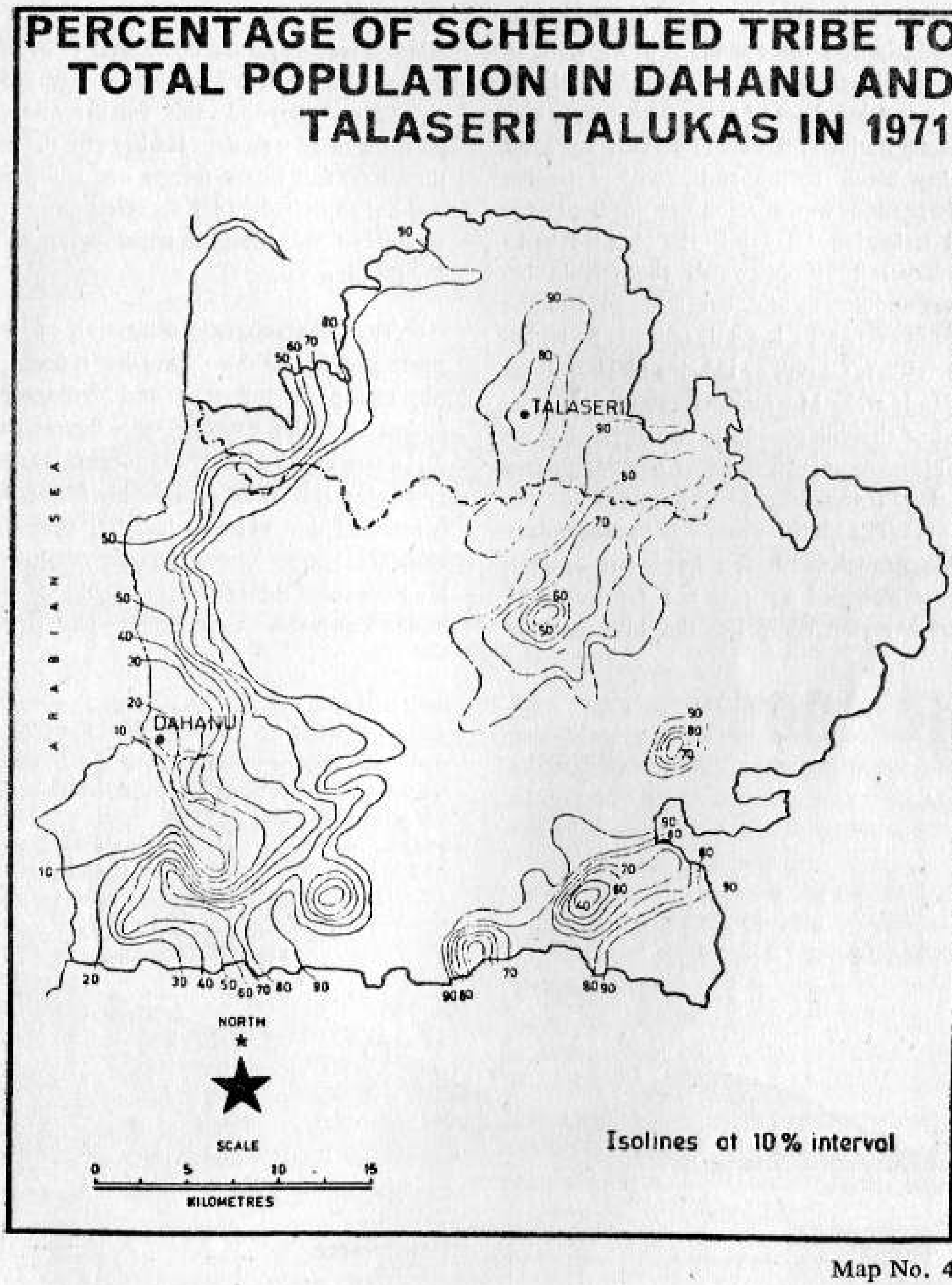
INDEX OF CHANGE FOR PERCENTAGE OF WARLIS TO TOTAL POPULATION FROM 1901 TO 1971 IN THANE DISTRICT



Map no 2


PERCENTAGE OF SCHEDULED TRIBE TO TOTAL POPULATION IN DAHANU AND TALASERI TALUKAS IN 1961
ARABIAN SEA
TALASERI
DAHANU
NORTH
SCALE
0 5 10 15
KILOMETRES
Isolines at 10 % interval

Map No. 3


PERCENTAGE OF SCHEDULED TRIBE TO TOTAL POPULATION IN DAHANU AND TALASERI TALUKAS IN 1971
ARABIAN SEA
TALASERI
DAHANU
NORTH
SCALE
0 5 10 15
KILOMETRES
Isolines at 10 % interval

Map No. 4

ges of marshy lands. Land is cultivated intensively on porous sandy soils as well as in deeper black cotton soils further inland. The transitional area between the coast and the hills is almost flat characterised by good quality black cotton soils, with extensive underground water resources utilised for well irrigation. Beyond the Ahmedabad - Bombay railway eastwards the terrain becomes undulating and continues to become more uneven with low hill ranges. Soils become either 'Garvi', or inferior black soils on lowlands and 'Murram', stony on uplands. Most of the villages (28 in number) have a combination of such soils. Above 33 metres the slope is too steep for cultivation in this region. The hills proper have secondary jungle growth with few hardwood species, but are classified as reserved forests. The interior region comprises the hills and the amphitheatre - like valleys carved out by minor streams and the open valley of river Surya. The valleys remain the only cultivable area. Beyond this further east, the plateaus of Mormada, Jawhar rise to more than 1000 feet where forests are still preserved but exploited under Government supervision and also leased to tribal communities for farming.

The characteristic utilization of land portrayed in the two profiles reflects the physiographic influence and demographic character of the country (See figures 1 and 2). Even at the turn of the century Dahanu and Talaseri talukas were thickly forested, 90 percent of the villages had 60 percent of their total area under forests. Cultivated land occupied the rest with negligible area under cultivable wastelands. The pattern

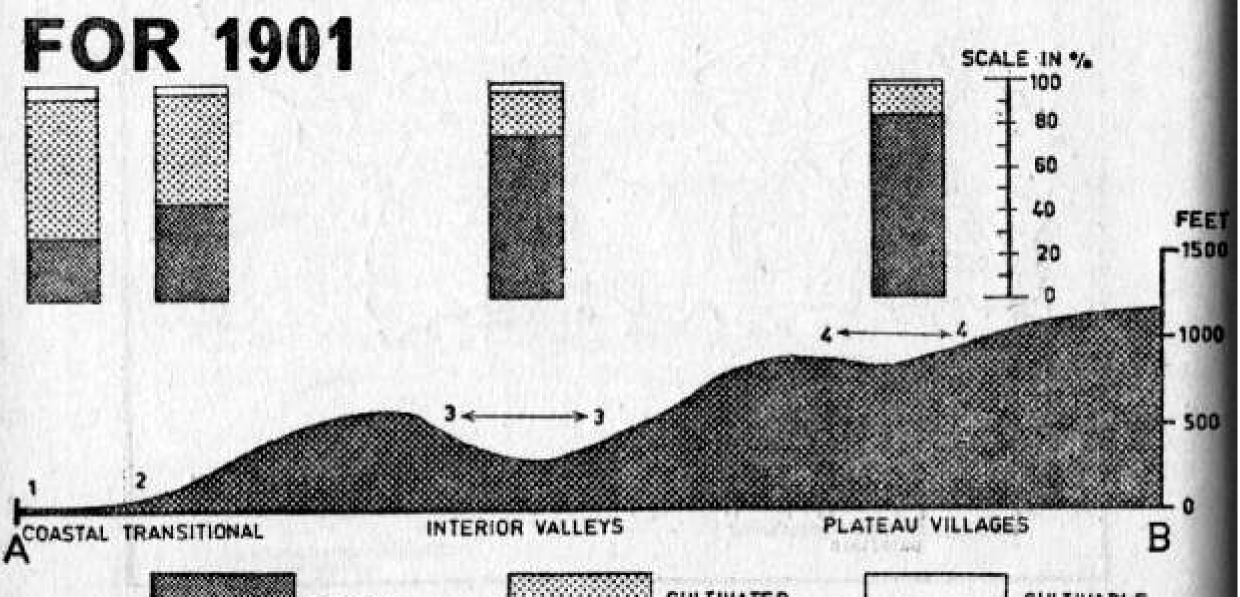


Fig. No. 1

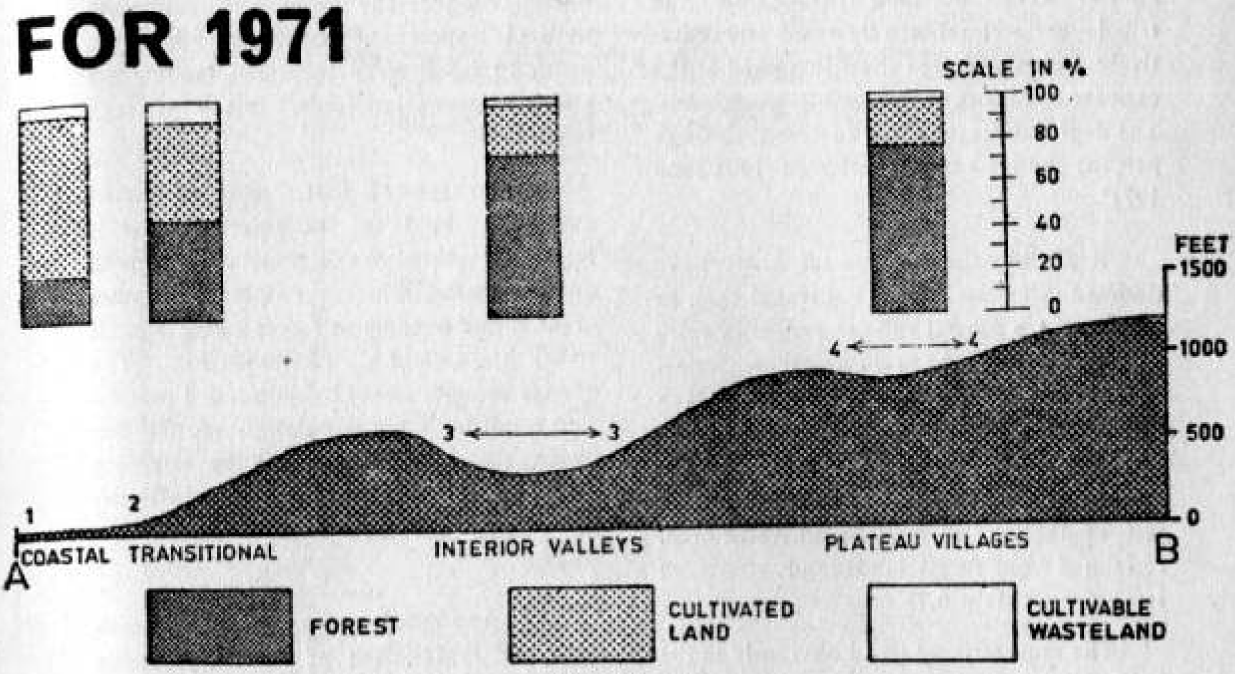


Fig. No. 2

in 1901 was (a) coastal villages had less than 35 percent under forests, 65 percent under cereals, fruits and vegetables. (b) The transitional belt had 50 - 60 percent under forests and rest under cultivation. (c) Interior villages numbering 82 had 70 percent under forests, 20 percent under cultivation and 5 - 10 percent under cultivable wastelands. Plateau area with 26 villages in the interior had 85 percent under forests.

On the basis of the landuse pattern it is probable that the Warlis, the largest tribal community, had settled down to sedentary cultivation (Save, 1945). "Three hundred years ago they practised slash and burn cultivation, but had settled down to sedentary agriculture with subsidiary dependence on forests."4

The forests supplied them with fuel wood and some food during lean months. Two types of land were recognised : the paddy land and upland called 'varkas'. 'Rab' or leaf litter was collected from varkas which was further classified into 'Malvarkas' with flat tops and gentle slopes of hills and 'Dongrivarkas' of steeper slopes. The former was utilised for coarse cereals or grass as fodder. To provide 'Rab' for one acre of rice land, three acres of varkas land was necessary. In effect, all holdings were in combination of lowland and upland. The high acreage under forests, medium acreage under cultivated land reflects conditions of low population pressure on land, rudimentary methods of agriculture and extensive methods of cultivation.

By 1971, the regional pattern remained unchanged but for structural changes.

Forests have declined throughout the tribal belt, qualitatively and quantitatively. Cultivated area has increased at the expense of forests or cultivable wastelands. The degree of change was analysed through percent change analysis between 1901 and 1971[5]

Regionally the (1) Coastal areas have declined in forests and in cultivated area. In the southern coastal villages decline in cultivated area was by 40 to 90 percnt with sizeable increase in cultivable wastelands. (Map 5) In the southern transitional belt again the same pattern is repeated as also in the interior villages of southern Dahanu. In the rest of the area increase in cultivated area, reclaimed from forest lands and wasteland is evident. (Maps 6,7)

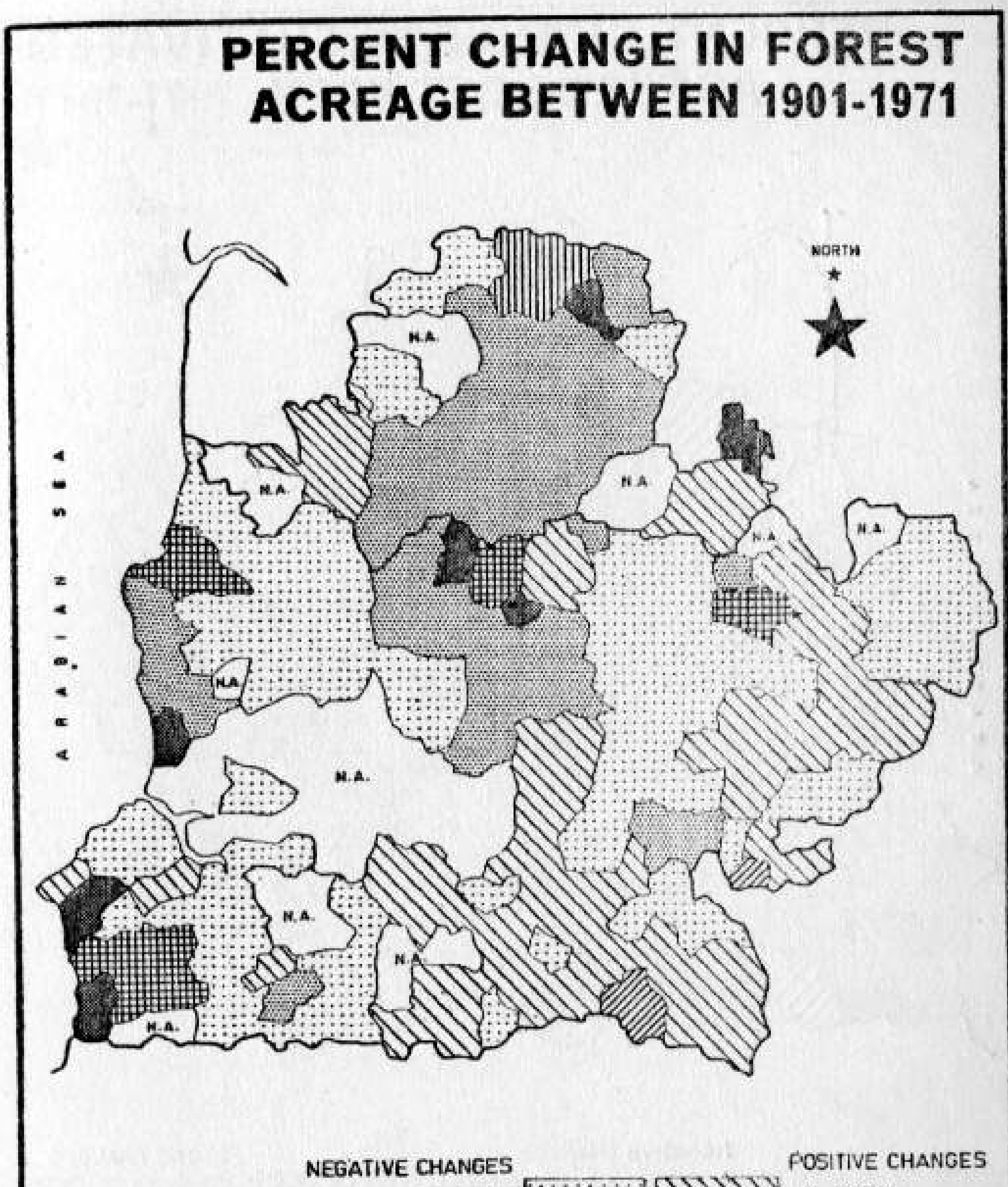
The most striking trend obviously in the landuse pattern has been increase in cultivable wastelands. An isolated pocket of increased cultivable wastelands in northern Dahanu exists around Dabchari village which has come under a government sponsored milk plant whereby all lands have been classified as cultivable wastelands later as pasture lands. A few coastal villages are experiencing salinity problems reducing area under cultivation. But these factors do not explain the general decline in other areas specially in southern Dahanu. It appears that these areas have come under a general phenomena whereby there is a deliberate underutilization of cultivated land in assured rainfall areas by large landowners and absentee landlords, due to tenancy regulations.

It is suggested that the extension of cultivated land in the interior areas is largely a result of Warli population growth and movement, whereas reduction in other areas is due possibly to forces acting against tribal processes i.e. of non-tribals. The change brought about by non-tribal population is not by mere population growth but by a subtler economic change by imposing commercial market gardening and extensive grass cultivation with tribal manpower as its base.

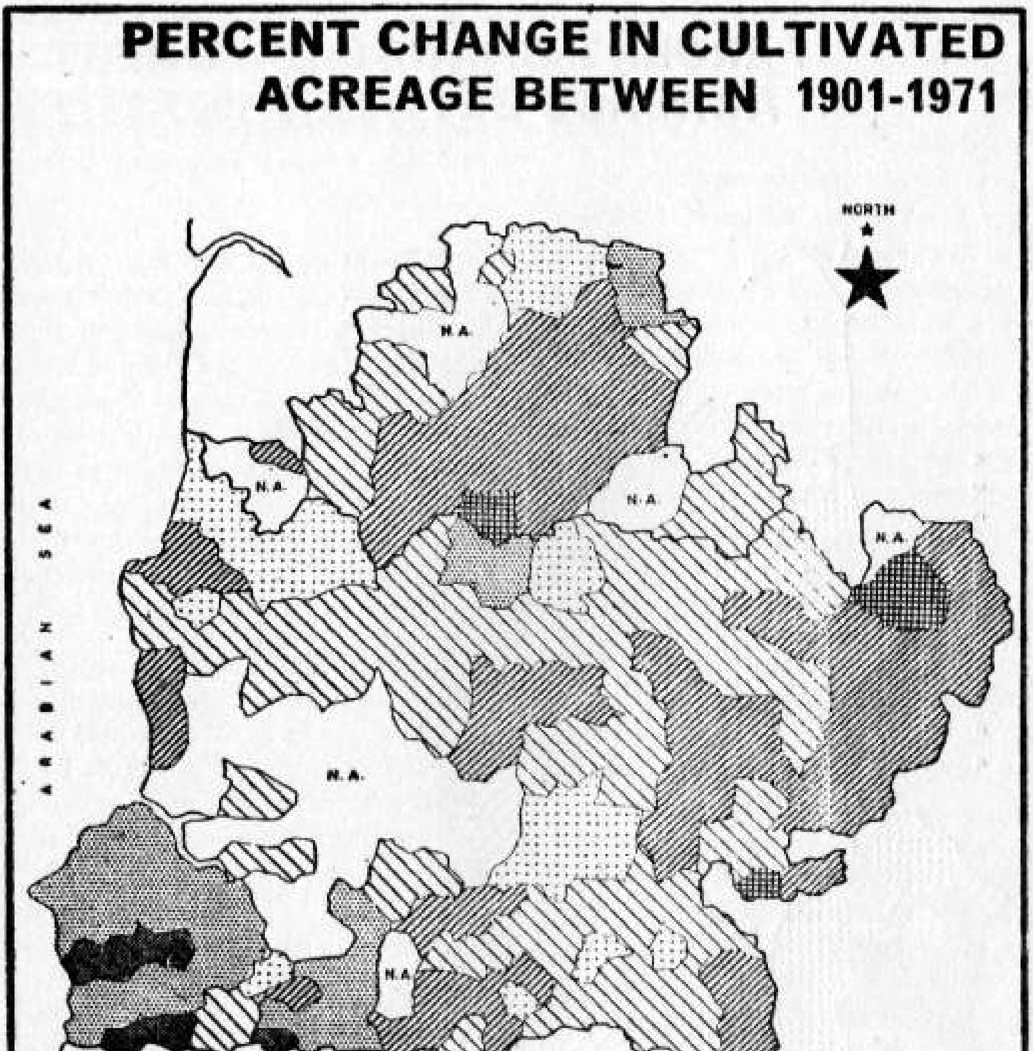
The non-tribals economic system began with the exploitation of forests, gradually shifted over to paddy lands by appropriation of tribal lands by usury, debt liabilities incurred during years of famine before 1957. In the post—Independence period, tenancy regulations did restore some ownership of lands to the Warlis. But the growth of metropolitan Bombay effected a change in the cropping pattern from paddy to commercial grass (for Bombay city's milk supply) specially grown on varkas lands. Due to this change there exists demand for varkas lands and alienation of hill land continues to this day.[6] The

5. The thesis by the author has dealt this aspect in greater detail : "The Changing Tribal Environment and the Role of Innovations—A Case Study of the Warli Tribe, Thane District, Maharashtra".

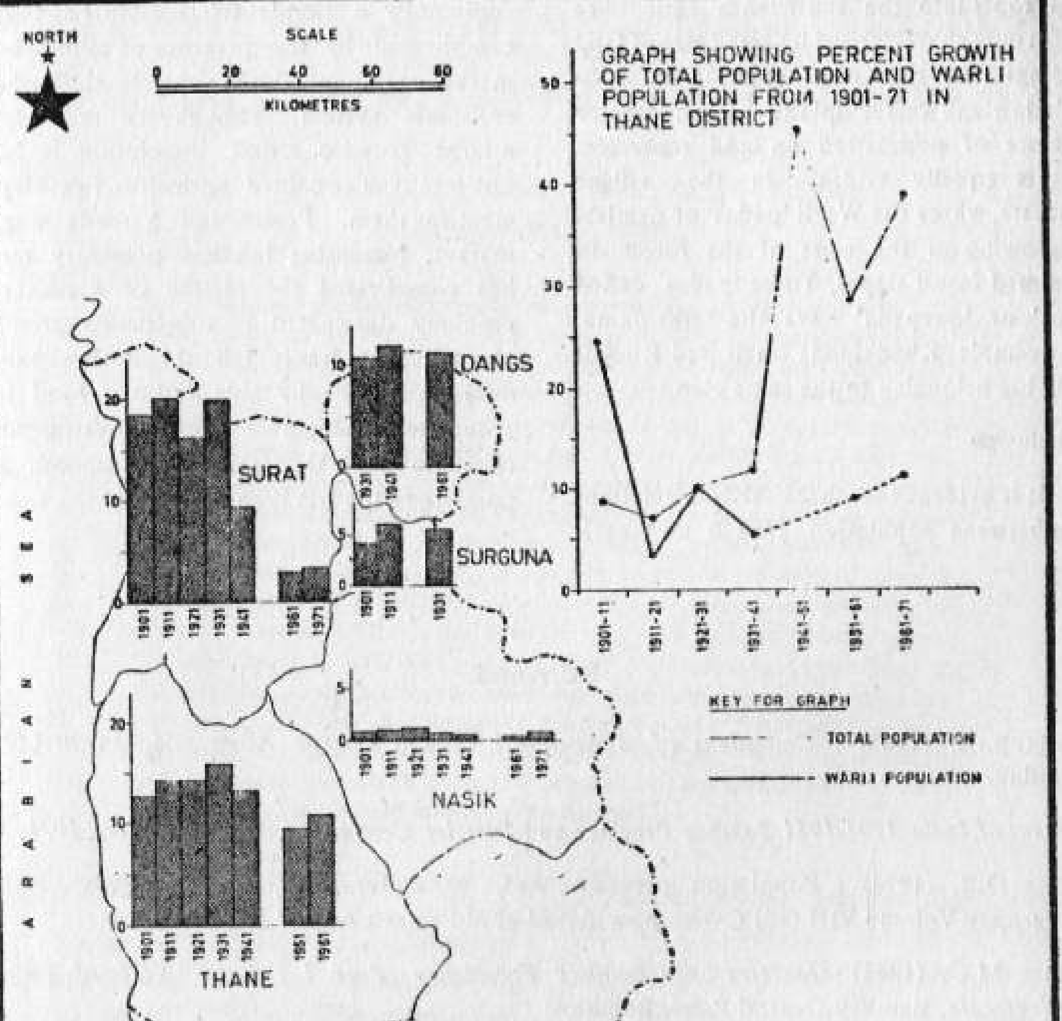
6. That there has been an increase in the transitional belt is borne out only indirectly by study of changes in the occupational categories. The transitional region represents an area of fairly steady cultivation by Warli peasants with less land alienation in recent years and also the region where land legislations were successful in restoring land to the Warlis The Warlis here have also adopted irrigation which has attracted migration towards this area evidenced by an 100-300% increase in agricultural labour between 1961-1971.


PERCENT CHANGE IN FOREST
ACREAGE BETWEEN 1901-1971
NORTH
ARABIAN SEA
N.A.
NEGATIVE CHANGES
0 20%
21 60%
above 60%
POSITIVE CHANGES
0 20%
21 60%
60% and above
SCALE
0 5 10 15
KILOMETRES
NOTE: N.A. = DATA NOT AVAILABLE

Map No. 5


PERCENT CHANGE IN CULTIVATED ACREAGE BETWEEN 1901-1971
NORTH
ARABIAN SEA
N.A.
N.A.
N.A.
N.A.
N.A.
N.A.
Key:
NEGATIVE CHANGES
POSITIVE CHANGES
0-20%
0-20%
21-60%
21-60%
above 60%
60 and above
SCALE
0 5 10 15
KILOMETRES
NOTE: N.A. = DATA NOT AVAILABLE

Map No. 6



HISTOGRAM SHOWING PERCENTAGE OF WARLIS TO TOTAL POPULATION FROM 1901 TO 1971 IN WESTERN INDIA

tentacles of commercialization have taken deep roots into the subsistence agriculture system now characterised by small size of land holdings (less than one hectare), unfavourable lowland versus upland ratios, greater pressure of population on land resources. This is equally evident in the village structure, where the Warli 'padas' or hamlets are growing on the edge of the forest on reclaimed forest slopes. These 'padas' called 'nava' or 'navpada' have the same name. For example Khadkipada small and Khakdi pada big belonging to the same clan.

Conclusion

It is evident that there exists a relationship between population growth and agricultural change. In the case of the Warli community a simple relationship has been complicated by the presence of non-tribal market economy which controls the tribal economic system. Though the area has a large growing tribal population it has not meant a sustained agricultural development for them. Presence of a ready wage market, increasing landless peasantry etc. has complicated the picture of a peasant economy dominated by subsistence agriculture based on family labour. Both economies exist side by side and the road to economic development lies in governments efforts to make this transition as smooth as possible to the tribal communities.

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DYNAMICS OF POPULATION GROWTH BUNDELKHAND REGION-A CASE STUDY

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The rapid growth of population together with its growing imbalances in different regions of the country causes great anxiety resulting into economic, social and political conflicts and posing a threat to the already low standards of living. The most important characteristic of population is its dynamic and consequently changing nature. The population growth in any region is the result of three interacting processes, namely births, deaths and the migration. The Bundelkhand region with unique geographical personality has much varied and significant historical-cultural background too. On the basis of the analysis of population growth of Bundelkhand region for the last eighty years, three distinct stages of the growth can easily be recognised : decades of decrease (1901-21), decades of moderate increase (1921-51), and ultimately decades of rapid increase (1951-81). It has also been seen that the distribution of growth is quite uneven, with many areas gaining population by higher rates of change than the regional average while some other areas experiencing lower rate of change. The total population of the region in 1981 (80,37,206 persons) is expected to reach a figure of 97,97,000 in 2001. This rapid growth of population will create enormous pressure on the resources of the region, slowing down the pace of economic development.

Introduction

Any change in the size of a population group, whether increase or decrease, is usually called growth. The population growth of any region is the result of three interacting processes, namely births, deaths, and the net migration.

The population growth of a region can better be explained only with reference to different stages of its economic and social development. The society passes through five different stages (David, 1968). The first type of society to evolve was one in which the predominant economic activity was nomadic hunting and food gathering. This was followed by the development of a society in which hunting and food gathering could take place without nomadism. In the third stage, the predominant economic activity was either horticulture or the herding of animals. The fourth stage was characterised by a fully developed agriculture and accumulation of a sufficient agricultural surplus to allow for the settlement of a portion of the population in cities. The fifth stage is one in which the division of the labour becomes very complex.

The region to be taken for the case study conforms to the fourth stage of socio-economic development. The basic purpose of the paper is to analyse the growth of population and its various characteristics in Bundelkhand region.

Study Area

Bundelkhand region-a distinct histo-cultural and geographical unit is a transitional zone between the two major physiographic divisions of India: Gangetic plain and Peninsular India. It lies between the Ganga Plain in the north, the Vindhyan ranges in the south, Baghelkhand in the east and the Udaipur-Gwalior region in the north-west and Malwa region in the south-west. Lying between 24°-26°30 N lat. and 78°10'-81°30'E long, it covers an area of about 50,380 Km^2 and is inhabited by 80,37,207 persons (1981). It comprises the five districts of Uttar Pradesh, i.e. Jhansi, Lalitpur, Jalaun, Hamirpur, Banda and four districts namely Datia, Tikamgarh, Chhatarpur and Panna (excluding Pawai tehsil), and two tehsils-Lahar (Bhind district) and Bhander (Gwalior district) of Madhya Pradesh. Thus, in all, the region spreads over 34 tehsils—22 in U.P. and 12 in M.P. The region has a complex geological structure and its topography is generally rugged and undulating. Due to its transitional location, the spatial and seasonal distribution of precipitation is quite uneven and high rate of evaporation causes serious problem to the agricultural economy and affects the socio-economic conditions of the region.

The region is a less developed part of the country where people are living in low social status with poor economic conditions. Here agriculture is the mainstay of the people, but the region suffers from the inadequacy and inefficiencies of irrigation facilities, in view of modern techniques of farming together with more use of chemical fertilizers and the introduction of improved varieties of seeds. Power is the basic infrastructure for any programme of area development. Bundelkhand is still an underdeveloped region in power resources. The contribution of the industrial sector to the economy of Bundelkhand has been very meagre. Due to a number of factors, such as the lack of various industrial raw materials, shortage of power, inadequate transport and communication facilities, paucity of skilled labour and capital and the lack of entrepreneurs etc., this region remains till today a big void on the industrial map of India.

Growth of Population

It is very difficult to have any correct understanding of population of the Bundelkhand region prior to 1901 because the data in the past were neither properly collected nor maintained. The enumerations were taken only for some special purposes, such as revenue collection and number of men available for military services. Previously the whole region was divided into a number of states and territories and their boundaries and areas were constantly fluctuating and changing. So it was not possible to collect the population data on any uniform pattern.

The history of population growth of the region during the last 80 years has followed multi-variate course. Besides the interplay of birth and death, in-migration also contributed considerably to the population growth. This fact can well be illustrated

Table 1.

Percentage Variation of Population in Bundelkhand Region (1901-81)

Sr. no.	Tehsil	1901-21	1921-51	1951-81	Net variation 1901-81	Annual rate of increase 1901-81		Projected population (in '000 persons)	
						Total	Urban	1991	2001
1	2	3	4	5	6	7	8	9	10
1.	Moth	-9.66	104.26	111.63	290.50	1.48	1.21	249	286
2.	Garautha	14.43	41.84	92.67	212.72	1.29	1.82	235	265
3.	Mauranipur	-2.84	22.38	94.24	130.96	0.99	1.22	252	275
4.	Jhansi	3.15	55.14	104.03	226.52	1.33	1.75	539	611
5.	Talbehat	...	...	...	...	...	0.37	172**	190
6.	Lalitpur	-4.23	35.04	85.94	140.98	1.03	1.78	384	424
7.	Mahroni	-9.61	35.60	80.54	121.30	0.94	*	250	273
8.	Jalaun	0.64	32.20	63.28	117.25	0.92	1.75	379	413
9.	Konch	-2.21	27.69	71.00	113.55	0.91	1.09	243	265
10.	Orai	10 80	40.63	113.62	232.90	1.35	1.98	223	253
11.	Kalpi	0 81	37.81	83.74	189.36	1.22	1.39	246	277
12.	Hamirpur	7.03	42.64	89.88	189.93	1.22	1.83	234	263
13.	Rath	-10.66	37.83	73.68	113.85	0.91	1.47	292	319
14.	Kulpahar	...	...	...	...	...	...	215**	234
15.	Charkhari	-9.79	64.86	30.90	94.66	0.80	1.28	235	254
16.	Maudaha	0.08	65.69	72.41	185.94	1.21	1.40	281	316
17.	Mahoba	1.55	43.13	178.44	304.75	1.51	1.71	290	336
18.	Banda	-4.56	10.74	94.21	105.25	0.86	1.40	397	428
19.	Baberu	-6.62	27.32	91.76	127.98	0.98	*	388	422

Contd......

1	2	3	4	5	6	7	8	9	10
20.	Naraini	-3.32	5.67	108.75	113.27	0.90	0.20	354	377
21.	Karwi	6.47	118.10	88.36	337.43	1.57	1.48	394	460
22.	Mau	0.79	18.34	86.66	122.65	0.95	0.76	157	171
23.	Lahar	-18.95	34.27	71.77	86.92	0.76	1.26	248	265
24.	Bhander	-16.84	0.25	86.82	55.74	0.55	1.05	102	107
25.	Seondha	-13.20	17.40	98.92	102.47	0.85	*	144	156
26.	Datia	-15.32	20.67	83.51	87.51	0.76	0.86	194	211
27.	Niwari	-9.67	29.27	113.51	149.33	1.07	*	234	258
28.	Jatara	-9.66	29.38	99.68	133.36	1.00	*	284	313
29.	Tikamgarh	-14.01	22.68	93.98	104.62	0.86	1.39	289	312
30.	Laundi	0.46	57.24	104.68	223.34	1.32	*	238	270
31.	Chhatarpur	0.46	107.19	81.50	277.78	1.45	1.66	504	579
32.	Bijawar	0.46	22.35	73.92	113.78	0.91	0.98	259	282
33.	Ajaigarh	32.21	58.21	96.73	311.52	1.52	0.92	104	120
34.	Panna	31.89	27.76	117.20	266.03	1.43	1.24	269	309
	Region	-2.88	26.49	89.31	132.58	1.00	1.62	8874	9797
	Uttar Pradesh	-4.02	35.45	75.40	128.03	0.98	1.44	120600	131300
	Madhya Pradesh	13.71	35.98	100.13	209.47	1.30	1.89	58660	65980
	India	5.42	43.67	82.27	176.11	1.21	1.79	764700	860000

Source : Basic data from different censuses of India and District Gazetteers.

* Prior to 1981, there was no urban population in the said tehsils.

** Annual rate of increase - calculated on the basis of district averages.

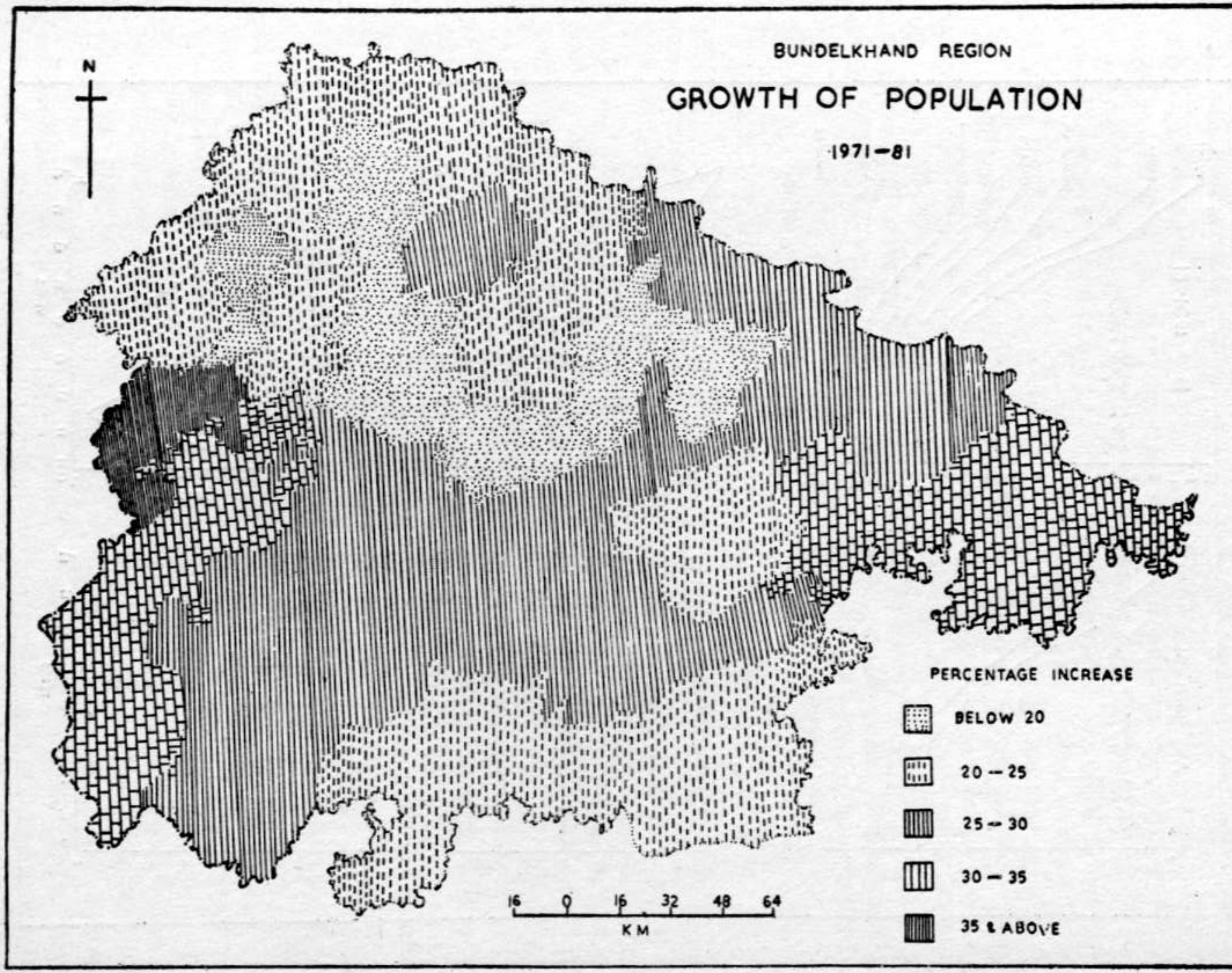
BUNDELKHAND REGION
GROWTH OF POPULATION
1971—81
N
PERCENTAGE INCREASE
BELOW 20
20 — 25
25 — 30
30 — 35
35 & ABOVE
16 0 16 32 48 64
KM

Fig. 1

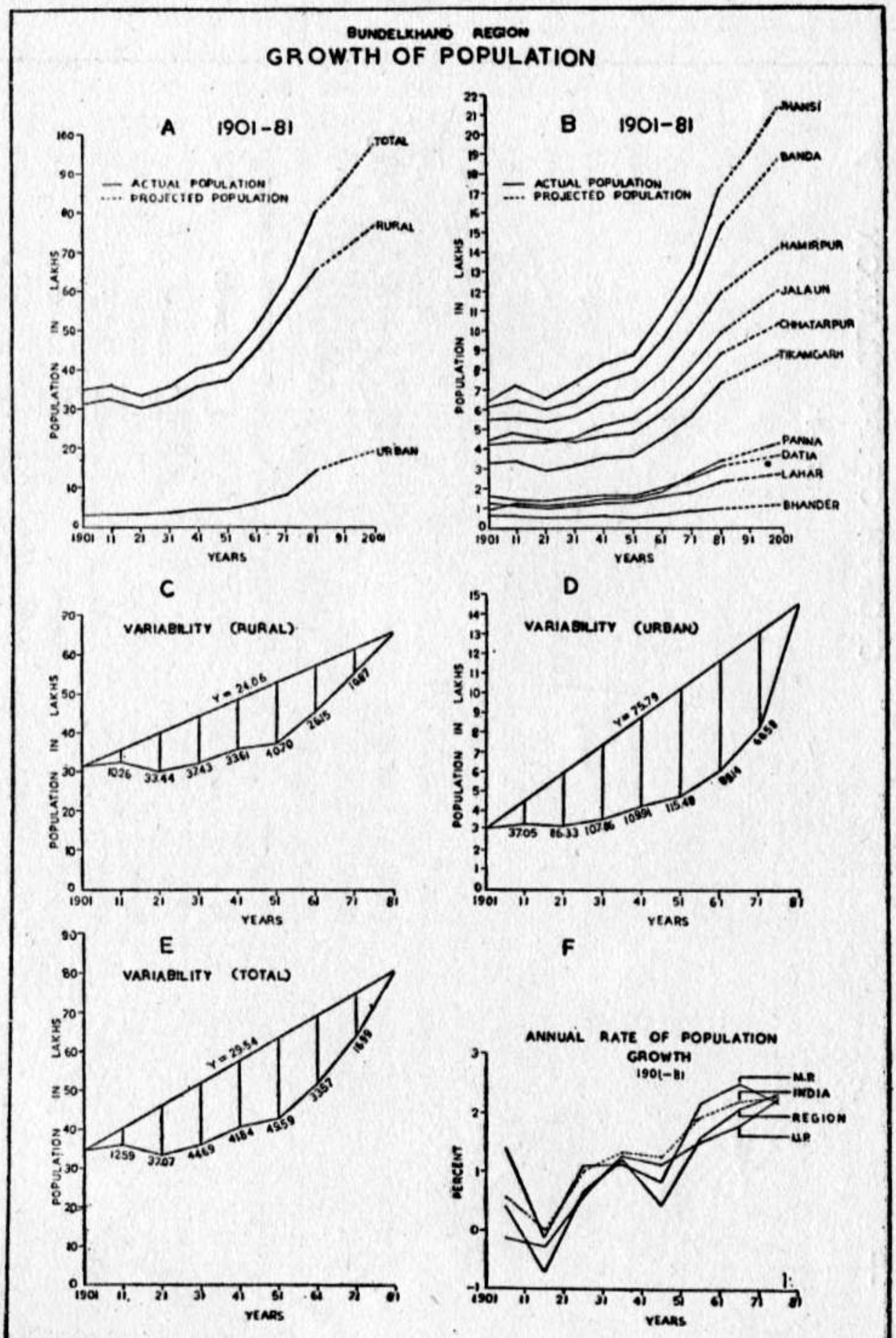
BUNDELKHAND REGION
GROWTH OF POPULATION
A 1901-81
ACTUAL POPULATION
PROJECTED POPULATION
TOTAL
RURAL
URBAN
POPULATION IN LAKHS
YEARS
B 1901-81
JHANSI
BANDA
HAMIRPUR
JALAUN
CHHATARPUR
TIKAMGARH
PANNA
DATIA
LAHAR
BHANDER
C
VARIABILITY (RURAL)
Y = 24.06
D
VARIABILITY (URBAN)
Y = 75.79
E
VARIABILITY (TOTAL)
Y = 29.54
F
ANNUAL RATE OF POPULATION GROWTH
1901-81
M.P.
INDIA
REGION
U.P.
PERCENT

Fig. 2

by examining the growth of population between various censuses from 1901 onwards (Table I, Figs. I & 2A, B). After a close analysis of the decennial growth of population in Bundelkhand region for the last eighty years three distinct phases can easily be worked out, as discussed below.

First Phase (1901-1921)

The first phase is that of progressive decline in line with the all India pattern between 1901-21 causing very slow growth of population. The decrease of population during 1911-21 was mainly due to the first World War (1914-18) and the influenza epidemic of 1918-19.

Between 1901—21 the population showed an actual decrease in Bundelkhand. It was reduced from 34,55,612 (1901) to 33,56,036 (1921) persons accounting for a fall of 2.88 per cent. During this decade Garautha, Jhansi, Orai, Hamirpur, Karwi, Ajaigarh and Panna tehsils experienced relatively higher rates of population growth. In Ajaigarh and Panna, the high rate of growth was mainly due to the increase in area and population caused by the reorganisation of administrative divisions. A few plain tehsils like Moth, Rath, Charkhari, Lahar, Bhander, Seondha and Datia experienced heavy mortality caused by 'plague' and famines. For the region as a whole, the condition of public health was extremely unsatisfactory. Blunt (Census of India, 1911 (a)) had observed that, "bad crops in 1905 followed by a poor harvest in the spring of 1906 led to famine in Jhansi revenue division. In 1907—08 there was a severe famine in the region. The mortality from malaria was greater amongst females than amongst males. Plague which was more serious in 1903, 1904, 1905, 1907 and 1910 also took a heavier toll among the females. Women at the reproductive period of life suffered heavily in particular." The same conditions were also prevailing in parts of M. P. Bundelkhand region. In 1918 and 1919 the region was devastated by the plague, cholera, malaria and influenza epidemics which swept over the region in two waves and carried off more than two lakh people. "Incidentally plague was imported into India from China, first to Bombay, from where it spread to other parts (Ramchandran, 1965). Boys under five years of age being more delicate than girls, suffered severely.

Second Phase (1921—51)

After 1921, the trend of population growth had changed and the next phase of thirty years was the period of recovery of population. This period shows a moderate growth rate of population. This was due to the national political movements and disturbances together with some natural disasters. "In 1946 plague spread over the northern part of the region and in 1948 floods came in the Yamuna and its main tributary river Betwa. The cholera-epidemic appeared in the summer months of the later year of 1950's and gave a setback to the demographic dynamics (Census of India, 1951 (b))". The total population of the region in 1951 was 40,53,837 persons showing an appreciable increase of 26.46 per cent over the previous phase. "The large increase of population was sufficient enough to fill the previous deficits (Om Parkash, 1973). It was during this phase that all the tehsils had experienced positive rates of population growth. The highest population growth (118.10 per cent) was recorded in Karwi tehsil followed by Chhatarpur (107.19) and Moth (104.26) tehsils. As a whole, the health and agricultural conditions in the region were better than in the previous period. However, emigration of people from India to Pakistan during 1947—51 was one of the important factors of slow growth rate of population.

Third Phase (1951—81)

Third phase is marked by more or less an accelerated growth. This rapid growth of population during 1951—81 was attained mainly due to the decline in the death rate. In-migration also contributed considerably to population growth.

The post-Independence period observed a big spurt in the population growth rate, which has certainly been affected by better health conditions, control of epidemics and also efficient handling of famine situation. The rapid decline in mortality, together with fertility remaining almost constant, offers the explanation for the high rate of growth. The population of the region increased from 42,45,382 to 80,37,206 persons accounting for a growth of 89.31 per cent which was higher than the state average of Uttar Pradesh (75.40 per cent) and lower than that of Madhya Pradesh (100.13 per cent). This was mainly because of control over epidemics and infant mortality which were common in the region till the end of British rule. "After 1920, plague was controlled by anti-rat campaign and anti-plague inoculations. To check cholera, inoculation was made compulsory for the pilgrims. Small pox was also controlled by vaccination (Misra, 1977)."

Coming to the inter-tehsil variations in the population growth rate within the region, the tehsil Mahoba recorded the highest percentage (178.44) due to reorganization of the area. Panna tehsil recorded 117.20 per cent of population growth due to the utilization of forest and mineral (diamond) resources. The significant increase was also recorded in tehsils of Orai (113.62 per cent), Niwari (108.75), Laundi (104.68) and Jhansi (104.03). Heavy in-migration of people to these centres in search of employment was also noted.

The rapid growth rate in the region may mainly be attributed to the phased economic development programmes launched during the five year plans. At present most of the urban and rurban centres are connected with the metalled roads. Now at the time of severe famine, drought and flood, food grains can easily be supplied from other parts of the country.

Net Increase

Over the last eighty years, the population of Bundelkhand region has increased from 3.45 million to 8.03 million, recording a net increase of 132.58 per cent as against 128.03 per cent in U. P., 209 47 per cent in M. P. and 176.11 per cent in India. However, at sub-regional levels, this increase shows wide variations. The highest percentage (337.43) goes to Karwi tehsil followed by Ajaigarh (311.52), Mahoba* (304.75), Moth (290.50). Chhatarpur (277.78), Panna (266.03), Orai (232.90),

* 167.84 per cent when the area of newly formed tehsil of Kulpahar is left out.

Jhansi (226.52), Laundi (223.34) and Garautha (212.72). Lalitpur, Kalpi, Hamirpur, Maudaha, Niwari and Jatara are other tehsils which have higher percentage of increase than the regional average (Table 1). Mauranipur, Mahroni, Jalaun, Konch, Rath, Banda, Baberu, Naraini, Mau, Seondha, Tikamgarh and Bijawar tehsils have more than doubled their population. Bhander tehsil with 55.74 per cent growth occupies the lowest position in the region.

However, it may be observed that these changes are not high when compared to national average (176.11 per cent). The real problem in the region is, thus, not associated with net increase in population but with the scarcity of resources and their proper utilization for improving the living conditions of the people.

The region being predominantly rural, the growth pattern of rural population is closer to that of total population. During 1901-81 the percentage variation of rural population was the highest (342.41) in Karwi tehsil, followed by Moth (319.29), Mahoba (280.31), Panna (280.15), Ajaigarh (272.97), Chhatarpur (251.72), Hamirpur (219.50), Laundi (192.39), Maudaha (180.89), Kalpi (179.74), Garautha (173.35), and Orai (145.79). Mauranipur, Lalitpur, Mahroni, Baberu, Mau, Niwari, Jatara and Bijawar tehsils showed the percentage variation above the regional mean (109.22). The minimum growth of rural population was observed in Bhander (47.79 per cent) followed by Lahar (60.30), Jhansi (78.04), Charkhari (81.34), Datia (81.52), Banda (84.54), Seondha (84.90), Tikamgarh (87.04), Naraini (91.18), Rath (96.16), Jalaun (97.67) and Konch (106.00) tehsils.

The growth of urban population shows a different pattern and moved up more rapidly than its rural counterpart. The urban population increased rapidly since 1921 at the cost of rural population. During 1901-21 the urban population showed a positive growth of 3.49 per cent, while the periods of 1921-51, and 1951-81 showed a high urban growth rates of 48.67 and 204.92 per cent respectively. Over the last eighty years (1901-81), the urban population of the region has increased from 3, 10, 674 persons to 14, 57, 477 persons, recording a net increase of 369. 13 per cent as compared to 109.22 per cent of rural population and 132.58 per cent of total population. There were 25 towns in Bundelkhand region in 1901 and the number increased to 28 in 1911; 30 in 1921 and 1931; 31 in 1941; 32 in 1951; 30 in 1961; 37 in 1971; and 74 in 1981. The adoption of a new definition of town in 1961 decreased the total number of towns while urban population increased by 27.00 per cent. The number of towns has been fluctuating since 1901 mainly due to the changing definition of a town at different censuses, but the total urban population has maintained its rising trend ever since 1921.

Now we see that there is no significant difference in the rates of natural increase of rural and urban population. "It is the rural-urban migration that is the main component in the high rate of growth of urban population (Dayal, 1959)."

Variability of Population Growth

Another useful method of assessing the growth trend of population in the region is its variability which is particularly valuable in comparisons between two or more areal units subjected to violent fluctuations (Geddes, 1941). For example, two areas may have equal magnitudes of percentage growth during any given span of time but while one may have experienced a steady increase of population, the other may have passed through all kinds of population vicissitudes (Ray, 1979). Geddes suggested the following formula to calculate the variation indices :

$$Ye = \frac{Yc - Y}{Y} X\ 100$$

Where Yc is the expected population and Y is the actual population. On the basis of the per cent variability mean, per cent variation may be calculated as follows :

$$\frac{d_1 + d_2 + d_3 + d_4 + \ldots\ldots}{N+1}$$

Where d_1, d_2, d_3......are per cent variations; and N is the number.

With the help of the above formula, the variability indices of total, rural and urban population of the Bundelkhand region have been calculated for comparing the actual population curve with its theoretical normal curve. The region has a variability index of 29.54 per cent which is higher than the state average of M.P. (28.03 per cent) and India (26.80 per cent) but somewhat lower than the state average of U.P. (29.55 per cent). The variability index of urban population (75.79 per cent) is much higher than of rural (24.06 per cent) and total population (29.54 per cent) which is quite obvious in terms of fluctuating growth rates during different decades (Fig. 2C,D,E,).

At the sub-regional or district level the variability index of population shows wide variations. The highest percentage (35.19) of variability is noticed in Tikamgarh, closely followed by Datia (33.12), Bhander tehsil (32.81), Lahar tehsil (31.74), Banda (31.19) and Jhansi (29.73) districts. Whereas famines, droughts, epidemics and periodic exodus accounted for these variations in the early part of this century, the improvements in agriculture, irrigation, transport and communication, general economic and health conditions were the main factors in the post-Independence days. On the contrary, the lowest percentage of variability index is noted in Jalaun (25.48) followed by Panna (26.12), Chhatarpur (26.85) and Hamirpur (27.77). This is due to slightly better conditions of agriculture and transport in the northern plain region of Bundelkhand together with the slow growth rate during the recent past. The gap of 9.71 per cent between the highest and the lowest indices represents an overall imbalanced and fluctuating trend of population growth amongst the districts of the region.

Annual Rate of Increase

"Apart from the absolute increase or decrease per annum, one of the most common measures is the annual rate of increase. It is useful rate, and may be helpful in assessing the accuracy of vital and migration statistics" (Clarke, 1972). Various techniques have been adopted for measuring the annual rate of increase of population. The results obtained vary from measure to measure, as the variables taken and the methods adopted are not always the same in all cases. The method followed by the U.N. Demographic Year Book(s) has been more commonly used and is adopted here to measure the annual rate of growth of population in the study region. The said method makes use of the following formula for the purpose :

$$t\sqrt{\frac{P_1}{P_0}} - 1 \times 100$$

Where P_0 is the population at the beginning of the period;

P_1 is the population at the end of the period; and t is the number of years.

The annual rate of increase in total, rural and urban population of various tehsils of Bundelkhand region for the last 80 years have been calculated in accordance with the above formula (Table 1). As the region is predominantly rural, the annual rate of increase of rural population (0.88 per cent) is closer to that of total population. The average rate of increase for the region comes to 1.00 per cent which is lower than that of Madhya Pradesh (1.30 per cent) and India (1.21 per cent) but higher than the state of Uttar Pradesh (0.98 per cent) However, the urban growth rate (1.62 per cent) is much higher than both the total as well as rural growth rates.

The annual growth rate of population is not uniform throughout the region. It is maximum (1.57 per cent) in Karwi followed by Ajaigarh (1.52), Mahoba (1.51), Moth (1.48), Chhatarpur (1.45), Panna (1.43), Orai (1.35), Jhansi (1.33) and Laundi (1.32) tehsils, all exceeding the regional, state and national averages. These tehsils are having comparatively better agricultural land, farming techniques, irrigational, transport and communication facilities, improved sanitary conditions and mineral resources. Bhander tehsil recorded the lowest (0.55 per cent) annual rate of increase in the region. As Talbehat and Kulpahar tehsils came into existence in 1981 census, the study of their annual growth rate could not be possible. However, calculated on the basis of concerned district averages, their growth rate would be 1.01 and 0.93 per cent respectively. The annual growth rate of population of Lalitpur, Mahroni (Lalitpur distt.), Charkhari and Mahoba (Hamirpur distt.) tehsils after excluding the area of newly formed tehsils of Talbehat (Lalitpur distt.) and Kulpahar (Hamirpur distt.), would be 0.61, 0.76,-0.084 and 1.14 per cent respectively, which seems to be deceptive. The annual growth rate calculated for the total original area would be 1.03, 0.94, 0.80 and 1.51 per cent, respectively.

The annual growth rate of urban population shows a different pattern. As is evident from Table 1, urban population increased by 1.62 per cent annually which was much faster than the general growth rate. The maximum growth rate of urban population was recorded in Naraini (2.00per cent) followed by Orai (1.94), Hamirpur (1.83), Garautha (1.82), Lalitpur (1 78), Jhansi and Jalaun (1.75) and Chhatarpur (1.66). These tehsils have big industrial and commercial centres of the region. The curves drawn (Fig. 2 F) for the decadal growth rate of population in Bundelkhand region together with U.P., M.P. and India - show a striking similarity. In all the cases population shows a continuous increase except in the period during 1911 to 1921, when the population decreased at the rate of 0.69, 0.31, 0.14 and 0.03

per cent respectively. The curve drawn for Madhya Pradesh shows a decreasing trend during 1971-81. "The incidence of plague and influenza have affected all parts of India, during 1901 to 1921, resulting in either an actual decrease of population or at best in a small net increase (Ram-Chandran, 1965)." Thereafter, the growth rate registered a remarkable increase. During the period 1941-51, the growth rate showed only a slight increase (0.46 per cent). The period extending from 1951-81 shows a higher growth rate mainly due to the marked improvements in hygienic conditions, better agricultural harvest, improved transport facilities and growing trends of urban and industrial developments in the region.

Population Projection

The estimated growth trend of future population is termed as population projection. An estimated future population of any region greatly helps the respective governments or other institutions in planning for future. Population forecasting is one of the most complicated processes as it is based on a number of assumptions. "Population forecasting is not a simple matter, it would not be correct to think that the trouble lies only with the technique of forecasting. Our real limitation is the factors on which we base our assumptions regarding the future trends in fertility, mortality and migration" (Agarwal, 1977). As there is no sure way of correctly predicting the future trends of fertility, mortality and migration, some of the projections turn out to be far away from reality. (Ganett, 1909) aptly comments that, "One or two of the predictions have by accident, hit very near the truth......but all have been finally wide of the mark."

Our projection of future population of Bundelkhand rest on the following two basic assumptions :

(i) The continuous population growth for the last 60 years or so (1921 onwards) itself indicates that the future trend would be one of the accelerated population growth.

(ii) After the analysis of the trends of birth and death rates, it appears that there is hardly any prospect of substantial fall in the birth rate and more so the falling trend of death rate is likely to be maintained. Thus, there is every possibility that this increasing trend of population growth would considerably be maintained in coming future. "The progressive vital rates of birth and declining vital rates of death are sure to produce the progressive age and sex composition of our population with still more potentialities of excess of births over deaths as to result in a large size of population in future (Om Prakash, 1973, p. 82).

Now, the expected population of the region at the end of the century (i.e. 2001) have been mathematically calculated (Table 1) using the following formula as given by Gibbs (1966) :

$$A = P\,(1+r/100)^t$$

where A stands for projected population,
P stands for existing population,
r is the annual average growth rate, and
t is the time interval between A & P.

The total population of the region in 1981 (80,37,206 persons) is expected to reach a figure of 88,74,000 persons in 1991; and 97,97,000 persons in 2001 (Fig. 2 A & B). This rapid growth of population undoubtedly would put enormous pressure on the resources of the region slowing down the pace of economic progress. Bundelkhand being predominantly an agricultural region, where about 90 per cent population depends on agriculture, the danger of population outstripping the means of subsistence in future decades is very obvious. This will create very high pressure on the limited cultivable lands and force the people to migrate towards the urban centres (push economy), bringing about storming unemployment situations everywhere. Family planning is left as the only way out to control and manage the population. Agro - industrial development of the entire region should equally be emphasised to cope with the growing population.

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SOME NEW TEXTBOOKS IN POPULATION GEOGRAPHY IN THE WEST

Reviewed by Amrit Lall

During the earlier stages of the growth of population geography as a distinct subfield of geography, the choice of textbooks was limited both in quantitative and qualitative terms. Also as a discipline, the emphasis was rather heavy on the distributional aspects, considered important in the areal differentiation context. From late 1970's, in response to a growing trend in geography towards a process-oriented analysis of spatial patterns and phenomena in closer integration with cognate social sciences, population geographers have also made important strides by adopting analytical approaches, emphasizing the formative processes particularly in the examination of demographic factors like mortality, fertility and migration. This approach, that brings population geography closer to demography and other social sciences, is strongly reflected in some of the new textbooks which provide a challenging fare to serious students who are looking into the formative processes behind spatial patterns. These developments in textbooks augur well for the future of population geography.

The appearance of several new textbooks on population geography since 1979 is a definite evidence of the maturation of the discipline as a distinct, systematic field of geography at the university level. For some years, after Trewartha's (1953) forceful advocacy for population geography, there was a dearth of suitable, formal textbooks for the courses that were established at several university departments. During this period of germination, teachers and students had to rely on a variety of textual materials from diverse sources, not geographical in all cases, and also on some selected geographical journals. During mid-1960's, and early 1970's some formal textbooks (Clarke 1965; Beaujeu-Garnier, 1966; Trewartha, 1969) and some reference books and supplementary readings (Zelinsky 1966; Demko *et. al.* 1970) met a growing demand. Even though each of these had its strengths, the choice was limited and these were becoming dated, despite several new editions and reprints. Moreover their focus, with the exception of Demko *et. al.*, was primarily on two central geographical themes: first, distribution patterns of population numbers and their characteristics within the framework of the prevailing concept of areal differentiation, and second, on the ecological implications of population numbers and their growth in relation to resources, food supplies, environment and development. While this emphasis on these two themes was, and still is, considered legitimate in order to distinguish population geography from demography, it did lead to a certain neglect of some basic demographic processes and analytical techniques that could have proved a source of strength to the discipline. During the last two decades, as human geography started developing analytical sharpness and theoretical approaches towards explanation of spatial phenomena and patterns, the need to investigate the formative processes underlying these patterns has been emphasized. This trend has also generated increased integration of various branches of human geography, particularly urban, cultural, and economic geography, with other closely-related social sciences. It was indeed appropriate that population geographers should also show increased awareness of analytical, process-related demographic concepts, models and techniques to explain spatial variations. Demko *et. al.* in their selection did attempt to bring out this process-oriented-thrust. This change in approach is certainly reflected in the new text-books, some of which reveal a strong emphasis on demographic and quantitative approaches, thus drawing population geography closer to demography and other social sciences. This is indeed opportune, since population issues do not belong to the domain of any one social science and are most effectively examined only in a closer integration with different concepts and findings of related specializations.

In this review of the recently published textbooks, an attempt will be made to evaluate these for their overall quality as textbooks in population geography, and particularly for their effectiveness in exposing geography students to demographic concepts, techniques and quantitative analysis.

Peter and Larkin (1979) in a brief, non-technical text-book, that would appeal mostly to neogeographers and non-specialists, discuss at length the major demographic processes : mortality, fertility and migration. Using a variety of tabulations, graphs, and maps and drawing upon materials from other related disciplines, world patterns of mortality, fertility and international migration are brought out. The discussion of migration and mobility is presented in a conceptual framework but while considerable space is devoted to international migrations, very little is said about internal migrations for no good reason. The treatment of population, environment, and food supplies is fairly objective and analytical, trying to find a balance between extreme positions of Malthusians and prophets of doom, like Ehrlick, Club of Rome, Hardin, and Paddocks on the one hand and the opposite views of Cole, Commoner and Brown. The discussion of population growth, demographic transition and various alternative explanations for changes in fertility behaviour is well conceptualized and organized. However, one wonders why the very well-regarded model of Boserup fails to find a place anywhere in these discussions. The treatment of population distribution and its composition is also rather inadequate, and little is done to expose geography students to the demographic and statistical techniques as applicable to a geographic treatment, particularly at regional and sub-regional levels.

Woods (1979) offers a concise volume that certainly cannot be considered as a formal textbook on population geography nor does it claim to be one. Having a strong feeling that geographers in their pre-occupation with distributional patterns had neglected demographic processes, concepts and techniques, Woods has tried to narrow the gap between the two. In general, it is a well-written discussion of the demographic-statistical techniques that apply to the dynamics of mortality, fertility and migrations. It also covers models of population structure and regional population projections. It is a well-documented study with nearly 16 pages of bibliographic references drawn from all related disciplines. The volume, while primarily designed to expose geographers to demographic techniques, would also make non-geographers aware of the geographer's spatial concepts and approaches. It would certainly prove useful as a reference to those geography students who intend specializing in spatial demographic analysis at regional and sub-regional levels, particularly in the context of regional and local planning.

Hornby and Jones (1980) in a concise introductory volume focus mainly on two themes : population growth and distribution and population mobility. In each case, a general examination of the main patterns and components on the world scale is followed by case studies focussed on countries from both the developed and developing worlds. These case studies could be considered as the most effective pedagogic feature of this text for the level it is meant. There is also a clear and well-organized discussion of the Malthusian theory and the opposing viewpoints in the context of population - resources - technology - survial debate and the concept of optimal population. Migration, the second theme, is also examined conceptually in a geographic framework, relating it to the processes and patterns responsible for it. This is followed by interesting case studies of migration patterns in selected areas, such as regional and local migration in England and Wales; migration in the U.S 1960-1970; migration in East Africa; rural migration in the sertao of North-east Brazil; labour migration into Western Europe. The volume, however, has its shortcomings, especially as a university-level textbook. It is certainly not comprehensive enough in its coverage as it fails to get into population composition, structure, and even elementary demographic and statistical techniques. It also does not introduce students to the scope and purpose of population geography as distinct from other social science approaches to population studies. A large section of Chapter 2, devoted to disease and population is, in effect, nothing but a brief introduction to medical geography but the authors have done little to integrate it into the main theme of the text, particularly in relation to the contemporary mortality rates, population growth rates, and changes in distribution patterns. In general one could consider parts of this book as a supplementary reading in an introductory college-level course in population geography in India.

Huw R. Jones' (1981) volume marks the emergence of a comprehensive, well-documented, and mature textbook attuned to the needs of modern times, designed to introduce statistical techniques and demographic concepts into geography. Among its strong points are : its well-organized discussion of the geographers' domain and particularly that of population geographers, which stands out not only in Chapter 1 but in almost every chapter; it is extremely well-illustrated and well-documented, with 31 pages of relevant bibliographic references including several research studies by geographers; it is balanced in its topical coverage, though spatially it has a heavy focus on the U.K. and Western Europe; its use of statistical analysis and an examination of behavioural aspects of population dynamics, particularly in the field of migration studies. In its approach, mortality, fertility and migration are first examined in their world patterns and then in smaller areas and regions. Medical geography is introduced as an integral part of the chapter on mortality backed by relevant case studies from the U.S.A., U.K. and Sri Lanka. Again in a well-documented discussion of fertility, spatial and temporal patterns are examined in the developed and developing countries separately. Here, the author is honest enongh to admit that the spatial approch was even adopted by non-geographers, primarily by demographers, with a view to testing hypotheses on the relationship between fertitility and socio-econmic factors. Two short chapters, that are conceptually strong in the spatial perspective, on population growth, theories, problems and policies are uselful even though not exhaustive enough. The discussion of internal migration is conceptually well organized and comprehensive, looking at different mechanistic gravity models, multiple-regression models and probablistic models focussing on volume, direction and distance differentials in aggregate migration flows. Also adequate space is devoted to the micro-modelling of behavioural aspects of migration, touching upon the decision-making process in the Mover-Stayer dichotomy. International migrations receive adequate coverage in a separate chapter. Among some of the shortcomings of the volume are its lack of focus on the patterns of population distribution, composition and structure except where such a discussion is germaine to mortality and fertility differences. In conclusion, Jones' volume is an adequate textbook for the undergraduates, majoring in geography, and even could be useful for graduate students as a reference. It is a defini ive exposition of population geography exposing students to quantiative analysis and theoretical concepts in order to look for explanations for regularity and order in an otherwise confusing world of man.

Next on line is Schnell and Monmonier's (1983) volume, in the same genre as Jones, although more comprehensive as an intermediate level population geography textbook "for students in geography as well as for environmental and social scientists, planners, and marketing experts with an interest in population". It also adopts a spatial-demographic and quantitative approach in exploring population size, composition and distribution-the end products of an interplay of various demographic and non-demographic factors. The spatial distribution of population, missing in Jones' volume, finds a respectable place (two chapters), after a well-organized discussion, in Chapter I, of the scope, purpose, and approaches in population geography. This is followed by two chapters on population growth, history, theory (focussing on Malthus, Boserup, Simmon and others), models of future growth, and selected case studies of population growth patterns in the world's developed and developing nations, United States, the Northeastern U.S., the Southwest U.S., particularly in relation to legal and illegal migration from the south of the U.S. border. The discussion of fertility and mortality patterns with a special focus on the U.S. is quite investigative, although world patterns are rather briefly reviewed. Interesting as an example of the geographers approach is a look at the mortality rates at four area levels, viz., the U S A., the Southeast U.S., Pennsylvania, and the Anthracite Belt in Pennsylvania. The chapter on internal migrations, though conceptually well developed and sound, completely ignores the migration patterns in various world regions, and is oriented towards the U.S. The chapters on population composition, characteristics and growth again highlight the pattern in the U.S., with a sketchy examination of age-sex structure and growth patterns in the major world regions and selected countries. The last chapter on Population, Resources, Environment : Policies and Programs, draws rather too heavily on the Global 2000 : Report to the U.S. President, (1980) in its review of the present and future prospects —a report that has been flawed as an extremely pessimistic view along the traditional Malthusian lines, lacking in scientific objectivity. The discussion of population and environment focussed as it is on the U.S., boils down to a discussion of relationship between environment and affluence, consumption patterns and technology and not population as such. The appendices provide some useful materials such as the forms of 1980 U.S. Census of Population, revealing the depth and complexity of one of the most organized census operations in the world, and Population Data Sheets for the World and the U.S.A., issued by the Population Reference Bureau. In general, this publication, with its heavy U.S areal bias, would be least suited to students in India, although it could serve as a useful reference for some of its methodological sections.

Newman and Matzke (1984), the last of the series under review, offer a fairly balanced and comprehensive view of population geography, which according to the authors tries to "probe the interplay of facts, theories, problems, and policies". Their aim appears to be to develop demographic and analytical skills among undergraduates with little or no formal exposure to population studies as well as geography by adopting simple language, bereft of a jargonized style and more complex mathematical equations. However, overall objective appears to be to generate an interest in the geographical approach to and an appreciation of population phenomena, rather than to train a specialist or a professional geographer. Although North America and Europe are the main focus of attention, quite a few useful examples and studies from the non-western world, highlighting the contrast between the developed and developing world, are drawn upon.

In topical coverage, it is almost similar to Schnell and Monmonier's volume, covering population distribution and changes, fertility, mortality, and migration patterns as well as the debate about population, resources, and environment, and population prospects polices, and planning for the future. In the chapter on population distribution, a discussion of various cartographic techniques of representing population and of the changing ecumene in the urban environment is an additional and useful element. Another special feature is a chapter on the politics of population and places within nations. The discussions in the chapters on Population Policy: Formulating the Future and Population Planning: Shaping the Future provide new insights not so adequately covered in the earlier textbooks. A number of Vignettes, highlighting special issues and problems within each chapter are another useful demagogic feature of the text. With its simple, jargon-free style, and a well-rounded organization backed by a fairly comprehensive bibliography, tabulations, maps, and diagrams, this volume could prove to be a useful textbook at the university level in India.

Judging by the number and quality of the newly available textbooks, some of which offer a strong theoretical and analytical approach and develop appropriate links with demography and other cognate social sciences, one can safely feel reassured that population geography has come of age. It is significant that just about the same time when these publications started appearing in the Western world, a pioneer *Introduction to Population Geography* (Chandna and Sidhu, 1980), highlighting the geographical interpretations of population issues in the developing countries, particularly in India and Malyasia, appeared in India to reinforce the new trends. Coinciding with these advances in the domain of new textbooks is the publication of a professional Journal by the Association of Population Geographers of India. All these developments augur well for the future of an important sub-discipline of geography that has come of age.

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