Status of Women and Family Planning : The Indian Case

Education is the key element for improving the status of women and for achieving a reduction in fertility

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The degree of personal autonomy of women in India varies from state to state. Several studies have noted the regional variations in the status of women in India (Karve, 1965; Srinivas, 1978; Mitra, 1979; Dyson and Moore, 1983). Women's personal autonomy is manifested in practices such as veiling (*purdah* or *ghungat*), pressures to get girls married at a very young age (partly to protect their virginity and partly to ensure compliance with parents' wishes in respect of the choice of spouse), denying or limiting educational or employment opportunities to girls, attaching differential values to sons and daughters, restricting the ability of women to control their fertility by pres-

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suring them to produce children (particularly male heirs), restricting their access to information, and economic and health resources etc.

The aforementioned studies indicate that there is greater autonomy for women as one moves from the north of India to the south and from west to east. Regional variations in fertility are fairly consistent over time and follow a more or less similar pattern, the northern states of India having higher fertility than the southern ones, and the western states having higher fertility than the eastern ones (Dyson and Moore, 1983).

The aim of this article is to examine the extent to which the status of women is related to awareness, knowledge and practice of family planning in India. It makes use of both macro-level data for the states of India and data from household surveys and field studies to assess the extent of interaction between the indicators of status of women and indicators of family planning.

By status is implied the extent to which women have control over their own lives and have access to knowledge, economic resources, political power etc. There is no single index of status of women which can reflect all its dimensions.

In determining the status of women, factors such as the role of women in decision making in the family and in the community, their educational status, their participation in social, political and economic activities and their position in the various professions as well as their legal status in terms of marriage, divorce, inheritance etc., should be taken into consideration (ECAFE, 1973).

Family planning can be defined as the conscious effort of couples to regulate the number and spacing of births. Family planning usually connotes the use of birth control but also includes efforts of couples to induce pregnancy. The first task in this study is to quantify those variables before establishing their intercorrelations. Recognizing the limitations of the available data, the following indicators have been utilized.

Indicators of the status of women

S_1 = Proportion of females married in the age group 15-19 years, 1981.

S_2 = Singulate mean age at marriage for females, 1981.

S_3 = Female work participation rate, 1981.

S_4 = Female workers as a percentage of male workers, 1981.

S_5 = Percentage of females in non-agricultural activities, 1977-1978.

S_6 = Female literates as a percentage of male literates, 1982.

S_7 = Enrolment of girls as a percentage of total enrolment in grades 1-5, 1982.

S_8 = Enrolment of girls as a percentage of total enrolment in grades 6-8, 1982.

(*Note:* These indicators are shown in table 1.)

Fertility and family planning indicators

F_1 = General marital fertility rate (GMFR), 1978.

F_2 = Total marital fertility rate (TMFR), 1978.

F_3 = Average number of children per woman (45-49 years of age), 1981.

F_4 = Percentage of couples protected by all methods of contraception, 1987.

F_5 = Percentage of couples protected by sterilization, 1987.

(Note: These indicators are shown in table 2.)

Most of the indicators are straightforward, but a brief explanation is required for F_4 and F_5. The estimates of couples protected are derived by the Department of Family Welfare based on the age distribution of the acceptors and estimation of joint survival ratios of husbands and wives in the different age groups. In essence, they are composite measures based on assumptions regarding survival and attrition. Some measures of the awareness and knowledge of family planning, current and ever-users as a proportion of the eligible couples, and the average open- and closed-birth intervals (as measures of spacing and limitation) would have been more appropriate, but such data are not available on a comparable basis for the different states of India.

In spite of the limitations of the data, these indicators may be taken to show the broad order of magnitude of variables for the different states. Also, the analysis has been restricted to the 14 major states to avoid errors owing to the limited amount of data or lack of them for some areas such as Assam.

In order to assess the strength of the relationship between the regional variations in fertility and the status of women, Spearmans' rank correlations *p* (rho) have been computed as shown in table 3.

Table 1: Indicators of the status of women by states of India

Indian state	Proportion of females married in age group 15-19		Singulate mean age at marriage for females		Female work participation rate		Female workers as a percentage of male workers		Percentage of females in non-agricultural activities		Female literates per 100 male literates		Enrolment of girls as a percentage of total enrolment (grades 1-5)		Enrolment of gas as a percentage of total enrolment (grades 6-8)	
	(1981)	Rank S_1	(1981)	Rank S_2	(1981)	Rank S_3	(1981)	Rank S_4	(1977, 1978)	Rank S_5	(1982)	Rank S_6	(1982)	Rank S_7	(1982)	Rank S_8
Andhra Pradesh	56.23	5	17.26	10	27.87	1	48	1	6.80	3	50	8	41.41	6	34.70	8
Bihar	63.95	2	16.55	13	9.16	10	18	9.5	2.42	8	34	12	29.69	13	21.35	13
Gujarat	26.73	11	19.52	4	11.85	7	22	7	2.15	14	56	4	39.92	7	37.07	4
Haryana	47.62	6	17.84	9	4.82	13	9	13	2.36	9	41	10	34.44	10	26.23	12
Karnataka	36.24	9	19.21	6	19.23	5	34	5	4.94	4	55	6	43.57	4	36.88	5
Kerala	14.13	14	21.82	1	12.79	6	32	6	9.45	1	90	1	48.51	1	47.91	1
Madhya Pradesh	62.18	3	16.56	12	22.63	3	40	3.5	2.27	10	37	11	33.10	12	26.26	11
Maharashtra	38.16	7	18.77	8	24.39	2	44	2	3.85	7	55	6	43.40	5	36.44	6
Orissa	30.76	10	19.08	7	10.88	8	20	8	3.92	6	44	9	39.31	9	33.28	9
Punjab	14.42	13	21.07	2	3.09	14	5	14	2.20	12	65	2	45.00	3	39.48	2
Rajasthan	64.31	1	16.10	14	9.44	9	18	9.5	2.25	11	29	14	25.01	14	19.49	14
Tamil Nadu	22.81	12	20.25	3	22.57	4	40	3.5	7.56	2	58	3	45.60	2	38.76	3
Uttar Pradesh	60.66	4	16.71	11	6.02	11	11	11.5	2.18	13	33	13	33.33	11	26.71	10
West Bengal	37.50	8	19.23	5	5.97	12	11	11.5	4.85	5	55	6	39.62	8	36.27	7

Sources: Proportion of married females is from the 1981 census based on 20 per cent samples from *Family Welfare Programme in India, 1986-87*, page 63; Singulate mean age at marriage for 1981 is taken from *Family Welfare Programme in India, 1986-87,* page 63; Percentage of rural females 5+ in non-agricultural activities is from the NSS 32nd round (1977-78), while other figures relating to employment are derived from the 1981 census; figures relating to literacy and school enrolment are from the *Fourth All India Education Survey*, NCERT 1982.

Table 2: Fertility and family planning variables by state in India

State	Fertility measures						Family planning indicators, 1987			
	GMFR 1978		TMFR 1978		Average No. of children per woman, aged 45-49		Percentage of couples protected by all methods		Percentage of couples protected by sterli-zation	
		Rank		Rank	1981	Rank		Rank		Rank
		F_1		F_2		F_3		F_4		F_5
Andhra Pradesh	153.9	9	4.8	11	4.34	13	35.8	10	32.6	7
Bihar	149.8	11	4.8	11	4.59	12	20.6	14	18.3	13
Gujarat	183.5	5	5.7	4.5	5.15	6	51.0	4	38.0	4
Haryana	177.4	6	5.4	7	6.21	1	53.2	3	30.6	8.5
Karnataka	158.4	8	5.0	8	5.07	8	39.7	7	33.2	6
Kerala	145.3	12	4.8	11	4.99	9	44.6	6	39.0	3
Madhya Pradesh	184.8	4	5.9	3	5.51	3	36.1	9	27.6	10
Maharashtra	133.4	14	4.3	14	4.95	10	54.9	2	42.9	1
Orissa	174.2	7	5.6	6	4.75	11	36.4	8	30.6	8.5
Punjab	186.0	3	5.7	4.5	5.28	4.5	62.4	1	33.9	5
Rajasthan	191.7	2	6.0	2	5.90	2	26.0	12	21.3	12
Tamil Nadu	144.6	13	4.8	11	4.18	14	46.3	5	39.5	2
Uttar Pradesh	207.2	1	6.6	1	5.28	4.5	25.0	13	15.3	14
West Bengal	152.8	10	4.8	11	5.11	7	29.5	11	27.2	11

Sources: GMFR & TMFR are from Registrar General India, *Survey Report on Levels, Trends and Differentials in Fertility,* 1979; Average number of children for women 45-49 years of age is from *Census of India* 1981, Series 1, Paper 2 of 1983 (based on 5% sample); and Family planning indices are taken from *Family Welfare Programme in India,* Yearbook 1986-87, p. 216.

Table 3 : Regional variations in fertility and status of women: Spearman's rank correlation coefficients

	Status indicators	Family planning indicators				
		GMFR 1978	TMFR 1978	Average number of children per woman 45-49	Percentage of couples protected by all methods	Percentage of couples protected by sterilization
		F_1	F_2	F_3	F_4	F_5
S_1	Proportion of 15-19 year-olds married	0.31	0.28	0.28	-0.68*	-0.74*
S_2	Singulate mean age at marriage	-0.34	-0.27	-0.23	0.65*	0.72*
S_3	Work participation rate	-0.28	-0.34	-0.52	0.06	0.48
S_4	Females as a proportion of male workers	-0.53	-0.42	-0.55*	0.07	0.50
S_5	Percentage in non-agricultural activities	-0.52	-0.71*	-0.68*	0.05	0.39
S_6	Female literates as a percentage of male literates	-0.46	-0.67*	-0.32	0.70*	0.84*
S_7	Female enrolment as a percentage of male enrolment (grades 1-5)	-0.51	-0.47	-0.44	0.65*	0.88*
S_8	Female enrolment as percentage of male enrolment (grades 6 - 8)	-0.37	-0.31	-0.32	0.63*	0.80*

Note: * Significant at 5 per cent level of significance.

In all cases the coefficients are in the expected direction. The proportion of females in the age group 15-19 years, which is an inverse indicator of status of women, has a positive relationship with the fertility measures (F_1, F_2 and F_3) and is negatively related to the two family planning indices (F_4 and F_5).† By contrast, the singulate mean age at marriage has a negative re-

† Early marriage of girls is widely prevalent in communities where the autonomy of women is restricted; therefore, the proportion of married girls in the age group 15-19 years can be taken as a proxy for the low status of women.

lationship with the fertility indicators and a positive relationship with the adoption of family planning. The indicators of participation of females in economic activity (S_4 and S_5) have a negative relationship with fertility F_1, F_2 and F_3), but a positive relationship with family planning adoption (F_4 and F_5). The indicators of educational status of women (S_6, S_7 and S_8) are negatively related to fertility (F_1 , F_2 and F_3) but are positively related to family planning adoption (F_4 and F_5). The low correlation coefficients with F_4 may be attributed to the fact that F_4 is a synthetic measure of adoption of various methods.

Even using these rough indicators, analysis shows that there is a definite statistical relationship between women's status and their ability to control fertility. This study confirms the findings of earlier studies by Jejeebhoy, and Bhargava and Saxena using entirely different variables and approaches (Jejeebhoy, 1981; Bhargava and Saxena, 1987).

The Jejeebhoy study showed that the regional variation in marital fertility is highly correlated with the practice of *purdah*, the sex ratios of infant and child mortality, the proportion favouring equal property rights, and the total and non-agricultural labour force participation rates. She also found that the Coale and Trussel Index of fertility regulation (the "m" index) and the ratio of observed to natural fertility are strongly correlated with socio-cultural variables such as the practice of *purdah*, the proportion favouring equal property rights, participation in non-agricultural activities and the proportion of attended births.

Bhargava and Saxena applied multiple classification analysis to survey data on 1,200 married women from Greater Bombay and found that women's education is the main predictor variable in determining the variation in fertility, followed by age at marriage and work participation of women. In the present analysis, the strongest relationship to adoption of family planning is observed for the educational attainment of women, followed by age at marriage and women's work participation, particularly in non-agricultural activities. These findings have important policy implications which will be discussed in the last section of this article.

Evidence from surveys

Although the above analysis suggests that the status of women is one of the most crucial variables affecting reproductive behaviour, one must be cautious about making generalizations based on statistical association, rather than demonstrated causal relationships. Unfortunately, evidence of this type is difficult to obtain particularly in the Indian context. Nevertheless, some surveys and micro studies have thrown light on the association of schooling, work participation, age at marriage etc., on fertility and family planning.

Table 4: Fertility indices according to educational level of women, India, 1978

Educational level		GFR	GMFR	TFR	TMFR
Illiterate	Rural	140.4	167.7	4.74	5.48
	Urban	117.2	144.5	4.00	4.93
Literate but below primary	Rural	122.3	175.9	3.85	4.98
	Urban	106.7	139.1	3.27	4.46
Primary and above but below matriculation	Rural	99.2	198.0	3.61	4.90
	Urban	84.6	146.0	2.61	4.23
Matriculation and above	Rural	81.3	186.4	2.48	4.67
	Urban	75.4	144.1	1.88	4.01
All literates	Rural	111.1	182.7	3.56	4.96
	Urban	88.9	142.8	2.58	4.27

Source: Registrar General, India: *Survey Report on Levels, Trends and Differentials in Fertility*, pp. 6-8.

Association with education

Table 4 shows the association of fertility with the educational level of women based on a national sample. This table shows that there is a marked reduction in fertility with increases in the educational level no matter which index is considered. The total fertility rate (TFR) of literate women is lower than that of illiterate women by 25 per cent in rural areas and 35 per cent in urban areas. The drop is even greater for women who matriculated, the reduction in TFR being 48 per cent in rural areas and 53 per cent in urban areas. Surveys in different parts of the country show reductions in fertility with increasing educational level; the reductions are particularly marked for persons with at least 10 years of schooling (WHO, 1972; Jolly, 1981).

Association with work participation

It is not merely work participation or the lack of involvement in work, but the kind of work a woman does which appears to have a bearing on the reduction in fertility, as is apparent from table 5.

Table 5: Fertility indices according to women's work participation

All India (1978)

Category		GFR	GMFR	TFR	TMFR
Workers	Rural	112.6	148.5	3.85	4.91
	Urban	62.8	103.7	2.25	4.11
Non-workers	Rural	143.3	178.7	4.76	5.61
	Urban	102.3	144.4	3.24	4.65

Age-specific fertility rate, Delhi Demographic Survey, 1980

Category	15	15-19	20-24	25-29	30-34	35-39	40-44	Total
Net working	0.03	0.75	1.62	1.37	0.92	0.47	0.15	5.32
Manual workers	0.01	1.05	1.78	1.57	1.22	0.78	0.21	6.62
Non-manual	0.00	0.31	0.85	0.90	0.53	0.23	0.15	2.97
Total	0.01	0.79	1.64	1.42	0.97	0.52	0.16	5.51

Sources: Data for all India = Registrar General, New Delhi, *Survey Report on Levels, Trends and Differentials in Fertility,* 1979;

K.G. Jolly, 1981, age-specific fertility rates = 123.

It has been observed that non-manual workers have lower fertility than manual workers. The WHO study at Gandhigram showed that women who are engaged in clerical and other "white collar" occupations had lower fertility than other workers, who in turn had lower fertility than non-working women (WHO, 1972).

Association with age at marriage

That there is a definite reduction in fertility with increases in the age at marriage is brought out by the data from the Delhi Demographic Survey. Comparison of fertility levels of women with similar levels of education also shows a decline in fertility with increases in age at marriage; this trend has been observed for all levels of education (Jolly, 1981).

Association with number and sex of surviving children

In the Indian setting, the presence of a child makes a difference in the status of the mother, particularly if the child happens to be a male. If there are more male children, the position of the mother is even better, although

Table 6: Age-specific fertility rates according to age at marriage

Present age group	Age at marriage				All
	Below 16	16-17	18-19	20+	
Below 15	0.03	0.00	0.00	0.00	0.01
15-19	1.44	0.94	0.32	0.00	0.79
20-24	1.66	1.73	1.80	0.98	1.64
25-29	1.39	1.38	1.34	1.26	1.42
30-34	0.87	0.93	0.90	0.95	0.97
35-39	0.53	0.50	0.40	0.59	0.52
40-44	0.13	0.17	0.12	0.31	0.16
Total	6.06	5.65	4.88	4.10	5.51

Source: Delhi Demographic Survey, 1980. K.G. Jolly, 1981.

Table 7 : Percentage of couples practising family planning according to age of wife and number of surviving children

	20-24	25-29	30-34	35-39
Rural				
No surviving son but having:				
One daughter	2.67	3.91	3.48	5.83
Two daughters	2.65	4.70	8.61	4.87
3 + daughters	2.93	4.69	6.44	6.51
Number of surviving sons:				
One son	5.06	8.75	10.96	11.67
Two sons	8.69	15.29	19.36	19.51
3 + sons	16.80	17.99	19.89	20.42
Urban				
No surviving son but having:				
One daughter	7.99	15.65	19.82	9.84
Two daughters	11.58	18.68	15.89	18.39
3 + daughters	15.76	18.65	19.59	19.43
Number of surviving sons:				
One son	13.76	22.84	27.42	30.47
Two sons	21.50	35.15	37.91	36.18
3 + sons	26.15	32.72	24.69	33.72

Source: "Some aspects of practice of family planning as revealed in the NSS" by N.C. Das, *Sarvekshana* [NSS 28th Round (Oct. 1973 – June 1974)], Vol. II, No. 3, Jan. 1979, pp. 126-127.

this cannot be proved satistically (Puri, 1971). Studies in the past had shown a close association between fertility levels and the experience of child loss among women (WHO, 1972; Vaidyanathan and Pisharoti, 1986) but little was known about the association between fertility levels and the number and sex of the living children. However, the National Sample Survey (NSS) in its twenty-eighth round (October 1973-June 1974) obtained that information, which is presented in table 7.

It is apparent from that table that the percentage of couples practising family planning is greater among those with two or more surviving children, particularly if these happen to be boys.

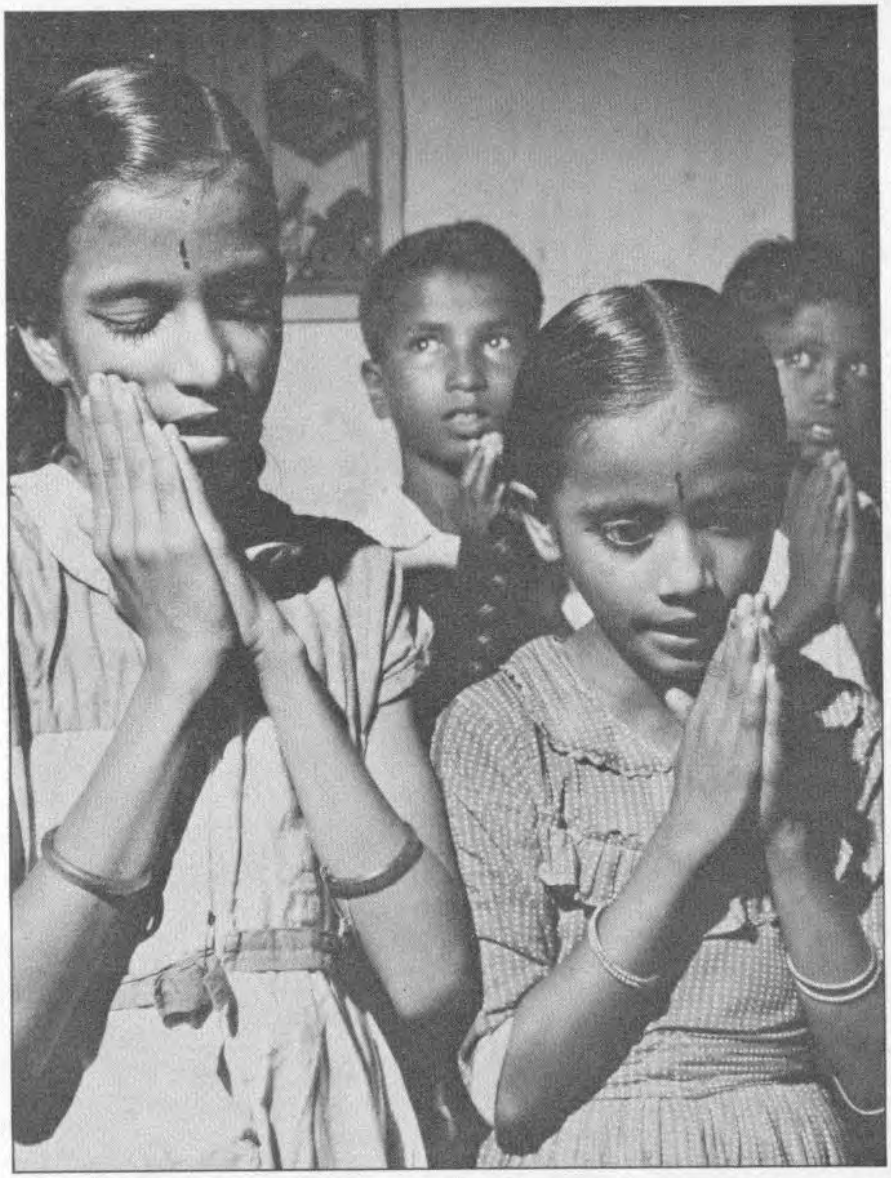
Other aspects related to the status of women

The Council for Social Development (India) carried out a survey in 1972 specificially addressed to the matter of status of women and family planning in three states: Haryana, Tamil Nadu and Meghalaya. The survey covered three districts each in Haryana and Tamil Nadu, and 15 villages and two urban blocks in Meghalaya. A total of 1,872 married women were interviewed using a pre-coded schedule containing 132 questions. The status variables included in the survey were as follows:

- Educational level of the woman and her husband;
- Employment status;
- Economic status as measured by ownership of house, construction rating of the house and possession of utility items;
- Perception of one's status within the home and in the community;
- Decision-making role with regard to domestic affairs and family planning matters;
- Number of restrictions imposed on one's activities and freedom;
- Number of living sons; and
- Frequency of interspousal communication.

Each of these aspects of status was measured by a series of carefully selected and pretested questionnaire items. Likewise, the family planning measures included the following:

- Knowledge of family planning methods;
- Attitude towards the small family norm; and
- Adoption of family planning (users, ex-users and non-users).



These girls from Orissa will have a brighter future than most of their peers in India because they have the opportunity to go to school. Education of females is the key to improving the status of women and for achieving a reduction in fertility. (United Nations photograph)

The strength of the relationships between status variables and family planning variables was analysed by working out product moment correlations (Mukherjee, 1973; Mukherjee, 1974). The main findings of that study are summarized below.

Based on the scores pertaining to status within the community, the study inferred that women in Haryana enjoyed a relatively better position compared with women from Meghalaya and Tamil Nadu. However, women in Meghalaya enjoyed a better position than their counterparts in Haryana and Tamil Nadu in terms of educational level and proportion employed, participation in community life and greater role in decision making in the family. The subordination of women is observed in a variety of restrictions imposed by their husbands, the number of restrictions being apparently greater in rural than in urban areas.

The study also revealed that women's role in decision making in household affairs is positively correlated with the degree of awareness and knowledge of contraceptives as well as adoption of family planning. Women's "perceived status" in the community is positively related to the awareness and knowledge of contraception only in urban areas of Harayana and Meghalaya, but their status within their homes is positively correlated with the awareness and knowledge of contraception in both rural and urban areas. Except in the Meghalaya urban stratum, this status variable was also found to be related to the actual adoption (use or past use) of family planning.

Adoption of contraception was more frequent in the case of those eligible couples who decided jointly about the number and spacing of their prospective children. Interspousal communication was significantly related to the practice of family planning in the three states as well as in rural and urban areas. Surprisingly, the employment status of women showed no consistent relationship with knowledge and awareness of contraception or with fertility. Similarly, education of women had a strong positive relationship with knowledge of family planning, but had no significant relationship with adoption of family planning (Mukherjee, 1973). However, these variables were highly correlated with other status variables.

Policy implications

This study shows that education of females is the key element for improving the status of women and for achieving a reduction in fertility. The 1981 census showed a literacy rate of 25 per cent for females compared with 47 per cent for males. The enrolment ratio of females in primary school (grades 1-5) is on the order of 82 per cent for girls in the age group 6-11 years, while enrolment in middle school (grades 6-8) is on the order of 37 per cent for

the girls in the age group 12-14 years compared with 100 per cent and 63 per cent for boys in the respective age groups.

These figures mask the considerable wastage in education, particularly among girls owing to their dropping out of school. Girls are either not sent to school or are easily withdrawn from school for manifold reasons (Caldwell *et al.,* 1985). The economic motivation for parents to send their daughters to school is less than that for their sons since daughters are not likely to support their parents once they are married. Girls are withdrawn from school because of the cost of education, i.e. direct costs incurred or the opportunity cost of labour foregone. Also, they are withdrawn because of the fear that once a daughter is educated, she must be married to a male with at least an equivalent amount of education. The situation is worsened by the dissatisfaction with the education provided, especially in rural areas.

Therefore, a vigorous thrust is called for on the educational front to make education attractive, meaningful and relevant for girls as well as boys. This should include introduction of more flexible curricula, improvement of the quality of teaching and efforts to reduce the cost of education to parents, so that full enrolment can be achieved.

An increase in the age at marriage is seen to be closely related to the adoption of family planning and consequent reduction in fertility. According to the 1981 census, the singulate mean age at marriage is 18.3 years for women and 23.3 years for men.

The current law prescribes 18 years as the minimum age for women to marry; however, the law is hardly enforced. Consequently, in some states (Andhra Pradesh, Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh) the marriage of girls (below the legal minimum age) is still taking place. The proportion of married females in the age group 15-19 years for these states in 1961 was 62 per cent compared with 43 per cent for India as a whole.

From the point of view of reducing fertility and improving the health of the mother, there is a case for raising the legal minimum age for women to marry to 20 years. However, the mere passing of legislation will not be sufficient unless efforts are made to educate parents and to enforce the law by imposing penalities for default.

Another important factor for the adoption of family planning is employment of women, particularly in non-agricultural activites. According to the 1981 census, only 20 per cent of the female population were in the workforce, and among them only 20 per cent were engaged in non-agricultural activities. More women would join the work force if there were appropriate employment opportunities for them.

This woman physician, who is explaining some of the details about a contraceptive method, has easier access to female patients than would male physicians in India. Health services is one of the areas that is considered an especially appropriate career for women in that country. (United Nations photograph)

There is justification therefore for introducing "positive discrimination" in favour of women in certain types of occupations considered culturally appropriate for Indian women, e.g. catering, secretarial work, health services, education and janitorial services. Furthermore, training should be imparted in skills such as tailoring, food processing, secretarial practices and electronics so that women could acquire the skills necessary for productive work. Also, the Factories Act and the Shops and Establishments Act should be amended, reserving certain kinds of jobs for women, reducing the number of hours they must work, and providing facilities such as creches.

Women's role in decision making, women's "perceived status" in the community and interspousal communication were found to be substantially correlated with fertility behaviour at the micro level. Population education and communication efforts should therefore be directed towards improving women's role in decision making and encouraging inter-spousal communication in family affairs.

The Family Welfare Programme in India currently views eligible women as "targets" and efforts are directed at convincing such women about the bene-

fits of family planning. Consideration should be given to discussions with the couple rather than with the individual, and incentives for acceptance of family planning should be given to both partners. This will also lead to improvement of the "perceived status" of women within the family.

The "perceived status" of the women in the community can be improved by including women in local administration (*panchayat*), strengthening women's associations (*mahila mandal*), and by encouraging the participation of women in the Minimum Needs Programme, employment loan schemes etc.

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Aging in Kerala: One More Population Problem ?

Education is the key element for improving the status of women and for achieving a reduction in fertility

By S. Irudaya Rajan*

India currently ranks fourth among the world's countries in terms of the absolute size of its elderly population; by the year 2000 it will be second only to China. The proportion of the elderly population in India is much higher than in South Asia as a whole. The proportion of those aged 60 years and above in South Asia is 3.9 whereas in India it is 4.8.

In this article, the elderly population is defined as those who have completed 60 years of age rather than 65. The reason for taking 60 as the cut-off

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point is that in both government and private institutions the retirement age falls between 55 and 60 years.

Growth of the elderly in India

Until the year 1951, the sequence of high birth rates followed by high death rates kept the proportion of the persons aged 60 and above at a low level in India. However, since 1951 this population has grown steadily. In recent years, a steady decline in the birth rate has accelerated this aging process. The elderly population in India accounted for 5.6 per cent of the total population in 1971, increased to 6.3 per cent in 1981 and it is likely to reach 7.7 per cent in 2001, according to the Expert Committee on Population Projections for India (Registrar General of India, 1985).

Although the proportion of India's elderly population is small compared with that of any developed country, still it is very large in absolute numbers. In 1961, there were 24.7 million persons above the age of 60 in India. This number increased to 42.5 million in 1981 and is expected to reach 75.9 million in 2001. This would amount to three times India's elderly population in 1961 or equal three times Canada's entire population in 1981 (Chanana and Talwar, 1987).

State-level analysis

There are major differences among the major Indian states in the proportion of the population above 60 years of age. The proportion of the elderly was 6.3 per cent for India in 1981; in no state is this proportion less than 5 per cent (table 1). The lowest proportion is in Rajasthan with 5.3 per cent. The proportion of population above the age of 60 is high in Punjab (7.7) and Kerala (7.6), both of which states are experiencing heavy out-migration. This in itself can be one of the factors that has contributed to their relatively high proportion of the elderly among the Indian states. Although the proportion of the elderly population in Punjab is slightly higher than that of Kerala in absolute numbers, the number of elderly in Kerala is much higher. According to the 1981 census, Kerala had 1.9 million persons above the age of 60 compared with 1.3 million in Punjab.

In view of the above fact, it is appropriate at this juncture to examine the population aspects of aging in Kerala, because several states in India will also follow a similar pattern in the near future. For example, out of 14 major states, 11 show their proportion of the elderly as more than 6 per cent and none is less than 5 per cent. It is reasonable to expect on the basis of table 1 that the problem of aging will become a source of more concern among the other Indian states.

Table 1: Elderly in India: an overview

Major states	Proportion 60 years of age and above (1981)
Andhra Pradesh	6.43
Bihar	6.27
Gujarat	5.60
Haryana	6.28
Karnataka	6.26
Kerala	7.55
Madhya Pradesh	5.98
Maharashtra	6.35
Orissa	6.22
Punjab	7.70
Rajasthan	5.34
Tamil Nadu	6.51
Uttar Pradesh	6.49
West Bengal	5.40
India as a whole	6.27

Source: V.S. Verma (1984). Age Tables Based on 5 Per Cent Sample Data, Census of India 1981, Series – 1, India, Paper 5 of 1984, Controller of Publications. New Delhi (Registrar General and Census Commissioner for India).

Introducing Kerala

Kerala is one of the southernmost states on the sub-continent. It was formed on 1 November 1956 as a result of the reorganization of India's states on a linguistic basis. It takes its name from the word *kerum* which means "coconut" in Malayalam. Among the Indian states, Kerala accounts for 1.1 per cent of India's land area, but it supports 3.9 per cent of the country's population. The population of Kerala was enumerated as 25.5 million in 1981.

Kerala's population is uniformly scattered throughout the state. The population is rather well advanced in its demographic transition, with a high but rapidly declining rate of population growth, a high average age at marriage, a high level of family planning acceptance and fertility control, a moderate decline in the mortality rate and a high degree of population mobility. The population is also fairly well advanced with regard to literacy and educational

attainment, and moderately successful economically: less than half of the labour force is dependent on agriculture and only one third is dependent on daily wages from farming.

Population growth

Until relatively recently, Kerala's rate of population growth had always been higher than that of India as a whole. The population in Kerala state had been rising consistently from one census period to another at rates faster than those experienced by the country as a whole from 1901 to 1971. Only in the period 1971- 1981 did the population of Kerala grow at a lower rate than that experienced in the country as a whole. The principal reason for the higher rate of population growth, particularly between 1941 to 1971, was a substantial drop in the mortality rate without a corresponding decline in the fertility rate. While the death rate declined from 29.1 per thousand in the period 1931-1940 to about 9.0 in 1970-1971 (approximately 20 points), the birth rate in the state declined from 40.0 per thousand to about 31.0 (approximately nine points) during the same period.

During the 10-year period 1971-1980, both the birth and death rates registered further significant declines so that the birth and death rates in Kerala were 25.9 and 6.9 per thousand, respectively, in 1979, but the decline in birth rates was more than twice as steep, measured in terms of percentage points, than that of death rates.

Also between 1901 and 1981, the state's population grew by 292 per cent while that of India as a whole grew by only 191 per cent. For the decade 1971-1981, however, Kerala's annual growth rate of 1.7 per cent was substantially lower than India's rate of 2.2 per cent. Since there is a clear prospect for further decline in Kerala's growth rate, the proportional contribution to the population of India is likely to diminish in the years to come.

Kerala has the highest population density in India with 654 persons per square kilometre as compared with 221 for the country as a whole. The density of Kerala in 1981 was four times higher than what it had been in 1901.

In spite of its very high population density, the state of Kerala has been far ahead of the rest of the country throughout the current century in terms of the percentage of total population that can read and write. Also significant is that over the years the literacy gap between the sexes has been narrowed considerably. The female literacy rate in India is only half of the general literacy rate, but in Kerala the female literacy rate is not only high in itself at 64.5 per cent, but it is also quite close to the male literacy rate of 74 per cent. Moreover, rural-urban differentials in literacy levels are also quite narrow.

It can be seen that not only has the ratio of women to men in Kerala been higher than for the country as a whole throughout the present century but also the ratio has always been in favour of females, unlike for the country as a whole. One of the important reasons that has contributed to the favourable sex ratio is the family organization in Kerala. As is widely known, a substantial portion of the state's population until recently followed the system of inheritance through the female line. What is important to note is that marriage under this system did not call for a change of residence for the woman on her marriage. Unlike in the rest of India, the pressure to subscribe to early and universal marriage was never very strong in Kerala. Factors such as the system of female inheritance, the right of female residence and the right to divorce and remarry if widowed gave women in Kerala a unique status unknown in the rest of India. This special status seems to have had an important impact not only on the female age at marriage but also on the whole texture of the civil condition in the state. Some of these factors go a long way in explaining the favourable sex ratio (Gulati, 1976). It can also be noted that the female age at marriage in Kerala has been rising from decade to decade so that the average age for the state was already close to 21 years in 1971 and 22 years in 1981.

Position of the elderly in Kerala

On the basis of population figures of the various censuses, the proportion of the population aged 60 and above has slowly and steadily increased from 1961 to 1981. According to the 1961 census figures, the proportion of the elderly stood at 5.8 per cent; it increased to 6.2 per cent in 1971 and 7.5 per cent in 1981.

It may be seen from table 2 that the rate of increase of the elderly in Kerala is steadily rising. If the growth rates of the elderly are compared with

Table 2: Age composition of the population, 1961 - 1981, Kerala

Year	Population (thousands)		Proportion aged 60+	Annual growth rate (per cent)	
	Total	Aged 60+		Total	Aged 60+
1961	16 901	986	5.83	–	–
1971	21 346	1 328	6.22	2.33	2.93
1981	25 451	1 910	7.50	1.76	3.63

Source: Census of India reports.

the general population, it is found that between 1971 and 1981 the growth rate of the elderly in Kerala is twice that of the general population. The number of persons above the age of 60 in 1961 stood at nearly one million and this increased to 1.3 million in 1971, and reached 1.9 million in 1981.

Population projections for 1981-2025

The Centre for Development Studies at Trivandrum, India, has prepared population projections for the period 1986-2026; these are used extensively in this article (Mari Bhat and Irudaya Rajan, 1988). Projections for the state of Kerala for the period 1986-2026 are presented in table 3. As can be seen from the table, while the annual growth rate for the general population would decline from 1.5 per cent in the period 1986-1991 to 1.1 per cent in the period 2006-2011 and further to 0.9 per cent in 2021-2026, the growth rate of the elderly population for the same period is expected to be 3.8 per cent in 1986-1991, 3.1 per cent in 2006-2011 and 3.7 per cent in 2021-2026 (table 3). On the basis of those population projections, the elderly population is expected to increase from 2.2 million in 1986 to 4.6 million in 2011 and 8.3 million in 2026. In other words, in the course of 40 years the elderly population in Kerala would have increased by four times, which indicates the magnitude of the problem and also the challenge to planners and policy makers.

Table 3: Projection of age composition of the population, 1986-2026, Kerala

Year	Population (thousands)		Proportion aged 60+	Annual growth rate (per cent)	
	Total	Aged 60+		Total	Aged 60+
1986	27 636	2 158	7.809	1.64	3.78
1991	29 799	2 611	8.762	1.51	3.81
1996	32 097	3 051	9.506	1.49	3.11
2001	34 434	3 503	10.173	1.41	2.76
2006	36 711	3 963	10.795	1.28	2.47
2011	38 882	4 622	11.887	1.15	3.08
2016	40 981	5 652	13.792	1.05	4.02
2021	43 032	6 866	15.956	0.98	3.89
2026	44 984	8 267	18.378	0.89	3.71

Source: Population Projections for Kerala by P.N. Mari Bhat and S. Irudaya Rajan of the Centre for Development Studies, Trivandrum, Kerala.

Table 4: Speed of population aging in Kerala

Population aged 60+ reaches specified percentage of total population (per cent)	Year reached	Number of years required
8	1986	–
10	1996	10
12	2011	15
14	2016	5
16	2021	5
18	2026	5

Source: Same as table 3.

It is also interesting to note the speed at which the population is aging as shown in table 4, which indicates an accelerated pace from 1986 to 1996, followed by a slowing in the rate of increase and then a rapid aging of the population after the year 2011. For example, while the increase from 6 to 8 per cent required 20 years (from 1961 to 1981), the same incremental increase from 8 per cent to 10 per cent is expected to occur in only 10 years (between 1986 and 1996). This process makes clear the term "population aging", a relative increase in the number of elderly persons and a relative decrease in the number of young persons. As distinct from individual aging however, the pattern of population aging is much more complex and less uniform. Although an individual always ages chronologically, human populations can either "age" or "rejuvenate" over time, reflecting changes in the age structure. Subject to changes in fertility, mortality and migration, human populations can undergo aging and rejuvenation alternatively at a different pace.

Factors contributing to population aging

Trends in mortality and fertility

The age structure of a population is governed largely by demographic factors, though these factors in turn are influenced by economic and social conditions. The three factors that contribute to changes in population age structure are fertility, mortality and migration. These demographic factors are reasonably independent of each other. However, based on the experience of developed countries, fertility movements play a primary role in the process of aging; the decline in mortality appears to have played only a seconda-

ry role. Decreases in fertility have generally been followed by decreases in mortality and are a product of the forces of modernization. Though the two components of modernization, i.e. increasing urbanization and industrialization, have not taken place in the state of Kerala, nontheless, declines in fertility, mortality and changes in the age structure have occurred. Therefore, the aging of the population in Kerala differs in some ways from the experience in Western countries.

Since at a given time the age composition of a population depends on past as well as current demographic conditions, the demographic situation in the state of Kerala in the recent past should be reviewed.

Bhat's estimates

Bhat (1987) estimated levels of fertility and mortality indices for Kerala and India for the period 1951-1981 using survey-based estimates of child mortality and census age distribution. The results are presented in table 5. According to those estimates, the crude birth rate (CBR) for Kerala was 43.6 per thousand during the period 1951-1961: it declined to 28.1 per thousand between 1971 and 1981, whereas CBR for India was 47.3 per thousand declining to 36.9 per thousand for the corresponding period. It is also interesting to note that according to the fertility and mortality indices presented in table 5, Kerala consistently had lower levels than that of India as a whole even for the period 1951-1961. The crude death rate declined from 19.7 to 8.6 per thousand between 1951 and 1981 in Kerala, whereas the corresponding

Table 5: Some estimates of fertility and mortality for Kerala and India as a whole, 1951 - 1981

Decade		Crude birth rate	Crude death rate	Expectation of life at birth		Probability of dying before age 5
				Males	Females	
1951-1961	Kerala	43.6	19.7	44.3	45.3	.181
	India	47.3	28.5	36.4	35.7	.292
1961-1971	Kerala	37.1	12.2	54.1	57.4	.128
	India	42.8	20.6	44.1	43.6	.237
1971-1981	Kerala	28.1	8.6	60.6	62.6	.082
	India	36.9	15.3	51.6	50.2	.199

Source: Mari Bhat, P.N. (1987). *Mortality In India: Trends and Patterns.* (Unpublished Ph. D dissertation, University of Pennsylvania, Philadelphia, PA, USA).

decline for India was from a high of 28.5 to 15.3 per thousand for the same period.

Sample registration system

Since 1970, reliable estimates of fertility and mortality are available from the sample registration system (SRS). Sample registration is conducted separately in rural and urban areas of the state every year. The relevant age-specific mortality indicators by sex and place of residence are available up to the year 1985. During the five years from 1968 to 1973, there was a decline of 4.4 points in the birth rate as compared with a decline of only 1.7 points in the death rate. Earlier, it was felt that the death rate was becoming stable though in recent years it has come down to 6.6 per thousand. Around 1973, it would appear that Kerala's population had passed the late expanding stage of a rapid fall in death rates as well as birth rates.

After this period, Kerala's population entered the second "low stationary" stage of demographic evolution, in which death rates remain more or less stationary and births continue to decline rapidly. Kerala has passed this stage also. In recent years, between 1975 and 1984, there has been a reduction of 5.6 points in the birth rate from 28.0 per thousand in 1975 to 22.4 in 1984. The death rate during the same period dropped by only 2.2 points from 8.4 per thousand in 1975 to 6.2 in 1984. As a result, the natural population growth rate declined from 1.96 per cent per annum in 1975 to 1.62 per cent in 1984. For the country as a whole, the birth and death rates were estimated as 35.2 and 15.9 per thousand, respectively, in 1983. According to SRS, the crude death rate for Kerala was 9.0 per thousand population in 1971; it declined to 8.4 per thousand in 1975, 7.0 per thousand in 1980 and 6.4 per thousand in 1985. The percentage decline was at its highest, i.e. 16.7, during the period 1975-1980. It declined further by 8.6 per cent between the period 1980 and 1985. Interestingly, no significant rural-urban differences in those rates could be observed.

Infant mortality rates

The infant mortality rate is considered as an index which measures the quality of life in any given population. Of all changes in the demographic sphere that have occurred in Kerala, the decline in the infant mortality rates is the most remarkable. In reviewing the last 70 years, it is found that the infant mortality rate, which stood at 242 per thousand live births (1911-1920) has been reduced to 30 per thousand live births in 1985 (Gulati, 1984). The major change in this index seems to have occurred during two phases of time, one between 1911 and 1950 and the other between 1951 and 1985 (see also table

Table 6: Infant mortality rates for Kerala and India as a whole

Year	Kerala	India
1911-1920	242	278
1921-1930	218	228
1931-1940	175	207
1941-1950	153	192
1951-1960	128	140
1961-1970	66	114
1971	61	129
1981	37	110
1982	30	105

Sources: *Fact Book on Population and Family Planning*, Demographic Research Centre, Trivandrum, 1974: and *Economic Review, 1982*, State Planning Board Trivandrum.

6). According to SRS figures provided by the Registrar General, the rate was 58 per thousand in 1971 and 30 per thousand in 1985. The percentage decline in the infant mortality rate was 25.9 per cent during the period 1975-1980 and 25.0 per cent during 1980-1985. The corresponding infant mortality rate for India stood at 104 per thousand live births in 1984, which is three and half times higher than that of Kerala.

One of the factors responsible for the rapid increases in the values of expectation of life at birth in the state is the success achieved in controlling infant mortality. There has been a perceptible fall in the infant mortality rate during the last three decades owing to improvements in maternity and child-care facilities. Inoculation and immunization programmes also have been successfully implemented in past decades.

Based on survey data on children ever born and children surviving, Bhat estimated that for the period 1951-1961, 18.1 per cent of children in Kerala died before they completed five years of age, whereas this percentage was 29.2 for India as a whole. In the decade 1971-1981 however, this percentage declined very sharply for Kerala, reaching 8.2 per cent as compared with 19.9 for India (Bhat, 1987). While both infant and child mortality rates have declined in India as well as Kerala, the quantum of decline is much higher for Kerala.

Age-specific mortality rates

The age-specific death rates by sex for Kerala are presented in tables 7 to 9. As can be seen from the tables, all age groups have experienced a

Table 7: Age-specific death rates for Kerala, 1971-1981

Age group	Age-specific death rate			1971	1976	1981
	1971	1976	1981	Index (1971 = 100)		
0-4	24.5	19.2	12.2	100	78	50
5-9	2.3	1.5	1.2	100	65	52
10-14	1.1	0.9	0.6	100	82	56
15-19	1.4	1.0	1.4	100	71	100
20-24	2.2	1.5	1.6	100	68	72
25-29	1.6	2.3	1.7	100	144	106
30-34	3.5	2.9	1.9	100	83	54
35-39	3.7	2.9	2.2	100	78	59
40-44	5.3	4.9	3.6	100	92	68
45-49	7.3	6.5	4.9	100	89	67
50-54	8.8	11.2	10.5	100	127	119
55-59	16.3	17.3	13.1	100	106	80
60-64	23.6	25.3	18.6	100	107	79
65-69	43.5	34.3	32.9	100	79	76
70+	103.8	97.0	86.7	100	93	84

Source: Sample Registration System.

Table 8: Age-specific death rates for males, 1971-1981, Kerala

0-4	24.5	19.1	13.3	100	78	54
5-9	2.2	1.4	1.6	100	64	73
10-14	1.2	0.9	0.7	100	75	58
15-19	1.6	0.9	1.4	100	56	88
20-24	1.9	1.6	1.8	100	84	95
25-29	1.9	2.6	2.1	100	137	111
30-34	4.4	3.0	2.4	100	68	55
35-39	3.9	3.8	1.9	100	97	49
40-44	6.0	6.4	5.7	100	107	95
45-49	7.6	7.8	7.6	100	103	100
50-54	10.8	14.2	14.3	100	131	132
55-59	20.8	23.6	20.1	100	113	97
60-64	24.4	28.0	24.1	100	115	99
65-69	42.1	39.8	38.9	100	95	92
70+	106.7	103.9	93.3	100	97	87

Source: Same as table 6.

Table 9: Age-specific death rates for females, 1971-1981, Kerala

Age group	Age-specific death rate			1971	1976	1981
	1971	1976	1981	Index (1971 = 100)		
0-4	24.4	19.3	11.0	100	79	45
5-9	2.4	1.6	0.7	100	67	29
10-14	0.9	1.0	0.5	100	111	56
15-19	1.2	1.1	1.3	100	92	108
20-24	2.4	1.3	1.5	100	54	63
25-29	1.4	1.9	1.4	100	136	100
30-34	2.7	2.8	1.5	100	104	56
35-39	3.5	2.1	2.4	100	60	69
40-44	4.6	3.5	1.7	100	76	37
45-49	7.1	5.3	2.6	100	75	37
50-54	6.7	8.1	6.9	100	121	103
55-59	11.6	11.0	5.9	100	95	51
60-64	22.8	22.8	13.5	100	100	59
65-69	44.8	29.3	27.2	100	65	61
70+	101.1	91.2	81.0	100	90	80

Source: Same as table 6.

decline in mortality rates between 1971 and 1981. If 1971 is taken as the base year, a great decline in the mortality rates among children and adults can be noted, but this decline is minimal among the elderly. In summary, while there is a substantial improvement in the mortality rates in the age group 0-14 years, there is only a marginal change among youth and a moderate decline in the middle ages and among the elderly.

Sex differentials in mortality

Data on sex differentials in mortality are presented in tables 8 and 9. In 1971, almost all age groups experienced a higher mortality rate for males compared with females. Biologically, females are stronger than males; if there is no discrimination against women, they tend to survive longer than males. This is the case in Kerala. To support this explanation some data are provided on sex ratios (number of females per 100 males) for the period 1901 to 1981 for Kerala and India. The data are available in table 10. It may be seen from the table that the status of women seems to be higher in the case of females in Kerala than in India as a whole. It is also interesting to note that except for the age group 35-39 years, the male mortality rates in Kerala are higher than the corresponding rates for women. Based on the indices calculated for

Table 10: Sex ratio in Kerala and India as a whole, 1901-1981

Year	Kerala	India
1901	1 004	972
1911	1 008	964
1921	1 011	956
1931	1 022	950
1941	1 027	945
1951	1 028	946
1961	1 022	941
1971	1 016	930
1981	1 034	935

Source: Government of Kerala, Series 10, Kerala. 1981.

Note: Sex ratio here is defined as the number of females per 1,000 males.

Table 11: Estimated annual change in age-specific death rates for Kerala between 1970 and 1984

Age group	Males		Females	
	Coefficients	T ratio	Coefficients	T ratio
0	-0.0596	-12.4518*	-0.0596	-12.4618*
0-4	-0.0742	-15.4583*	-0.0843	-12.3971*
5-9	-0.1141	- 2.2774*	-0.0892	- 6.0270*
10-14	-0.1068	- 1.6380	-0.0251	- 1.0546
15-19	-0.0697	- 1.1116	-0.0374	- 1.9684
20-24	-0.1028	- 1.9287	-0.0359	- 4.3780*
25-29	-0.0573	- 1.0977	-0.0158	- 1.0327
30-34	-0.0780	- 1.8014	-0.0686	- 3.6296*
35-39	-0.0664	- 1.6039	-0.0693	- 6.0261*
40-44	-0.0415	- 1.2769	-0.0623	- 3.7988*
45-49	-0.0426	- 1.6772	-0.0613	- 4.0867*
50-54	-0.0146	- 0.6577	-0.0415	- 3.9904*
55-59	-0.0182	- 1.3893	-0.0371	- 2.8760*
60-64	-0.0206	- 3.1213*	-0.0275	- 2.6699*
65-69	-0.0166	- 1.7113	-0.0478	- 4.0855*
70+	-0.0113	0.5736	-0.0207	- 5.5946*

Notes: Estimated by P.N. Mari Bhat and S. Irudaya Rajan of the Centre for Development Studies, Trivandrum.

* = Significant at the 5 per cent level.

1971 and 1981, the decline in mortality rates between 1971 and 1981 was greater for women than men with respect to practically all age groups. Although this is an interesting feature, particularly among females in Kerala, it must be noted that this feature applies just for those two points in time. In order to account for this, the annual change in the age-specific death rates by sex for Kerala is used for the entire period between 1970 and 1984, which is estimated and presented in table 11.

The coefficients are at a significant level for females, indicating that there was a decline in the mortality rates for all age groups, and for males there was a decline only among children; the other age groups had not experienced any substantial decline during the 1970-1984 period.

Analysis of life expectancy

Expectation of life at birth is an important indicator for assessing the overall health situation of any population. There has been a remarkable improvement in the expectation of life in Kerala among both males and females (table 12). Interestingly, even at the turn of this century, expectation of life at birth was not very different for men and women in Kerala. Between 1911 and 1960, the expectation of life had increased by 21 years for males and by 23 years for females.

Table 12: Expectation or life at birth by sex for Kerala

Years	Males	Females
1911-1920	25.49	27.41
1921-1930	29.54	32.70
1931-1940	33.19	35.00
1941-1950	39.89	42.34
1951-1960	46.17	50.00
1966-1970	56.20	60.00
1970-1975	60.80	63.30
1977-1979	63.82	66.91
1978-1980	64.23	67.88
1979-1981	64.71	69.01
1980-1982	66.33	70.71
1981-1983	66.02	71.78

Source: Bureau of Economics and Statistics, Kerala.
Statistics for Planning, 1986. Government of Kerala.

Table 5 provides some decennial estimates of expectation of life at birth made by Bhat for the period 1951 - 1981. These estimates show that the expectation of life at birth has been consistently higher among females in Kerala whereas it is not true for India as a whole. In the period 1951-1961, the expectation of life at birth was 44.3 years for males and 45.3 years for females. A comparison of the values of the expectation of life at birth in Kerala and India as a whole reveals that in all the decades the values of expectation of life at birth in Kerala are much higher than that for India as a whole.

It would appear that people in Kerala have all along been enjoying a better and healthier life than people in other parts of the country. The expectation of life at birth for females is also higher than that of males, as is the pattern in developed countries. In the period 1971-1981, the expectation of life at birth was 60.6 years for males and 62.6 for females. The percentage increase in the expectation of life at birth between 1951-1961 and 1971-1981 was 37 per cent for males and 39 per cent for females. Among all the states of India, longevity is highest for Kerala, both for men and women.

The expectation of life at various ages as assumed in the population projections for the period 1986-2026 are presented in table 13. These are presented for ages 0, 30, 60 and 80. The expectation of life at birth is assumed to reach 65.5 years for men and 70.22 years for women between 1981 and 1985, and 76.9 years for men and 79.8 years for women during the years 2021-2025. It would appear that the level for females would continue to be higher than that for males at all ages. The difference between men and women with regard to expectation of life at birth was just one year during the period 1951-1961; it increased to two years during 1971-1981, and is expected to increase further to four years during 1981-2026.

The projected expectation of life is likely to increase at every age. The percentage increase for men in the expectation of life at ages 30, 60 and 80 would be 19, 27 and 40 per cent, respectively. For women, the expected rise is 13, 23 and 28 per cent, respectively, between 1981 and 2026. The projected figures shown in the table suggest that the percentage increase would be highest in the expectation of life at age 80, meaning that more and more older people are expected to survive.

Age-specific and total fertility rates

The age-specific fertility rates for Kerala are presented in table 14. The TFR for the state as a whole stood at 4.1 in 1971 but dropped to 2.8 in 1981. The urban TFR was slightly lower than the rural TFR in 1971 and 1981. Between those years, the percentage decline in TFR was 32 for all areas, 31 in rural areas and 37 in urban areas. In the population projections, TFR is

Table 13: Average expectation of life as assumed in population projections, 1981-2026

Years	Males				Females			
	e_0	e_{30}	e_{60}	e_{80}	e_0	e_{30}	e_{60}	e_{80}
1981-1985	65.45	40.90	16.48	5.41	70.22	45.14	18.25	6.28
1986-1990	68.52	42.42	17.14	5.67	72.81	46.31	18.91	6.59
1991-1995	70.99	43.78	17.79	5.94	74.91	47.39	19.56	6.91
1996-2000	72.92	44.99	18.43	6.23	76.61	48.36	20.21	7.25
2001-2005	74.38	46.03	19.07	6.53	77.97	49.21	20.87	7.62
2006-2010	75.29	46.96	19.70	6.85	78.71	49.77	21.39	7.77
2011-2015	76.08	47.77	20.31	7.19	79.23	50.28	21.88	7.91
2016-2020	76.57	48.27	20.72	7.44	79.61	50.66	22.29	8.04
2021-2020	76.91	48.62	20.99	7.58	79.78	50.84	22.48	8.04

Source: Same as table 3.

Table 14: Age-specific fertility rates (per thousand) and total fertility rates, 1971-1981, Kerala

Year	15-19	20-24	25-29	30-34	35-39	40-44	45-49	TFR
				Rural				
1971	49.1	213.9	226.6	175.8	118.4	43.6	6.9	4.2
1976	42.3	195.9	203.9	137.9	81.5	25.2	5.9	3.5
1981	41.9	185.7	173.4	103.3	52.6	20.7	4.3	2.9
				Urban				
1971	66.9	208.6	213.2	147.8	86.1	22.4	5.1	3.8
1976	58.2	173.7	166.1	108.6	54.0	18.1	5.1	2.9
1981	48.2	170.8	143.3	80.0	27.6	6.3	2.7	2.4
				Total				
1971	51.8	213.1	224.5	171.8	113.6	40.6	6.7	4.1
1976	45.2	192.4	196.6	132.1	76.7	23.9	5.8	3.4
1981	42.9	183.4	168.4	99.5	48.7	18.7	4.0	2.8
1983	35.0	172.7	161.0	87.5	42.5	13.6	3.1	

Source: Sample Registration System.

Table 15: Age-specific fertility rates and total fertility rates as assumed in the population projections, 1981-2026, Kerala

Years	15-19	20-24	25-29	30-34	35-39	40-44	45-49	TFR
1981-1986	39	178	167	85	42	15	4	2.65
1986-1990	35	168	148	63	28	10	3	2.27
1991-1995	35	168	148	63	28	10	3	2.27
1996-2000	35	168	148	63	28	10	3	2.27
2001-2005	35	168	148	63	28	10	3	2.27
2006-2010	35	168	148	63	28	10	3	2.27
2011-2015	35	168	148	63	28	10	3	2.27
2016-2020	35	168	148	63	28	10	3	2.27
2021-2026	35	168	148	63	28	10	3	2.27

Source: Same as table 3.

assumed to result in 2.3 children per woman during the period 1986-1990. Since the value of TFR is very near the replacement level, it has been assumed that TFR would remain at this level during the rest of the projection interval.

When the age-specific fertility rates for Kerala between 1971 and 1981 are examined, it is noticed that the decline in fertility has occurred among all age groups, but that the decline is very impressive for those in ages above 30. The highest percentage decline has been observed in the age group 35-39 years (58 per cent), followed by the age group 40-44 years (54 per cent). Although both the rural and the urban areas have shown a continuous decline in their age-specific fertility rates, the decline was more impressive in the urban areas among all age groups. An analysis of this phenomenon indicates two major changes in Kerala. Firstly, women are avoiding higher order births thereby affecting fertility rates in the late reproductive ages and secondly, those in the age group 15 - 19 years are avoiding births owing to the increase in the age at marriage for both rural and urban areas.

The projected age-specific fertility rates are available in table 15. Constant age-specific fertility rates are assumed after the period 1986- 1990, indicating there will be no major change in age-specific fertility rates in Kerala in the near future. India is aiming to realize the replacement level (net reproduction rate of 1) by the year 2000. Interestingly, Kerala nearly realized this demographic goal in 1985.

Changes in age composition

Broad age groups

The percentage distribution of the population by broad age group for the period 1961-1981 is presented in table 16. Between 1961 and 1981 there had been an increase in absolute numbers in all age groups. However, when

Table 16: Composition of population by broad age group between 1961 and 1981, Kerala

Year	Population (thousands)			Percentage		
	0-14	15-59	60+	0-14	15-59	60+
1961	7 205	8 712	986	42.62	51.53	5.84
1971	8 595	11 425	1 328	40.26	53.52	6.22
1981	8 901	14 643	1 910	34.97	57.53	7.50

Source: Census of India reports.

the distribution of population over various age groups is examined, the percentage of population in the age group 0-14 years is found to have declined from 42.6 per cent in 1961 to 40.3 in 1971 and 35.0 in 1981. In terms of the percentage of the elderly, it is found that it was 5.8 per cent in 1961, increasing to 6.2 in 1971 and reaching 7.5 in 1981. The net result of the opposing trends among young and old ages is that the working age group has continued to increase as a proportion.

It is also observed that the proportion of population in the age group 60 years and above was also increasing at a much faster pace (27.6 per cent) as compared with those in the working ages of 15-59 years (11.6 per cent) between 1961 and 1981. Additionally, the increase in the proportion of the elderly is much sharper than the decrease in the proportion of those in the age group 0-14 years. The percentage decline in the age group 0-14 between 1961- 1971 was on the order of 5.5 per cent, and between the years 1971 and 1981 this decrease was 13.0 per cent. When this decline is compared with the increase in the proportion of the elderly, it is found that between 1961 and 1971 the increase was 6.9 per cent, and between 1971 and 1981 it had increased to 20.9 per cent.

Sex differentials

The percentage of the male population in the age group 0-14 years stood at 43.6 per cent in 1961, 41.1 in 1971 and 36.1 in 1981; the corresponding figures for the female population were 41.7, 39.5 and 34.0 per cent, respectively. Thus, in all the three census periods, the percentage of women in the age group 0-14 years was lower than that of men. In the working ages of 15-59 years, however, the proportion of women was uniformly higher for all the three census periods. The proportion of the elderly women was also higher than for elderly men for all three census periods. In 1981 the proportion of men above the age of 60 years was 7.2 per cent and for women, 7.9. The proportion of women aged 65 years and above in the total population was 4.2 per cent in 1971 and 5.2 per cent in 1981; the proportion of elderly men was 3.8 per cent and 4.5 per cent, respectively, for the same period. One of the reasons for the higher proportion of females at the older ages is due to the sex differentials in mortality rates.

Rural-urban differentials

The population of Kerala by broad age groups and by urban-rural residence for the census year 1981 is presented in table 17. With regard to the age distribution of the rural and urban populations, it is found that 5.4 per cent of the men and 7.8 per cent of the women in rural areas were aged 60 years and above compared with 6.5 per cent of the men and 7.9 per cent

Table 17: Population by broad age group and urban-rural residence, Kerala, 1981

Age group and sex	Age composition		Urban-rural distribution		
	Urban	Rural	Total	Urban	Rural
Total	100	100	100	18.7	81.3
0-14	32.9	33.4	100	17.7	82.3
15-59	59.9	58.0	100	19.2	80.8
60+	7.2	6.6	100	20.0	80.0
Males	100	100	100	18.8	81.2
0-14	33.8	36.4	100	17.7	82.3
15-59	59.7	58.2	100	19.2	80.8
60+	6.5	5.4	100	22.0	78.0
Females	100	100	100	18.6	81.4
0-14	32.1	34.5	100	17.6	82.4
15-59	60.0	57.7	100	19.3	80.7
60+	7.9	7.8	100	18.7	81.3

Source: Census of India 1981.

of the women in that age group in urban areas. In other words, there were more elderly men and women in urban areas than in rural areas although in both areas the sex distribution among the elderly favours women. It is also evident from the table that the urban population was slightly older than the rural population. Compared with the rural population, the urban population contains a smaller proportion of children and somewhat larger proportions of those in the working ages and the elderly.

Out of 100 elderly women in Kerala, 19 were in urban and 81 were in rural areas; the distribution for men was 22 and 78, respectively. Overall, more than 80 per cent of Kerala's elderly population reside in rural areas, a fact which should be considered very seriously for any policy concerning the elderly in the near future. Because the urbanization process in Kerala is very slow, it is also important to point out that the urban and rural distribution of the population by age shows little variation. Therefore, not only do today's elderly predominantly reside in rural areas, but the elderly of the future may also be expected to be concentrated in rural areas.

Table 18: Projections of population composition by broad age group between 1986 and 2026, Kerala

Year	Population (thousands)			Percentage		
	0-14	15-59	60+ years	0-14	15-59	60+ years
1986	8 817	16 661	2 158	31.90	60.29	7.81
1991	8 698	18 490	2 611	29.19	62.05	8.76
1996	8 880	20 166	3 051	27.67	62.83	9.51
2001	9 172	21 759	3 503	26.64	63.19	10.17
2006	9 496	23 252	3 963	25.87	63.34	10.80
2011	9 585	24 675	4 622	24.65	63.46	11.89
2016	9 624	25 705	5 652	23.48	62.72	13.79
2021	9 744	26 421	6 866	22.64	61.40	15.96
2026	9 965	26 752	8 267	22.15	59.47	18.38

Source: Same as table 3.

Projected age composition

The projections of population composition by broad age group between 1986 and 2026 are presented in table 18. These show a continuous decline of population in the age group 0-14 years and an increase among the elderly. The child population is expected to decline as a proportion by 18.9 per cent for the period 1986-2006 and by 14.4 per cent between 2006 and 2026. The elderly population is projected to increase as a proportion of the total population by 38.3 per cent in the first phase (1986-2006) and by 70.2 in the second phase (2006-2026). The proportion of projected working age population is expected to increase through the first period, but then to decrease steadily in the second period.

The three broad age groups show an increase in absolute numbers, but this increase is very pronounced in the case of the elderly rather than that of adults and children. Between 1986 and 2026, the increase in absolute numbers of the child population is expected to be around 1.1 million and in the elderly population around 6.1 million, almost five times more than the child population.

Five-year age groups by sex

Table 19 shows the population distribution by five-year age groups and sex for Kerala between 1961 and 1981. In 1961, the number in the age group

Table 19: Percentage distribution of population by five-year age groups and sex for Kerala between 1961 and 1981

Age	1961[a/]			1971[b/]			1981[c/]		
	Males	Females	Total	Males	Females	Total	Males	Females	Total
0-4	15.29	14.61	14.95	13.62	13.14	13.38	11.00	10.39	10.69
5-9	14.84	14.07	14.45	13.77	13.18	13.47	11.82	11.15	11.48
10-14	13.48	12.97	13.22	13.66	13.18	13.42	13.12	12.50	12.80
15-19	8.25	8.70	8.48	10.65	11.25	10.95	11.50	12.13	11.82
20-24	8.11	8.84	8.48	9.24	9.41	9.32	10.03	10.55	10.29
25-29	7.22	8.04	7.64	6.27	6.72	6.50	8.03	8.38	8.21
30-34	6.24	6.45	6.35	5.54	5.78	5.66	6.32	6.11	6.22
35-39	6.06	5.89	5.98	5.84	6.14	5.99	5.40	5.63	5.52
40-44	4.55	4.36	4.45	4.69	4.61	4.65	4.49	4.40	4.44
45-49	4.31	4.12	4.21	4.71	4.32	4.52	4.61	4.60	4.61
50-54	3.33	3.29	3.31	3.32	3.16	3.24	3.56	3.44	3.50
55-59	2.63	2.60	2.62	2.72	2.64	2.68	2.97	2.86	2.92
60-64	2.18	2.28	2.23	2.21	2.30	2.25	2.64	2.70	2.67
65-69	1.42	1.48	1.45	1.57	1.71	1.64	1.92	2.14	2.04
70-74	0.97	1.05	1.01	1.02	1.12	1.07	1.17	1.34	1.26
75-79	0.62	0.67	0.64	0.62	0.71	0.67	0.74	0.87	0.81
80-84	0.30	0.34	0.32	0.33	0.39	0.36	0.42	0.48	0.45
85-89	0.12	0.14	0.13	0.15	0.16	0.15	0.18	0.21	0.20
90-94	0.04	0.05	0.04	0.04	0.07	0.05	0.05	0.07	0.06
95+	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
N.S.	0.02	0.02	0.02						

Sources: a/ Devassy, K.K. (1965). Census of India 1961, Volume VII, Kerala, Part II C, Cultural and Migration Tables. Manager of Publications, New Delhi (Superintendent of Census Operations, Kerala);
b/ Narayanan, K. (1976). Census of India 1971, Series 9, Kerala, Part II, Social and Cultural Tables. Controller of Publications, New Delhi (Director of Census Operations, Kerala); and
c/ Vijayanunni, M. (1986). Census of India 1981, Series 10, Kerala, Part IV-A, Social and Cultural Tables. Controller of Publications, New Delhi (Director of Census Operations, Kerala).

0-4 years was the highest for males and females, with the numbers declining in the other age groups. There was a major shift in the highest proportion of the population from 0-4 years to 5-9 years in 1971 and from 5-9 years to 10-14 years in 1981. This phenomenon brings forth clearly the fact that a drastic reduction is taking place in the number of births along with a decline in infant and child mortality.

When the age groups up to age 60 are combined, it can be seen that the proportion of men is higher than women in all age groups. Only in the age group 60 and above is there a shift in favour of women. As a result, women outnumber men in the age groups 60-74 years and 75+.

Over the years between 1961 and 1981, the size of the population in the working age group has continuously increased, exerting high pressure in society for the generation of employment and income opportunities. The proportion of the population of working age accounted for 51.5 per cent of the total in 1961; the proportion increased to 53.5 per cent in 1971 and 57.6 per cent in 1981. The percentage increase between 1961 and 1971 was 3.7 per cent and between 1971 and 1981 was 7.6.

Comparing the 1981 percentage distribution with the projected age distribution for 2026 (see table 20) three major points can be made: (a) more women will be found in the older age groups (60 years and above) than men; (b) at the same time, the number of men and women in the working age population will increase but it will be substantially higher for men relative to the total male population; and (c) there will be a marked decline in the proportion of children.

Dependency ratios

Gerontologists are concerned with the personal support systems and "social convoys" of older persons since these support systems have important implications for the social, psychological and economic well-being of older persons. The need for national measures concerning the social and economic dependency of older persons has been partly identified by demographers using various measures of "age dependency". These measures simply relate the numbers of people in various age categories to one another. Some of these measures relate to the dependency of the elderly on their families, particularly their children, while others serve as measures of their dependency on society as a whole. The former tend largely to be surrogates for measures of social and psychological support of the elderly whereas the latter tend largely to be surrogates of economic support. The ratio of persons 60-74 years of age to those 40-44 years is a type of familial dependency ratio rating the elderly to their middle-aged children. The ratio of persons 80 years of age and over to persons 60-64 years old is a type of familial dependency ratio relating the

Table 20: Percentage distribution of population by five-year age groups and sex, 1981 and projections for 2001 and 2002

Age	1981		2021		2026	
	Males	Females	Males	Females	Males	Females
0-4	11.00	10.39	9.56	9.00	7.74	7.44
5-9	11.82	11.15	9.28	8.74	7.53	7.24
10-14	13.12	12.50	8.59	8.12	7.31	7.03
15-19	11.50	12.13	8.61	8.16	7.21	6.94
20-24	10.03	10.55	8.57	8.24	7.21	6.96
25-29	8.03	8.38	8.73	8.39	7.15	6.92
30-34	6.32	6.11	8.79	8.45	6.91	6.71
35-39	5.40	5.63	8.30	8.04	6.37	6.22
40-44	4.49	4.40	7.02	7.00	6.36	6.24
45-49	4.61	4.60	6.02	6.01	6.29	6.26
50-54	3.56	3.44	4.41	4.60	6.34	6.32
55-59	2.97	2.86	3.28	3.80	6.25	6.27
60-64	2.64	2.70	2.82	3.44	5.68	5.82
65-69	1.92	2.14	2.31	2.98	4.48	4.85
70-74	1.17	1.34	1.77	2.24	3.39	3.79
75-79	0.74	0.87	1.14	1.48	2.02	2.43
80-84	0.42	0.48	0.60	0.86	1.07	1.48
85+	0.26	0.30	0.23	0.47	0.68	1.09
Total	100	100	100	100	100	100

Source: Same as table 3.

Note: The above projected figures are from the population projections for Kerala made by Mari Bhat and S. Irudaya Rajan of the Centre for Development Studies, Trivandrum.

extreme elderly or "old old" to their "young-old" children. The ratio of persons 60 years and over to persons 15 to 59 years of age is the most common type of societal dependency ratio. The prospective shifts in the age structure of the population suggest that the extent of the problem of familial support of the elderly will fluctuate in the future, reflecting mainly past trends in fertility rates, and that, in general, those shifts will tend to become greater than they are at present, becoming probably very serious around 2025.

The following ratios for Kerala from 1961 to 2026 will help in understanding familial and societal dependency ratios:

- *Youth dependency ratio:* The number of persons aged 0-14 years per 100 persons in the working age group, i.e. those 15 to 59 years of age;
- *Elderly dependency ratio:* The number of persons 60 years and older per 100 persons in the working age group (15-59 years);
- *Total dependency ratio:* The number of persons in the non-working age groups (0-14 years and 60+) per 100 persons in the working age group (15-59 years);
- *Index of aging:* The proportion of the population aged 60 years and older to the population aged 0-14 years – this index is intended to measure the structure of dependency;
- The population aged 0-14 years per 100 persons aged 60 years and older;
- The population aged 60-74 years per 100 persons aged 40-44 years; and
- The population aged 80 years and older per 100 persons aged 60-64 years.

The dependency ratios, aging index and familial dependency ratios for the period 1961- 1981 are presented in table 21. The youth dependency ratio was 82.7 in 1961; it declined to 75.2 in 1971 and 61.5 in 1981, whereas the elderly dependency ratio, which was 11.3 in 1961, increased to 11.6 in 1971 and 13.2 in 1981. The increase in the elderly dependency ratio was two percentage points whereas the decrease in the child dependency ratio was 21 points. Currently, households in Kerala have gained in terms of a reduction in the burden of dependents, having to take care of fewer children without having too great a strain in caring for older people. Every 100 persons in the working age group take care of 13.2 elderly people.

Table 21: Analysis of dependency ratio, aging index and familial dependency ratio for Kerala, 1961- 1981

Year	Dependency ratio			Familial dependency ratio			
	Young 0-14/ 15-59	Elderly 60+/ 15-59	Total 0-14+60+/ 15-59	Index of aging 60+/0-14	0-14/ 60+	60-74/ 40-44	80+/ 60-64
1961	82.71	11.32	94.03	13.69	731	105	23
1971	15.23	11.62	86.85	15.45	647	107	26
1981	61.48	13.19	74.67	21.46	466	134	27

Source: Census of India reports.

Table 22: Dependency ratio, index of aging and familial dependency ratio for Kerala, 1986 -2026

Year	Dependency ratio (percentage)				Familial dependency ratio		
	Young 0-14/ 15-59	Elderly 60+/ 15-59	Total 0-14+60+/ 15-59	Index of aging 60+/0-14	0-14/ 60+	60-74/ 40-44	80+/ 60-64
1986	52.92	12.95	65.87	24.48	409	135	20
1991	47.04	14.12	61.16	30.02	333	129	26
1996	44.03	15.13	59.16	34.36	291	114	29
2001	42.15	16.10	58.25	38.19	262	111	35
2006	40.84	17.04	57.88	41.73	240	106	40
2011	38.84	18.73	57.58	48.22	207	116	41
2016	37.44	21.99	59.43	58.73	170	145	37
2021	36.35	25.99	62.34	71.49	140	184	38
2026	37.25	30.90	68.15	82.96	121	222	38

Source: Same as table 3.

The decline in fertility has reduced the overall (youth plus elderly) dependency burden from 94.0 in 1961 to 74.7 in 1981. Although the elderly dependency ratios are on the increase, the overall dependency ratio has shown a decline of 20.6 per cent during the period 1961-1981.

The projected age dependency ratios for the period 1986-2026 are presented in table 22. During this period, the youth dependency ratios are expected to decrease from 52.9 in 1986 to 37.3 in 2026. By comparison, the elderly dependency ratios are expected to increase from 13.0 in 1986 to 30.9 in 2026. The percentage decline of the youth dependency ratio would be around 29.6 and the increase in the elderly would be around 138.6. The implication of these ratios for the future is that instead of there being six working-age persons with the responsibility of taking care of one elderly person there would be only three working-age persons to do so in 2026. Moreover, the probability of the elderly being women who are widowed, less skilled, less well educated and unemployed would also be much higher.

The number of persons aged 60 years and older per 100 persons under 1.5 years of age (index of aging) was nearly 14 in 1961, increasing to 15 in 1971 and 21 in 1981. Table 21 shows that the increase between 1961 and 1971 was only two percentage points, whereas this increase was six points between 1971 and 1981, indicating an acceleration of the aging index in Kerala. Analysis of the projections of the aging index for the year 2026 indicates that it will increase by more than three times the index for 1986. Between 1981 and 2026, the aging index is expected to increase to around 83.0, indicating that there could be 83 older persons for every 100 of their children.

In other words, in the future every household in Kerala would have to take care of one child and an elderly mother or father.

The implications of this to the family would be quite substantial as the cost and care of an older person is different from that of a child. For society, this shift in the dependency structure could mean that there will be a substantial change in the type of public sector expenditures. Furthermore, while the care of children is the direct responsibility of parents, the care of the extreme elderly involves only a social obligation of their children; there are no legal sanctions to enforce such care.

Analysis of structural changes among the elderly

The elderly population is divided into two categories: (a) the "young old" which includes persons in the age group 60-74 years and (b) the "old old" which includes the age group 75 years and older. Between 1961 and 1981, the proportion of the "young old" remained constant at 80 per cent, but by 2026 it is expected to decrease to 76 per cent (table 23).

Table 23: Age structure of population aged 60 years and above, and sex ratios for Kerala, 1961-1981

Age	1961			1971		
	Number (000)	Per cent	Sex ratio	Number (000)	Per cent	Sex ratio
60+	988	100	92	1 328	100	91
60-74	793	80.3	93	1 060	79.8	92
75+	195	19.7	88	267	20.1	85

Age	1981		
	Number (000)	Per cent	Sex ratio
60+	1 909	100	88
60-74	1 518	79.5	90
75+	391	20.5	83

Source: Same as table 2.

Note: Sex ratio here is defined as the number of males per 100 females.

Table 24: Age structure of population aged 60 years and above, and sex ratios for Kerala, 1986 -2026

Age	1986			1991			1996		
	Number (000)	Per cent	Sex ratio	Number (000)	Per cent	Sex ratio	Number (000)	Per cent	Sex ratio
60+	2 158	100	81	2 611	100	78	3 051	100	77
60-74	1 778	82.39	82	2 076	79.51	82	2 380	78.01	79
75+	380	17.61	72	535	20.49	64	671	21.99	68
		2001			**2006**			**2011**	
60+	3 503	100	76	3 963	100	77	4 622	100	79
60-74	2 678	76.45	78	2 952	74.49	79	3 407	73.71	84
75+	825	23.55	69	1 011	25.51	69	1 215	26.29	68
		2016			**2021**			**2026**	
60+	5 652	100	83	6 866	100	87	8 267	100	90
60-74	4 230	74.84	89	5 236	76.26	92	6 298	76.18	94
75+	1 422	25.16	69	1 630	23.74	71	1 969	23.82	76

Source: Same as table 3.

Note: Sex ratio here is defined as the number of males per 100 females.

The sex ratio among the elderly reveals another interesting aspect of the situation likely to occur in 2026. In 1961, the sex ratio (males per 100 females) among the elderly 60 years and older was 92; it declined to 88 in 1981 and is expected to decline further thereafter; however, it is expected to reach 96 in 2001 and 90 in 2026. Moreover, women are expected to outnumber men in the older age groups all throughout this period. It is also interesting to note that as age advances, the sex ratio becomes more favourable to women with more and more of the "old old" being women. Among that group, the sex ratio was 83 in 1981; it is projected to decline to 76 in 2026.

Another emerging feature is that in 2026, Kerala will have 6.3 million persons belonging to the "young old" group and another 2.0 million in the "old old" group (table 24). Put in other words: the elderly population of Kerala in 2026 will be equal to the total male population of Kerala in 1961.

The preponderance of women at the extreme old ages has itself important socio-economic implications for the kind of care needed for the elderly.

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Population and Environment in the Hills of Nepal

A comprehensive hills development programme is urgently needed to avert any worsening of environmental problems

By Gopal B. Thapa and Karl E. Weber*

The ecological zones in Nepal known as hills and mountains, which comprise three fourths of the country's territory and contain 56 per cent of its population, are suffering from increasing environmental hazards, notably deforestation, soil erosion, landslides, flash-floods and desertification (NPC, 1985, p. 200).

During the recent past, an estimated 240 million metric tons of soil have been washed out of Nepal each year (WRI & IIED, 1987), thereby re-

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ducing crop productivity owing to the loss of plant nutrients in the soil. Moreover, the on-going ecological degradation process has aggravated the scarcity of fodder and fuelwood, contaminated the surface water, diminished the supply of ground and surface water, and destroyed valuable agricultural land. The effects of ecological problems have accelerated the pace of a downward process of underdevelopment in Nepal since nearly 90 per cent of the population in the affected areas depend directly on agriculture for their sustenance.

Why have these events taken this course ? Studies carried out in various developing countries of Asia, Africa and Latin America (Geertz, 1968; Eckholm, 1976; Blaikie, 1985; Thapa, 1988) relate these problems to the encroachment on and destruction of forests and pastures, mainly by a small but powerful group of people, for commercial crop production, livestock ranching, logging, land speculation and promotion of their political interests.

Expropriation of small but productive landholdings by the affluent, displacement of small and marginal farmers in environmentally critical areas, and unfavourable agricultural market prices are other factors related to ecological degradation.

These latter factors could explain, to some extent, the environmental problems prevailing in the *tarai.** However, these factors are apparently not applicable to the situation in the hills where there is no distinct disparity in economic conditions in general, and of land resources distribution in particular.

On the whole, the average size of landholdings in the hills is 1.12 hectares (ha), while that of large landholdings is 2.07 ha (DFAMS, 1983, p. 254). Owing to the small size of landholdings, the average annual income of the population in the hills amounted to only $US430 per household; the highest per capita income on record was $119 (NPC, 1978, pp. 83-84). Thus, most people in the hills have been living under subsistence conditions, with the exception of the few influential families which have acquired large tracts of land in the *tarai* as well. The ecological degradation in the hills is, therefore, related largely to its rapidly growing population.

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* Ecologically, Nepal can be divided into three distinct physiographic zones: mountains (above 4,800 metres), hills (300 to 4,800 metres), and *tarai* or plains (below 300 metres). Although these ecological zones stretch like belts across the country from north to south, its development regions divide the country into five parts, each of which in defined by a system of adjacent watersheds thus covering segments of all three ecological zones. These parts include the Eastern Development Region (EDR), the Central Development Region (CDR) with Kathmandu Valley, the Western Development Region (WDR), the Mid-western Development Region (MWDR), and the Far-western Development Region (FWDR) in this sequence from east to west (NPC, 1987, p. 290).

Table 1: Population size and growth in Nepal, 1952/54-1981

Year	Population	Exponential growth rate (%)	Geometric growth rate (%)	Linear growth rate (%)
1911	5 638 749	–	–	–
1920	5 573 788	-0.13	-0.13	-0.13
1930	5 532 574	-0.07	-0.07	-0.07
1941	6 283 649	+1.16	+1.16	+1.16
1952/54	8 256 625	+2.27	+2.30	+2.26
1961	9 412 996	+1.64	+1.65	+1.64
1971	11 555 983	+2.05	+2.07	+2.04
1981	15 022 839	+2.62	+2.66	+2.61

Source: NPC, 1987, p. 7, table 1.2.

Although the entire country is suffering from population pressure (see table 1) and environmental degradation problems, the hills deserve special attention for the following reasons:

- The hills accommodate the major proportion of the national population engaged in a predominantly subsistence agricultural economy. Of equal if not higher importance is the fact that more than half of the national territory is occupied by the hills.
- The hills are more vulnerable to erosion than other areas. Weak rock formations combined with steep slope gradients, high precipitation and sparse forest cover have made them even more erodable than in the past.
- Since the hills are at the head-reach of the country's large river basins, any environmental problem originating there swiftly embraces entire basins.

Interestingly, the hills had not undergone severe ecological and economic problems at a time when nearly three fourths of the country's population were concentrated there. The problems actually started to become conspicuous as their proportion of national population gradually declined owing to continuous out-migration (tables 4 and 6).

The objective of this article is to examine how the people in the hills, in spite of their physical and economic isolation from the national mainstream, could manage their economic activities for such a long time without any heavy environmental stress (although they gradually failed to maintain the ecological balance). The article also includes broad policy suggestions for solving the inherent problems.

Population and development

The hills have been accommodating the major proportion of the population since Nepal's emergence as an independent country. In the past, population concentration was inversely related to dense tropical forest cover, endemic malaria and insecurity owing to occasional invasions into the *tarai*, and to the harsh and adverse physical as well as climatic conditions in the Himalayas. In view of the comparatively unfavourable physical conditions in the northern and southern parts of the country, the moderately elevated middle hills, with their narrow and small intermontane river valleys and mild climatic conditions, offered security for the life and property of the people. However, making a living there was not any easier than in other parts of the country.

The current concentration of the major proportion of the national population in the hills is a result of the lack of vacant public land in the *tarai* following its transformation into a habitable region in 1956 through the Malaria Eradication Programme of the World Health Organization and the United States Agency for International Development.

In retrospect, despite the population concentration in the hills, the environment or resource system in that area could sustain the pressure because the size of the population was small in absolute numbers. For example, according to the first population census of Nepal published in 1911, the population of both the hills and the mountains combined was 3.3 million (Kansakar, 1980, p. 16). Lack of health and sanitation facilities resulted in high mortality rates, which curtailed population growth in spite of a high fertility rate. Moreover, aware of the region's environmental potential and prospects, the hill dwellers adopted a field-crop-forestry-based agricultural system. Forests provided fodder for livestock, fuelwood for farmers and green manure for field cropping. Assorted species of livestock provided draught power, dairy and meat products, and manure. Field cropping, as the economic mainstay, could be operated successfully by relying on both forest and livestock resources. In areas bounded by physical and economic constraints, this type of system enabled people to become largely self-sufficient and self-reliant (Thapa *et al.*, 1989). Furthermore, to meet their requirements for certain necessities that

Table 2 : Fertility rates for Nepal and its ecological zones, 1971- 1984

Fertility rate	Year	Nepal	Ecological zones		
			Mountains	Hills	*tarai*
TFR	1971	5.83	5.99	6.08	5.34
	1974-75	6.26	5.93	5.98	6.22
	1981	6.40	6.23	6.53	6.18
TMFR	1976	–	6.62	6.62	6.86
	1984	–	6.87		7.04

Notes: FR = fertility rate; TFR = total fertility rate: and TMFR = total marital fertility rate.

Source: NPC, 1987, p. 270, table 11.11; p. 284, table 12.2; p, 287, table 12.4; and p. 291, table 12.7.

local people neither possessed nor produced, they engaged in barter trade to a limited extent.

Over time the hill population gradually swelled, contributing substantially to the overall population size and growth of the country (table 1). In a little over 40 years, i.e. from 1911 to 1952/54, the hill population grew by nearly 50 per cent; from a combined hill and mountain population of 3.3 million in 1911, the hill population alone reached almost 5 million in 1952/54 (Kansakar, 1980, p. 16). Owing to the availability of basic preventive health care services, especially since the mid-1950s, and regional political stability, the mortality rate in general and the infant mortality rate in particular dropped significantly, while the fertility rate rose and the birth rate remained very high, which subsequently accelerated population growth (tables 2 and 3).

Table 3: Infant mortality rates (IMR), 1962-1971 and 1978

Ecological zones	IMR (per 1,000)	
	1962-71	1978
Mountains	190	186.2
Hills	145	163.5
tarai	184	122.3

Source: NPC, 1987, p. 309, table 13.7 and p. 311, table 13.9.

The combined population of the hills and the mountains, despite continuous migration from the hills into the *tarai*, reached 8.46 million in 1981 (NPC, 1987, p. 18, table 2.1 – in contrast to the estimation of 6.6 million given by Gurung, 1984, p. 218), which represents a further increase of close to 60 per cent in 30 years (table 4).

The implementation of the Malaria Eradication Programme in the *tarai* in 1956 brought about a change in the spatial population distribution. Complemented by the Government's *tarai* resettlement policy, the Programme stimulated the physically and economically constrained hill people to migrate into virgin areas with rich agricultural potential. Over the years, the migration from the hills into the *tarai* steadily increased. In the 1952/54 population census, the total number of internal migrants was only 13,380; however, during the intercensal period of 1952/54 to 1961, the number rose to

Table 4: Distribution of population by ecological zone, 1952/54-1981

Ecological zone	Item	Year			
		1952/54	1961	1971	1981
Mountains	Population	–	–	1 138 610	1 302 896
	Population (%)	–	–	9.9	8.7
	Change (%)	–	–	–	+14.4
Hills	Population	–	–	6 071 407	7 163 115
	Proportion (%)	–	–	52.5	47.7
	Change (%)	–	–	–	+18.0
Mountains & hills	Population	5 349 988	5 991 297	7 210 017	8 466 011
	Proportion (%)	64.8	63.6	62.4	56.4
	Intercensal change (%)	–	+12.0	+20.3	+17.4
	Cumulative change (%)	–	+12.0	+34.8	+58.2
tarai	Population	2 906 637	3 421 699	4 345 966	6 556 828
	Proportion (%)	35.2	36.4	37.6	43.6
	Intercensal change (%)	–	+17.7	+27.0	+50.9
	Cumulative change (%)	–	+17.7	+49.5	+125.6

Source: NPC, 1987, p. 18, table 2.1.

Table 5 : Intercensal exponential population growth rates by ecological zone, 1952/54-1981

Ecological zone	1952/54-1961	1961-1971	1971-1981
Mountains	–	–	1.35
Hills & mountains	1.42	1.85	1.61
Hills	–	–	1.65
tarai	2.04	2.39	4.11
Total	1.64	2.05	2.62

Source: NPC, 1987, p, 28, table 2.11.

178,000 (Rana and Thapa, 1975). By 1971, the number of internal migrants reached 445,128, of whom 87 per cent had originated in the hills and 11 per cent in the mountains. Among the 410,064 in-migrants into the *tarai*, the vast majority (92 per cent) hailed from the hills (NPC, 1987, p. 155, table 7.2). According to the most recent census of 1981, the number of native born migrants totalled 929,585, most of whom had settled in the *tarai* (78 per cent). More than three quarters of them had come from the hills (NPC, 1987, p. 155, table 7.3).

As a result of on-going out-migration, the population of the districts in the hills increased by 18.0 per cent during the period 1971 to 1981 as compared with 34.8 per cent during the intercensal period between 1961 and 1971, whereas the proportionate increment in the *tarai* was recorded as 50.9 per cent, caused by natural population growth, in-migration from the hills as well as from the mountains and immigration from neighbouring India (tables 4 and 5).

Owing to continuous out-migration, the proportionate share of the population in the hills and mountains has been steadily declining, whereas the crude population density has been continuously increasing (table 6) as a result of considerable growth in absolute numbers. A comparison of crude population densities in the hills and mountains on one side and of the *tarai* on the other side seemingly indicates less population pressure in the former two areas (table 6). However, this perception is highly misleading; in fact, the hills and the mountains account for only one third of the country's total arable land, which is the area available for actually supporting the indigenous population. According to a World Bank report, population density in the country's arable areas reached almost 1,500 persons per square km in the hills and the mountains, whereas it was 400 persons per square km in the *tarai* World Bank,

Table 6: Changes in population distribution and density by ecological zone

Year	Hills and mountains*		*tarai*	
	Proportion of population	Density (per sq km)	Proportion of population	Density (per sq km)
1952/54	60.3	47.9	34.7	85.0
1961	58.7	57.0	36.4	89.0
1971	53.4	64.8	41.2	127.3
1981	51.2	76.0	43.3	179.9

Note: * Excluding the population of Kathmandu Valley.

Source: Gurung, 1984, p. 33, table 4: p. 37, table 7; and p. 220, table 54 (authors' compilation).

1979, p. 12). As a consequence, the average landholding size in the former two regions was 1.12 ha per household compared with 2.31 ha in the latter region (DFAMS, 1983, p. 254).

Small landholdings coupled with unfavourable physical conditions and rudimentary agricultural development facilities have restricted agriculture in the hills to the extent where sustaining the ever-growing population is hardly feasible any longer. In a document issued by the National Planning Commission (NPC, 1978, p. 110), the daily requirement of grains to derive an average of 2,250 calories of energy per day was estimated to be 605 grams per capita (221 kg per annum). Considering this estimate as a standard measure, the per capita cereal production in the hills has, with only some fluctuation, been invariably below the required level since 1967/68. For example, the highest per capita cereal production, amounting to 187 kg, was recorded in 1970/71; the lowest level, amounting to 160 kg, was recorded in 1977/78 (Khadka and Gautam, 1981, p. 36). A recent study (Adhikari, 1987, p. 53), carried out in the Pokhara Valley of the western hills, revealed that more than half of the households surveyed reportedly faced an acute food shortage.

The steadily deteriorating food balance and degraded ecological conditions resulting from population pressures apparently challenge the proposition (Boserup, 1965) that a growing population could stimulate agricultural and economic development. Population growth could be an impetus to agricultural intensification in Nepal if the physical conditions were as favourable as in the Asiatic deltas or in the vast Indo-Gangetic plain, which are characterized by flat topography, alluvial soil, warm climate, moderate precipitation and, above all, the irrigation opportunities provided by numerous

rivers. For example, farmers on the island of Java (Indonesia) manage to keep pace with the growing demand for cereal crops, despite the area's montainous topography, because the basalt lava soil, adequate moisture supply and gentle sloping of the undulating topography enable cropping intensification (Geertz, 1968). However, an increase in the number of people where agro-physical conditions are adverse such as in the Baucau-Viqueque area of the nearby island of Eastern Timor, the terrain of which is characterized by steep slopes, poor soils and extreme climate, does not enable much cropping intensification (Metzner, 1977). Population growth, therefore, cannot everywhere and always be an asset for agricultural intensification and economic development. Even if an area possesses high agricultural potential, its carrying capacity cannot be expanded infinitely as the steadily growing population would require increasingly higher amounts of cereals to meet the people's need for food. Under present circumstances, the hills of Nepal do not allow any drastic further intensification of cropping because of the zone's high elevation, steep slopes, poor soils and high level of precipitation.

Bypassed area

The hills, despite comprising the major proportion of the country's land base and its population, were largely bypassed in terms of policy and plan-making until the beginning of the Fifth Five-Year Plan period (1976 -1980) when, for the first time in the country's history, development plans were drawn up and budget allocations made on a regional basis. Until the end of the Fourth Five-Year Plan period (1971-1975), planning efforts had been concentrated on the capital region with an emphasis on consumptive investment and on the *tarai* with a focus on export commodity production, thus facilitating only residual investment in the hills. During the years 1956 through 1970, the regional distribution of projects, relative to successive planning period, was as follows (Gurung, 1984, p. 28):

34 per cent in Kathmandu Valley;

28 per cent in the *tarai*;

22 per cent nationally; and

14 per cent in the hills and mountains.

Contrary to the Government's much publicized regional development planning approach, a policy of concentrating on agriculture in the *tarai* was pursued, leading to "benign neglect" of the hills and mountains (World Bank, 1979, p. 13). As a result, non-farm employment opportunities barely exist there, while the carrying capacity of agriculture remains narrowly restricted.

The indigenous cottage industries, namely, handloom, agricultural tool-making, paper manufacturing and shoe-making, which had been generating

employment and income opportunities in the hills throughout history, gradually slipped into oblivion owing to their lack of competitiveness with foreign commodities and manufactured goods. Likewise, an influx of foreign artisans dislodged indigenous artisans, forcing them to abandon their traditional profession (Thapa, 1981; Blaikie *et al.,* 1980, pp. 263 -267).

Alternative strategies

Constrained by the limited carrying capacity of scarce land resources and virtually deprived of alternative employment opportunities, the hill people have adopted strategies of expanding of agricultural lands into marginally suited areas, of enlarging the size of their herds of livestock, and of outmigrating (see figure, p. 64) so as to cope with their increasing demand for food, clothing, shelter and medicine.

Expansion of agricultural lands

Knowingly or unknowingly, subsistence farmers have appreciated and conserved natural resources. Terracing the fields located on mountain slopes, fallowing fields for a period of three to eight months annually and manuring them, practising multiple and mixed cropping, and the community management of forest resources, especially before the government take-over of forests in 1956, are but some of the manifestations of people's awareness of the importance of the country's natural resources.

With the narrowing of the base for their sustenance, they have been forced either to abandon or to repress their conservation ethics and practice, since the present challenges are more important to them than the implications for the future. Because people do not normally think about posterity when their own survival is at stake, the hill people have encroached into marginal lands, mostly located on steep slopes covered with forest and grass. This process has reduced Nepal's forest resources from 64,000 km^2 in 1963 which is equivalent to 45 per cent of the total (NPC, 1985, p. 476) to 56,000 km^2 in 1978/79 and further to 54,000 km^2 in 1985/86 which represents a decline of 16 per cent over the years since 1963 (MFSC, 1988, p. 30, table 3.4) – while inversely expanding the area under field cropping and pasture (see table 7).

In two small watersheds, namely, the Phewa and Begnas of Pokhara Valley, farmers have been observed regularly cultivating field crops on slopes with 40 to 60 per cent gradients (Basnet *et al.,* 1987; Fleming, 1983), even though slopes with gradients of more than 36 per cent are not considered suitable for field-crop cultivation (Fearnside, 1982).

One of the important but unnoticed implications of the process of en-

Table 7 : Change in size of area under selected staple crops in the hills

Year	Crop area (in 1,000 hectares)									
	Rice		Maize		Wheat		Millet		Barley	
	Area	%	Area	%	Area	%	Area	%	Area	%
1967/68	169.4	–	244.5	–	71.4	–	72.7	–	9.1	–
1977/78	202.8	+20	273.0	+12	111.0	+55	86.0	+18	10.2	+13
1981/82	237.6	+40	303.7	+24	134.0	+88	87.8	+21	10.8	+19

Source: DFAMS, 1983.

croachment of forests and pastures is that it has created dispersed settlements with isolated homesteads interspersed between patches of forests and pastures. The degree of dispersion is so high that in some locations it takes as much as half an hour to walk from one homestead to another. Thus, because they live far away from community surveillance, these people have steadily destroyed public resources. If such destructive action were pursued by a single household only, it might not be of any consequence; however, once a large number of households are engaged in this type of activity, it could rapidly cause irreversible depletion of public resources.

Forests and pastures are recognized as being the best protectors and promoters of soil resources. The on-going process of destruction of these resources in the pursuit of agricultural production has accelerated the rate and intensity of erosion and, consequently, deteriorated overall socio-economic conditions in the country as well as disrupted the ecological balance. According to the Seventh Five-Year Plan, 1985-1990 (NPC, 1985), 53 per cent of the total erosion was caused by anthropogenic factors.

Increasing livestock population

Along with the growth of the human population, the livestock population has also been expanding, partly because of natural, religious or legal reasons (Thapa *et al.*, 1989), partly because of the increasing requirement for draught power and manure for agriculture, and partly owing to the demand for cash to compensate for the decline in income from crop production. In spite of a livestock population growth rate of only 0.17 per cent per year (Rajbhandary and Shah, 1981, p. 49), livestock density per unit of cultivated land in Nepal reportedly is the highest in the world (ICIMOD, 1986, p. 5), a phenomenon which is attributed to the sharp increase in the absolute number of the country's human population.

The estimated carrying capacities of the open grasslands and forests in the middle hills are only 0.54 and 0.31 large livestock units per hectare, respectively, whereas the recent stocking rates reportedly are 7 and 2.8 large livestock units, respectively, per ha, or 13 and 9 times greater than the carrying capacity of those types of land (Rajbhandary and Shah, 1981, p. 54).

This has led to a situation where the rate of fodder consumption exceeds the rate of regeneration, which explains why the stock of forests and pastures has been shrinking steadily. A considerable proportion of the overall destruction is related to browsing and trampling due to unmanaged free grazing.

Livestock grazing is the single most important cause of the depletion of forests and rangelands (Fox, 1983), which ultimately leads to both economic and ecological problems.

Out-migration

As previously noted, there has been a steadily increasing flow of permanent as well as temporary migrants from the hills. The question is whether or not this out-migration has been conducive to solving the inherent problems of poverty and environmental deterioration. Available evidence indicates that out-migration has not solved those problems for the following reasons:

- The proportion of out-migrants compared with the sheer size of the hill population is quite small, resulting in a marginally increasing man-to-land ratio.
- Most temporary migrants are working as lowly paid labourers (Thapa, 1981). Their remittances, which are very small in value, are usually spent on debt repayment and buying food staples (Tiwari, 1988).
- Although certain migrants, for example, the men recruited into the British army, remit relatively large amounts of money (Tiwari, 1988), these funds are invested mainly in regional urban centres (Gurung, 1979).

Rather, it is more likely that out-migration might have adverse economic and environmental effects owing to the following factors:

- Hill agriculture depends largely on labour input. The out-migration of young male labourers could have negative impacts on farm management and operations, thereby reducing the overall amount of farm income and accelerating the rate of soil erosion owing to the lack of maintenance of the existing system.

- A large number of migrants have settled in the *tarai*, encroaching into the virgin tropical forests, which might intensify soil erosion and related problems.

Rising demand for fuelwood

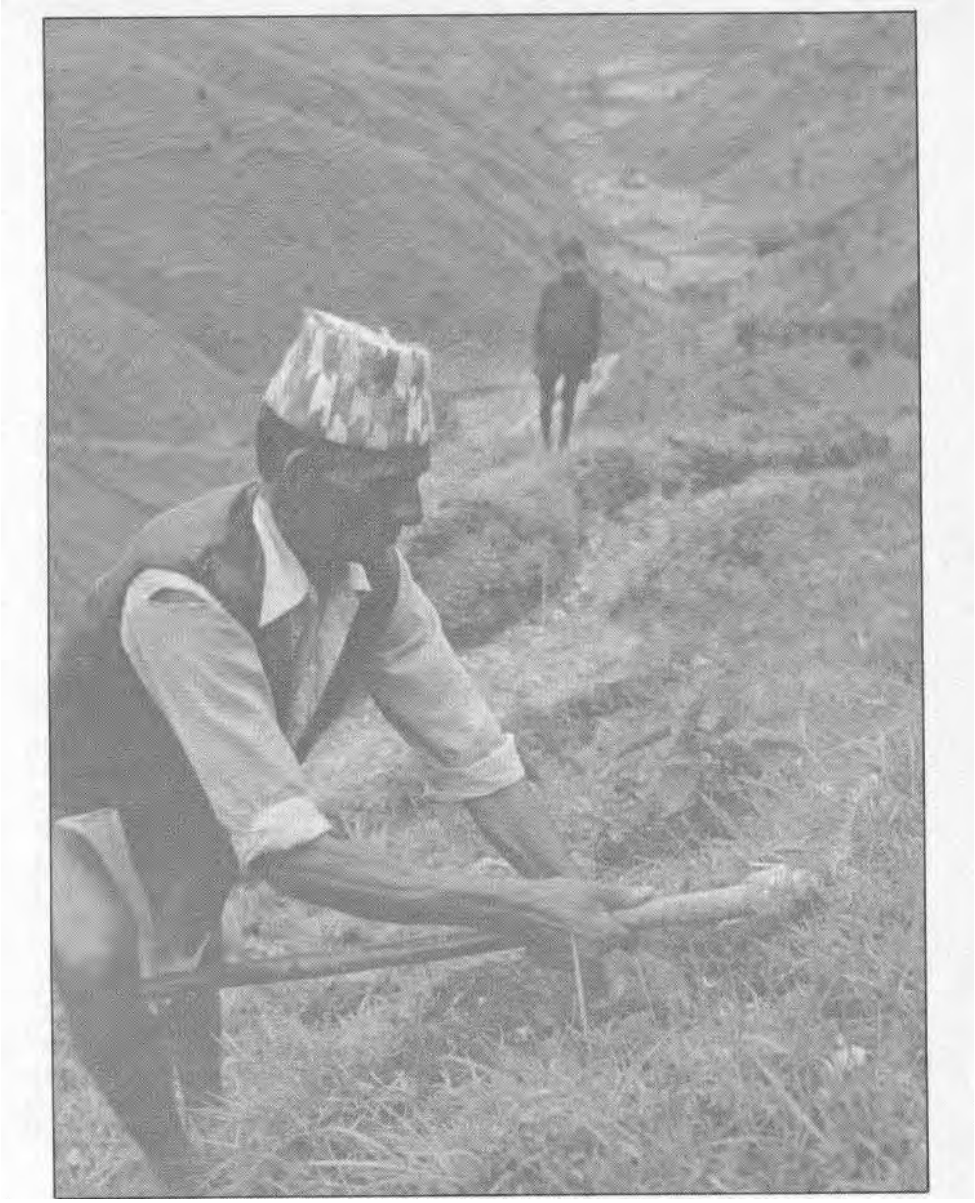
Fuelwood is the single most important source of energy for all hill people in view of their free access to forests and because of their poor economic condition (Wallace, 1981). The steadily growing population and the deterioration of income and employment opportunities have led to an increase in fuelwood consumption that exceeds the rate of regeneration and reduces the net stock of forests.

A micro-level study (Bajaracharya, 1983, p. 1064) carried out in the eastern hills recorded the consumption of fuelwood as being about 2.5 million kg per year, whereas the sustainable supply of fuelwood was estimated at 1.2 million kg, In view of the rapid depletion of forest resources, the hills are likely to face an energy crisis in the not too distant future (Eckholm, 1976) that most probably will compel people to substitute agricultural residues and cattle dung for fuelwood, even though these are needed for fertilizing field crops. Meeting energy requirements in this manner will aggravate soil erosion and reduce land productivity.

Because fuelwood is cheaper than other commercial sources of energy such as kerosene, coal and electricity, a considerable proportion of urban dwellers, particularly low-income households, use fuelwood as their major source of energy. A study carried out in Kathmandu Valley showed that about 50 per cent of the poor as well as the lower-middle income and upper-middle income households were using fuelwood as their main source of energy (Sharma, 1987, p. 23).

Aware of the demand for fuelwood in cities and towns, a considerable number of the rural poor living close to urban centres in the middle hills, e.g. in Kathmandu, Bhaktapur, Patan and Pokhara, have begun selling fuelwood for a living. Because fuelwood can be collected free of charge, its sale helps to complement the household income of these poor people. In view of the on-going large-scale rural-urban migration, the demand for fuelwood in these urban centres will rise continuously.

As the people's income cannot be expected to increase considerably in the forseeable future, the rapid urbanization of some pocket areas could lead to severe backwash effects, especically in terms of ecological degradation.



The deforested hills of Nepal are sorely in need of replanting both to assure a suppy of fuel and fodder for the future, and to prevent further damage to the environment through erosion, landslides and flash floods.

Food supply or family planning?

"The more children, the more wealth". This is a proverb still popular in the hills of Nepal. Similarly, the older people bless the younger generation by invoking the wish "may you have many children".

These two frequently expressed statements imply the importance of human labour in the hills. Indeed, the entire hill economy almost completely depends on the labour force. As people normally cannot afford to buy cereals, dairy products and fuelwood, or hire draught power, they need labourers to work in their fields, collect green manure, fodder and fuelwood from the forests, and fetch drinking water from a usually distant source. With such a heavy dependency on human power, any shortage of labour could cause a further deterioration in living conditions in general, and jeopardize the food supply in particular.

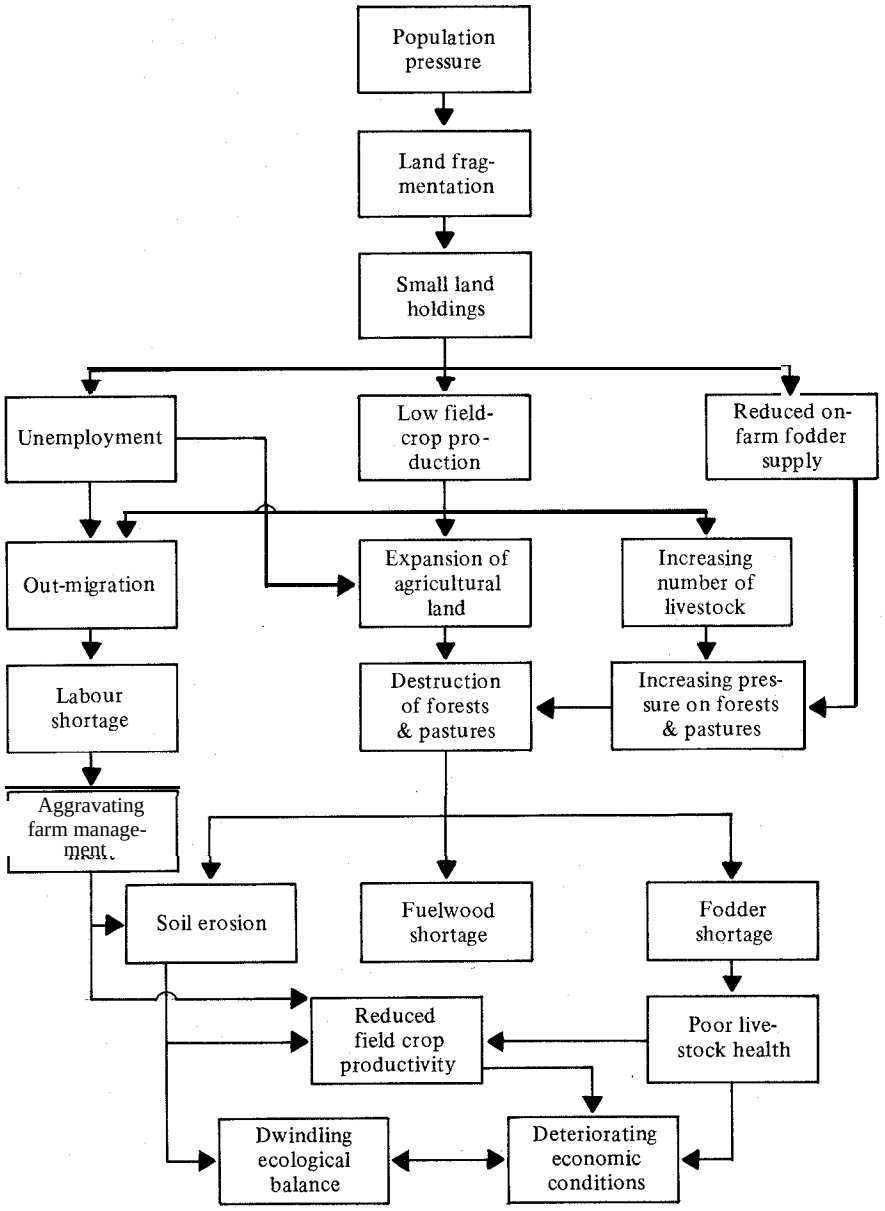
The physical conditions in the hills, i.e., steep slopes, poor soils and extreme climatic conditions, are not conducive to agricultural intensification as previously mentioned. Consequently, agricultural production has remained stagnant.

In this situation, the addition of one household member would be expected to directly reduce the per capita allotment of cereals, which theoretically should lead to instances of famine and starvation. Surprisingly, this does not happen because the people are not dependent solely on field-crop cultivation. Rather, they have adopted assorted strategies to supplement field-crop cultivation, such as raising livestock, working as agricultural labourers, and temporary out-migration in search of employment.

As the amount of income that one additional adult household member consumes would always be less than what he earns, surplus earnings become available for supporting household dependents, e.g. elderly people and children, and for fulfilling some other basic needs. Thus, the effect of increasing family size does not perpetuate stagnation at the household or micro-level. At the macro-level, however, accelerated population growth has begun to yield adverse effects.

Although the Government has adopted a sectoral approach to population control through the implementation of its family planning programme, adoption of family planning does not ease the economic constraints faced by rural households. Rather, the acceptance of small family size is likely to put heavier pressure on the household economy and its available labour force. It is for this reason that the hill people are reluctant to adopt family planning, as manifest in the average annual population growth rate of 2.6 per cent during the inter-censal period of 1971 to 1981 (table 1). This corroborates

Figure: Population growth and people's changing strategies for survival



the insight that development programmes which do not address the people's social and economic problems face the prospect of "faint" success or "tender" failure.

Alternative strategy for planning

The foregoing discussion of population and the environment in the hills of Nepal shows that a population growing rapidly and concurrently with a faltering economy leads to ecological degradation (see figure). To stabilize the economic and environmental systems and to control accelerated population growth in the hills, a comprehensive development programme for the hills must be worked out with a focus on alleviating pressure on the fragile resource system.

This would entail an integrated strategy of population control, the implementation of an integrated agrarian and land reform programme, agricultural development, promotion of non-farm employment opportunities, and the people's participation in decision-making and planning. The development programme proposed for the hills would not adversely affect development in the *tarai*; instead, it would be complementary.

A hill development programme could, in fact, be conducive to further development in the *tarai* as it would presumably reduce the frequency and intensity of flash-floods, increase the amount of perennial water supply, produce industrial raw materials, and supply fruits, livestock as well as livestock products to lowland markets.

Agricultural development

In general, hill agriculture is not problematic. However, its efficiency could be improved with the introduction of suitable crops and cropping systems in conjunction with agro-economic and agronomic research, as well as by strengthening agro-marketing and by upgrading accessibility. The official policy of designating the hills as a fruit-farming region appears to be unscientific as well as irrational in view of the diverse micro-climatic conditions which are appropriate for crop cultivation, horticulture, livestock ranching and forestry. Planners and policy makers ought to realize the potential of the hills in this regard and formulate a comprehensive micro-spatial agricultural plan, especially directed towards the development of the aforementioned components of agricultural land use.

With regard to livestock rearing, emphasis should be placed on the promotion of goats, sheep and pigs, all of which require a relatively small amount of investment and relatively little fodder, and which can also be reared through stall-feeding.

Land reform

According to a relatively recent report (Ali, 1983, p. 50), 59.9 per cent of the land under cultivation is owned by only 9.8 per cent of the households; by contrast, the vast majority (68.5 per cent) of the rural households in Nepal own only 10.5 per cent of the total cultivated land. Thus, if the tenant population is disregarded, it is apparent that the land held by a relatively small group of people is under relatively low population pressure compared with land owned by marginal and small farmers.

Under the threat of internal discontent and with the advice of international agencies such as the World Bank and the Food and Agriculture Organization of the United Nations, a land reform programme was implemented in 1964. However, it could not produce the results intended owing to high land ceilings and certain legal loopholes which enable landlords to retain their land holdings intact. According to a report prepared more than a decade afterwards (APROSC, 1978, p. 10), only 21,050 ha of land had been distributed to former tenants under the land reform programme. However, as much as 60 per cent of the land identified as excess land was still under the ownership of erstwhile landlords.

To alleviate the pressure on marginal landholdings and to check subsequently the accelerated rate of soil erosion on that land, any land reform programme capable of being successful would have to put special emphasis on low land ceilings and on land tenure security, and would have to provide for agricultural support services, especially directed towards small farmers.

Non-farm employment opportunities

In view of the small arable land resource base of Nepal, a land reform programme alone could not relieve pressure on land resources even if they were efficiently utilised. Therefore, the non-farm sector is an important alternative that could shoulder the burden, if it were not for the fact that this sector is severely lagging behind. According to an income and consumption survey conducted in 1977, the non-farm sector reportedly generated employment for only one fourth of the total rural labour force (NPC, 1978, p. 3).

The most serious threat is that traditional cottage and small-scale industries, which previously had long generated considerable employment and income opportunities, are gradually disappearing. Thus, the challenge is to promote and develop non-farm employment opportunities. While some policy makers and planners (Yadav, 1986; Banskota, 1986) emphasize infrastructural development, particularly the construction of roads and irrigation systems, the promotion of agro-processing industries and the improvement of marketing facilities, others advocate the development of small market cen-

tres (Manandhar, 1986). All the strategies suggested by them would have the potential of becoming operational, if the current dependency on imports of manufactured goods could be reduced.

In the wider regional context, the fact ought to be realised that the proliferating problems of flooding, siltation and water contamination in the vast river plains of neighbouring countries cannot be solved unless the population pressure on the land in the mountains of Nepal is alleviated. In the long run, the benefits would be higher for the countries concerned if there were a reorientation of univectoral cross-border trade towards the in-country manufacture of goods, taking advantage of mutually exclusive location facilities, rather than continuing the currently random pattern of goods and commodities trade.

Population control

Unless the population growth rate is reduced, neither land reform nor non-farm employment programmes could alleviate the current pressure on land resources. Despite the implementation of a much publicized family planning programme, Nepal's population has grown by 2.6 per cent annually during the period 1971 to 1981. The current population growth rate is about 2.5 per cent per year, and the total fertility rate is 5.9 (ESCAP, 1988). These statistics illustrate the ineffectiveness of that programme.

Poverty, illiteracy, poor public health services and inadequate medical facilities, and a weak family planning programme have been the major impediments to the adoption of family planning advice and acceptance of contraceptive methods. In view of the limited manpower of the National Family Planning Association and the constraints posed by the lack of roads in terrain characteristic of the hills and mountains, which make accessibility difficult in vast parts of the country, it would be sensible to have the programme implemented through non-governmental organizations (NGOs) and educational institutions such as village schools. If school teachers were trained properly and offered adequate remuneration for this purpose, they might prove far more effective in motivating rural people to adopt family planning than extension or health workers.

People's participation

While people's participation is indispensable for achieving sustainable development, this approach has not been fully realized in Nepal. Although popular participation has been highlighted in planning documents, the basic politico-administrative processes are of the top-down type. It would be desirable, therefore, to envisage a system which fosters and promotes popular leadership, establishes checks and balances, decentralizes decision-making and, above all, entails accountability to the people.

Watershed approach to planning

Being a predominantly mountainous country with numerous large, medium and small-size rivers, the entire territory of Nepal is divided naturally into several major river basins or watersheds, each comprising several sub-basins with narrow, long river valleys surrounded by rugged mountains. The upstream and downstream, or upland and lowland, areas of these mountain watersheds are interlinked physically, hydrologically, climatologically, culturally, socially and economically.

The uplands are areas with sources of water for irrigation, industrial and domestic use in the lowlands. They also include areas that supply fuelwood, fodder, fruit, timber and livestock or livestock products. The lowlands complement the food crop requirements of the uplands and provide income and employment opportunities for uplanders. For these and related reasons, watersheds are deemed to be the appropriate spatial planning units for regional development planning purposes.

Scientific land capability analysis

While the major proportion of the country's land area is vulnerable to soil erosion, no scientific land capability database has yet been created which would make possible scientific land-use planning. Therefore, policy makers and planners should direct their efforts towards preparing a national land capability database with particular emphasis on climatological data, soil surveys, slope analysis and land-use evaluation. Suitable microcomputer software packages for scientific land-use planning are available for the storage, retrieval and analysis of such data and information.

Conclusion

Despite the steady out-migration of the hill population, the absolute number of that population is growing rapidly. In the absence of non-farm employment opportunities, this population growth has led to increasing pressure on scarce and fragile land resources. In response, people have opted for encroaching on forests and pastures usually located on steep slopes, increasing the volume of livestock they rear, and for out-migration which has enabled them to solve to some extent their problems in securing a livelihood. Such survival strategies, however, have led to the deterioration of the ecological balance, thus jeopardizing the future of the country. A comprehensive hills development programme with a focus on alleviating the pressure on land resources is urgently needed to avert any worsening of the indherent problems and to embark on development activities with the objective of maintaining the ecological balance.

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Sustainable Development

The link between population and sustainable development was the focus of an address by Mr. Tatsuro Kunugi, Deputy Executive Director of the United Nations Population Fund (UNFPA), to the Academy of Social Sciences and Management at Sofia, Bulgaria on 17 March 1989.

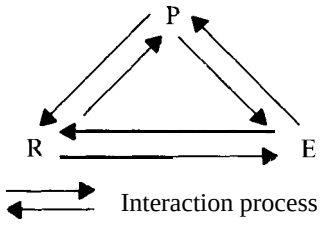
In referring to the reports entitled *Our Common Future* by the World Commission on Environment and Development and *The State of World Population 1988* issued by UNFPA, Mr. Kunugi said that, instead of a "gloom-and-doom" forecast, these reports call for a programme that integrates population and resource management.

This approach would ensure human progress through sustainable development which will not compromise the resource requirements of future generations.

In the 1990s, the United Nations and its agencies, drawing on the co-operative capacities of member countries and non-governmental organizations, will need to be the fulcrum for forging and aodpting a globally integrated approach to sustainable development, recognizing the crucial linkages between population, resources and environment.

These linkages, according to Mr. Kunugi, may be conceptualized as comprising a trilateral interaction process, each factor affecting, either directly or indirectly, the other two factors.

Conceptual framework



For instance, increased population pressure may tax limited resources and degrade the environment, whether directly or indirectly, both of which may in turn lessen the quality of human life and eventually threaten its survival.

This conceptual framework may serve not only as an analytical tool but also as a tool to help determine the direction and type of action that should be taken in order to restore and/or maintain the optimum equilibrium in the trilateral relationships with regard to particular situations at various levels, i.e. local, national, regional or global levels. Futhermore, in cases where the intensity of interaction between the three factors is not particularly strong or is non-existent, the use of this conceptual tool would help in identifying the underlying causes behind certain changes. For example, it may be seen that the availability of natural resources played only a minor role in enabling modern economic growth and population growth in European societies, Japan, Hong Kong and others, because it illustrates the dependence of economic growth on production techniques and institutional, cultural and human resource factors.

Projections and implications

Turning to current world demographic trends, Mr. Kunugi noted some salient features. The United Nations Population Division estimates the current world population to be about 5.2 billion, with an annual rate of growth of 1.73 per cent, or about 90 million persons per year. It will reach 6.25 billion by the year 2000 and almost 8.5 billion by the year 2025. These projections are higher than the previous assessment of 1984, mainly because the rate of fertility decline in some regions, especially in South Asia, had been overestimated. Most of the world's population growth is taking place in the develop-

ing regions. Some 93 out of every 100 persons currently being added to the world's population will live in developing countries, and the total population in the developing regions is expected to double in about 35 years.

If this trend continues, there is a strong possibility that food crises and further slowing down of economic development as presently seen in Sahelian Africa, Ethiopia and Bangladesh may spread to other parts of the world. This downward spiral can be stemmed only through concerted international efforts.

The rapid growth of population in the poorer countries may result in mass migrations from rural areas to urban centres. Urban populations in developing countries will double from 1990 to 2000, creating numerous large cities, including 16 of the world's 20 largest "mega-cities." This will create not only grave internal tensions for countries and severe hardship for urban migrants, but also pressure for international migration, particularly from developing countries to the developed countries. The political implications of such pressure may not be easy to assess, but it could ultimately pose a threat to international security in the next century unless the catalysts for such mass movement can be reduced.

Signs of hope

The majority of developing countries, including virtually all of the most populous ones, are convinced of the need for slower population growth and more even distribution of population. They know that this will help to take pressure off agricultural lands and conserve energy sources, vital watersheds and forests. In the industrialized countries, smaller families have been the result of economic change, especially the transition from agricultural to modern economies. However, in developing countries where populations are already huge, economic progress may be impossible without slower population growth. Increasingly, developing countries are adopting population policies to guide their overall development planning.

Some countries are already demonstrating how to slow population growth in a way that contributes to sustainable development. For example, countries that are on the way to industrialized country status, such as the Republic of Korea and Thailand, have confronted head-on the problem of resources versus population with successful results.

As for industrialized countries, they perceive the growing need to assist developing countries in the field of population and resource management. They also generally recognize their responsibility to curb wasteful and dangerous industrial practices and to assist developing countries to find clean and efficient means of industrial development.

Tasks ahead

Population work has never been so extensive or more varied. In addition to the need to improve and expand the outreach of maternal and child health care and family planning services, there are important tasks to be performed to raise awareness of the problem and its possible solution among policy planners as well as the general public. The issues of migration, human resource development and population aging need to be addressed; similarly the key role that women play in the development process needs to be appreciated. The vital importance of women as managers of the natural environment is beginning to be grasped, yet the promotion of full and equal participation of women in all stages of the development process must become one of the aims of population programmes.

On the occasion of UNFPA's twentieth anniversary celebration, held on 25 Janaury 1989, UNFPA Executive Director, Dr. Nafis Sadik, said that despite the considerable efforts of the international community over the past two decades, 50 per cent of the world's women still do not have access to family planning services and information. It is this audience that must be reached in the coming years, she said, because "only when women everywhere are fully involved in decisions on family size, when they have access to education, when their economic contribution is recognized, and when they have some leisure to enjoy family life, can development be said to succeed".

Population policies and projects are more likely to succeed if those benefitting from the activity also participate in the formulation and implementation of the activity. In addressing the extensive and varied tasks in the field of population, non-governmental organizations (NGOs) are particularly suited to organize population communication and education activities, to deliver services and to promote community development. Sensitive to the people's needs and perceptions, they tend to see things in a holistic way, and are often flexible in their methods and operations.

Because of their flexibility and willingness to take risks, NGOs are in a comparatively advantageous position to undertake activities that are considered sensitive or controversial. Once the activities are accepted, Governments tend to become more willing to get involved in such activities.

If joint endeavours with Governments, NGOs and youth groups are successful, the future will see rational management of resources, the environment and development in such a way as to meet both the imperatives of justice for those in need and the common interest of all peoples in a more stable and secure socio-economic order. "Our aim must be not just development, but sustainable development which safeguards the future of the human race," Mr. Kunugi concluded.

Women and Population Aging*

One of the dramatic demographic changes that is taking place, in both developing and industrialized countries, is the increasing proportion of elderly (people 60 years of age and above) in the total population.

"Population aging" is the process by which the relative size (proportion) of the young age population decreases and the relative size of the older age population increases, as a result of the transition from high levels to lower levels of both fertility and mortality.

Demographic trends show that in coming years the proportion of older persons – in both developing and industrialized countries – will increase. In 1985, there were 427 million persons aged 60 years and over, accounting for approximately 9 per cent of the world's population. By the year 2020, the elderly population will account for 13 per cent of the world's total population, and 70 per cent of these older people will live in developing countries (see table 1).

Unlike other critical dimensions of world population growth, such as fertility and mortality which may be directly influenced by government policies, the basic process of population aging can be influenced only indirectly through pronatalist policies to increase fertility or by the immigration of young people.

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* This paper was presented by Tatsuro Kunugi, Deputy Executive Director of the United Nations Population Fund (UNFPA), at the Fourth Informal Meeting on the Health and Well-Being of the Elderly at the 81st session of Inter-Parliamentary Conference, Budapest, Hungary, 13-18 March 1989. (Enquiries about UNFPA activities on population aging should be addressed to Mr. Pedro Pablo Villanueva, UNFPA Headquarters, New York, the focal point on this subject.

Table 1: Size of population aged 60 and over by sex for the world and regions, 1960-2020
(In thousands, medium variant)

	1960			1980			2000			2020		
	Males	**Females**	**Total**	**Males**	**Females**	**Total**	**Males**	**Females**	**Total**	**Males**	**Females**	**Total**
Developed regions	49 032	69 527	118 559	68 172	105 152	173 324	98 092	136 470	234 562	134 266	173 909	308 175
Developing regions	59 797	66 135	125 932	98 737	109 145	207 882	178 371	195 759	374 130	333 637	369 787	703 424
World	108 829	135 662	244 491	166 909	214 297	381 206	276 463	332 229	608 692	467 903	543 696	1 011 599

Source: Global Estimates and Projections of Population by Sex and Age. The 1984 Assessment. United Nations, DIESA, New York, 1987.

Table 2: Percentage of population aged 60 and over by sex for the world and regions, 1960-2020

	1960			1980			2000			2020		
	Males	**Females**	**Total**	**Males**	**Females**	**Total**	**Males**	**Females**	**Total**	**Males**	**Females**	**Total**
Developed regions	5.19	7.36	12.55	6.00	9.25	15.25	7.68	10.69	18.37	9.75	12.63	22.38
Developing regions	2.88	3.19	6.07	2.98	3.29	6.27	3.68	4.04	7.72	5.18	5.74	10.91
World	3.60	4.49	8.10	3.75	4.82	8.57	4.51	5.43	9.94	5.98	6.95	12.93

Source: Global Estimates and Projections of Population by Sex and Age. The 1984 Assessment. United Nations, DIESA, New York, 1987.

The aging of population has economic implications, i.e. the imbalance in the proportions of those who produce income and those who need to be supported, and social implications, i.e. the need to provide social support for the elderly and the incorporation of this group in society.

In order to deal with these implications, Governments and international agencies should increase their efforts and activities with a view to improving care for the elderly within the family unit. Moreover, Governments should view the aging sector of the population not merely as a dependent group, but in terms of the active contribution that older persons have already made and can still make to the economic, social and cultural life of their families and community.

The dimension of the socio-economic implications of aging is greater for the female population because of their higher life expectancy. Women survive longer and outnumber men at higher ages. Women's lower level of participation in economic activities, their disadvantaged economic status, the transformation of the role and the pattern of the family – from the extended to the nuclear – have affected the traditional caretaker role of older women and have been conducive to their social isolation.

In industrialized economies, the gap in life expectancy between women and men is six years. In developing countries, the difference is smaller, but still significant, i.e. three years, and in some Latin American countries and East European countries as well as in Republic of Korea in Asia, it is more than six years. According to United Nations projections, in the year 2000, 11 per cent of the world's female population will be aged 60 and over; in the developed regions, the number will be 21 per cent. In the same year, 5 per cent of the world's total population will be women aged 60 and over (see table 2).

In developing countries although the age structure is younger (in the year 2000, only 8 per cent of the female population will be aged 60 and over), the absolute number of elderly women is high and is projected to increase in forthcoming years. By the year 2025, there will be 604 million elderly women in the world, 70 per cent of whom will be living in developing countries and, among them, 70 per cent in rural areas.

A prerequisite for the formulation of programmes aimed at improving women's status is filling the vast gaps that exist in data collection, analysis and research on their roles, income and employment situations, health and family life. Although in developed countries, research on elderly women is no longer uncharted territory, the application of these research findings in policy formulation is very scanty. Policies in many countries continue to be developed as if the older population were a homogeneous group.

Table 3: Expectation of life by sex

	Females	Males
Developing economies	63	60
Industrial economies	79	73
High-income oil exporters	66	62
Non-reporting non-members	73	65

Source: World Development Report 1988, (The World Bank, 1988).

One important issue requiring both research and policy attention is the interdependence among women's economic, health and social concerns, which increase with age. The Plan of Action on Aging* recognizes a number of specific areas of concern for elderly women, since their longer life expectancy frequently means an old age aggravated by financial problems and social isolation for both single women and widows, possibly with little or no prospect of paid employment, which in turn precipitates or exacerbates health problems. (See table 3.)

The interplay between age-related and gender-related issues suggests the need for greater collaboration between two large networks that have emerged in some countries in recent years, i.e. "aging networks" and "women's networks"

Both demographic trends and changing attitudes towards women's position in society are harbingers of changes in the roles and status of elderly women in the decades to come. In both industrialized and developing countries, women's participation in socio-economic development efforts is rapidly increasing. This change is occurring at precisely the time when women in some developing countries are beginning to make some gains in their social status within the family and society. The challenge will be to find ways of providing supportive services to elderly women who wish to participate in the these development efforts.

Some policy issues

The elderly, simply by virtue of being in the 60-plus age group, are neither a "social problem" nor a "problem group". Nevertheless, some societal structures and attitudes impose upon the elderly the status of being vulnerable or marginal. One consequence of this marginality has been the growth

* Vienna International Plan of Action on Aging, 26 July - 6 August 1982, Vienna, Austria, United Nations, DIESA E94, New York, 1983.

of age-group-specific programmes for the elderly, many of which are accorded a low political priority.

Some policies exclusively targeted for specific groups, tend to segregate rather than integrate families and communities. In this wider context, there is a need to have more specific policies that aim to eliminate discrimination against disabled persons, against the elderly and indeed against elderly women.

What is needed, then, is radical change of perspective that would break the orthodoxy which segregates elderly women, replacing it with a strategy to integrate them.

Recommendations on women and aging

Governments and non-governmental organizations are urged to take the necessary steps to implement the following recommendations, many of them already having been adopted by international bodies:

- Promote research studies and the collection and analysis of information on the socio-economic, health, legal and demographic situation of elderly women.
- Promote awareness among the general public of elderly women's important socio-cultural and economic contribution to society, and discourage negative stereotyping of elderly women.
- Eliminate discriminatory treatment of women in social security systems, providing better protection, social benefits, tax deductions and other supportive services.
- Develop health promotion programmes and services focusing on community and institutional care to meet elderly women's needs for long-term care.
- Promote wider appreciation of continued participation of elderly women in social and cultural activities utilizing their invaluable skills and experience.
- Promote the development of elderly women's organizations and self-help groups of all kinds.
- Promote and ensure the participation of elderly women in the process of development – especially rural development – and in the formulation of policies that affect their social life.
- Develop literacy programmes and training programmes for elderly women in their own health care, nutrition, child care, and appropriate production techniques and income-generating activities.