RURAL SEX RATIO IN NORTH-WESTERN REGION OF INDIA : AN EXPLORATORY ANALYSIS

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CERTIFICATE

Certified that the Dissertation entitled **"RURAL SEX RATIO IN NORTH-WESTERN REGION OF INDIA : AN EXPLORATORY ANALYSIS"** submitted by **NAVNEET DHAWAN** is for the award of the Degree of Master of Philosophy of this University.

This dissertarion has not been previously submitted for any other Degree of this or any other University and is his own work.

We recommend that this Dissertation may be placed before the examiners for evaluation.

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DEDICATED

TO

MY PARENTS

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This dissertation would not have taken shape but for the support I received from my teachers and friends.

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Finally, I accept complete responsibility for what has been presented and to all errors -factual or otherwise-that may have crept into this dissertation.

New Delhi.

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NAVNEET DHAWAN

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CHAPTER 1

INTRODUCTION

Sex composition is one of the basic demographic components of population composition. According to the provisional results of 1991 census, India's population has reached 844 million by the sunrise of March 1, 1991. Her share in the world population has increased to 16 per cent from 15.2 per cent in 1981. In other words, every sixth person in the world is an Indian. Another major feature of 1991 census, apart from the total population increase, is the sex ratio (number of females per 1000 males) which is found to have declined from 934 in 1981 to 929 in 1991 i.e., the number of females per thousand males has declined by five points over the decade which is seen as a very disturbing phenomenon by demographers, policy planners, sociologists and various social scientists.

The lower sex ratio is not specific to India. Many underdeveloped countries have a sex ratio much below 1000. The sex ratio of various developed and developing countries is given in Table 1.1. Similarly, the declining sex ratio in India is not unique to 1991 census alone. The decline of the number of females in the population has been registered at every successive censuses commencing from the start of this century indicating that the proportion of female population to male population is decreasing resulting

in an increasing masculinity of the Indian population (Table 1.2).

Table 1.1

Sex ratio in Different countries of the World

Developing		Developed	
Countries	Sex ratio	Countries	Sex ratio
India	929*	Canada	1027
Bangladesh	940	Netherland	1022
Pakistan	905	Switzerland	1051
China	941	Germany	1109
Iran	942	U.S.S.R.	1127
		New Zealand	1018
		Finland	1064
		Hungary	1071
		Australia	1008

Note: *the data for India refer to 1991; for the rest the refernece year is 1986.

Source : UN Demographic Yearbook 1989.
Census of India, series 1, India, Provisional population Tables, Paper 1 of 1991 New Delhi, Register General and census commissioner.

Table 1.2

Sex ratio in India 1901-1991

Year	Sexratio
1901	972
1911	964
1921	955
1931	950
1941	945
1951	946
1961	941
1971	930
1981	934
1991	929*

Source : Census of India 1991. Series 1, India, Provisional, Population Total, Paper 1 of 1991, New Delhi, Registrar General and census Commissioner, India.

From Figures 1.1 and 1.2 (based on Table 1.2), it may be noted that the 1971 sex ratio is sharply declined one as compared to 1961 which seems to have improved in 1981 and again plummeted in 1991. However, the improved position of 1981 was due to an undercount of females in the 1971 census. For example, sex ratio in Bihar declined from 994 in 1961 to 950 in 1971; in Uttar Pradesh from 909 in 1961 to 879 in 1971; and in Tamil Nadu from 992 in 1961 to 978 in 1971. Considering these and other cases of sharp shortfall of

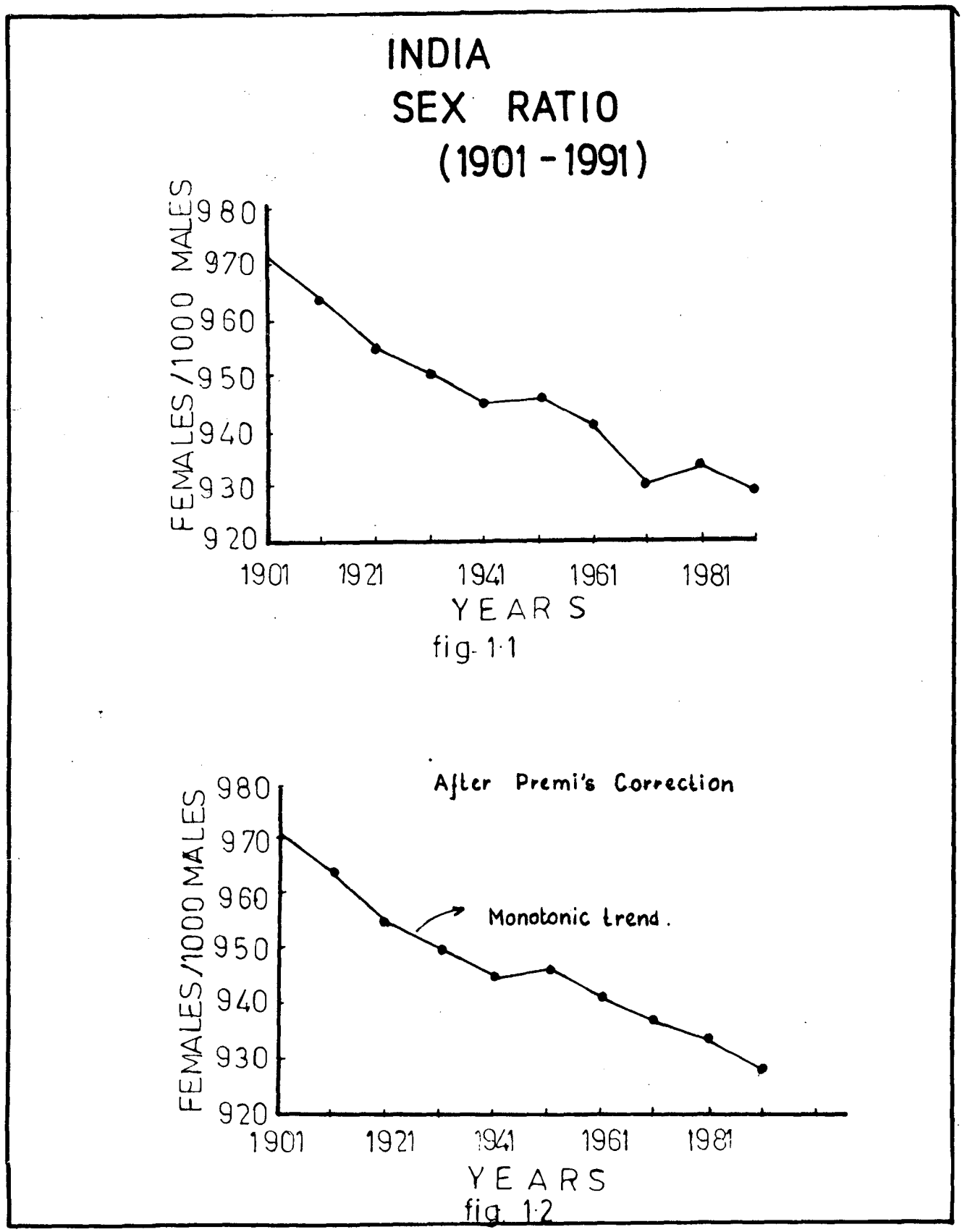

INDIA
SEX RATIO
(1901 - 1991)
FEMALES / 1000 MALES
980
970
960
950
940
930
920
1901
1921
1941
1961
1981
YEARS

fig. 1·1

After Premi's Correction
FEMALES / 1000 MALES
980
970
960
950
940
930
920
Monotonic trend.
1901
1921
1941
1961
1981
YEARS

fig. 1·2

females in 1971, it has been estimated that if there was no differential undercount of females in 1971 as compared to that in 1961, the sex ratio in 1971 should have been around 937. Thus, the 1981 'improvement' in sex ratio and the subsequent downfall in 1991 has been seen as spurious. In that case one observes a monotonically declined trend in the sex ratio in the country (Premi 1991). Even if the trend is monotonically declining one, it has been argued that the 1991 decline is much more than such a trend should reflect (Kundu 1991).

This decling trend of sex ratio is a matter of serious concern and has resulted in various attempts to account for the observed phenomenon. Different authors have tried to explain this phenomenon. The explanations offered are at two levels : (a) National, and (b) Regional. At national level there can be four possible reasons for the decline in the sex ratio over time (Premi 1991).

(1) there has been higher emigration of females than of males and / or larger immigration of males.

(2) the sex ratio at birth is becoming more favourable to males than what it was in the past.

(3) female mortality has been higher than male mortality and this differential has increased instead of narrowing down over time, and

(4) there has been greater undercount of females in the current census than in the previous one.

Similar views have been expressed by Kundu and Sahu (1991) and they add the fifth point i.e.,

(5) female selective termination of pregnancy leading to a decrease in the sex ratio at birth.

However, statistics on international migration are scarce. The volume of international migration in India, compared with the total population, has always been in significant. Further, there is no evidence at all of female selective emigration or male selective immigration of a magnitude which can affect sex ratio.

There is, however, a possibility that the sex ratio at birth has changed over time. Biologically there are more male conceptions than female conceptions (Premi 1991). But at the same time, there are more male foetal losses (due to instantaneous and voluntary abortions) than those of females. This is established by the data available in this regard. Consequently, reduction in foetal losses are expected to raise the sex ratio at birth. For example, the sex ratio at birth in Sweden around 1780 was 104.3. By 1980, it increased to 107.2. In United Kingdom the sex ratio at birth in 1861 was 103.5. It had increased to 107.4 in 1980. In Belgium, the sex ratio at birth improved from 104.8 in 1900 to 105.8 in 1980 and in France it improved from 104.4 in 1851 to 105.2 in 1980. (Anantharam 1989).

In India, the mortality as well as foetal wastage

at the beginning of this century was very high due to several factors. This can be established from the available data whereby death rate has been brought down by about 10-11 by the end of the 1980s, the infant mortality rate has also declined from 300 at the beginning of this century to 91 by 1989 (Premi 1991).

The Civil Registration System meant for recording of each birth and death alongwith the sex of the child at birth has somehow not worked well in India and one cannot depend on those data. Further, the Sample Registration System (SRS) which has been in operation for almost a quarter of a century now has also not provided this vital information except for the first few years. The sex ratio at birth in rural India during 1965-67 in the Sample Registration System was 107.5. However, there are some indirect indications that the sex ratio at birth in India has been rising. However, it is not possible to provide hard data for this argument. Recently, Registrar General's office has started collecting sex-wise birth data from hospital records. Information on approximately 35,000 birth from three hospital records in Delhi covering the last five years show that the sex ratio at birth has gone up to 109 as compared to the earlier sex ratio of 106 (Raju and Premi 1992).

It is necessary to know the impact of rise in sex ratio at birth on the overall sex ratio of India starting

with the sex-age structure of India's 1971 population, Anantharam (1989) has analysed the change in the sex ratio with change in sex ratio at birth and with different life tables. He selected three Indian life tables - one relating to 1891-1901 in which the female expectation of life were almost equal; and the third relates to 1961-71 period when the female expectation of life was lower than that of males. Table 1.3 gives the trend in sex ratio over a period of time under varying assumptions of sex ratio at birth and life expectancy.

Life table, the simulation exercise indicates that with the rise of one point in sex ratio at birth, say from 104 to 105, the overall sex ratio declines by 3 points in ten years, by 4 to 5 points in 20 years and by 6-7 points in 30 years when other conditions remain constant. Thus, an increase in sex ratio at birth can at least partly, explain the decline in the overall sex ratio. However, this proposition remains highly controversial.

Biologically, right from birth onward, females have greater resistance to diseases than males. Consequently, in most societies, the overall sex ratio is in favour of females.

In India, The improvement in living conditions and in the availability of medical facilities throughout the country over the past half a century or more has led to greater survival of both males and females and should have

Table 1.3

Trends in sex ratio with 1971 Age Composition and different life Tables

	Year sex ratio at birth										
	108		107			106			105		104
Year	61-71	91-01	21-31	61-71	91-01	21-31	61-71	91-01	21-31	61-71	61-71
1971	930	930	930	930	930	930	930	930	930	930	930
1976	925	934	928	926	935	930	928	936	931	929	930
1981	921	937	926	924	939	929	927	942	932	929	932
1986	919	940	922	922	943	925	926	947	929	930	934
1991	916	942	920	920	946	924	925	951	929	930	934
1996	913	943	919	919	949	924	924	954	930	930	935
2001	911	944	919	917	950	925	923	956	931	929	936
2006	910	945	917	916	951	924	923	958	931	930	936
2011	908	945	916	915	952	924	922	960	931	929	937
2016	907	945	916	914	953	923	922	961	931	929	937
2021	906	946	915	913	954	923	921	962	930	929	937
2026	905	946	915	913	954	923	921	963	931	929	937
2031	904	946	914	912	955	923	920	963	931	929	937
2036	903	947	914	912	955	923	920	964	931	929	937
2041	903	947	914	911	956	922	920	965	939	929	937
2046	903	947	914	911	956	922	920	965	931	929	938
2051	903	947	914	911	956	922	920	965	931	929	938
2056	903	947	913	911	956	922	920	965	931	929	938
2061	903	947	913	911	956	922	920	965	931	929	938
2066	903	947	913	911	956	922	920	965	931	929	938

Sources : Cited in Premi, M.K. - India Population: Heading Towards a Billion, B.R. Publishing Corporation, 1991.

led to narrowing down the gap if not reversing the prevailing trend. Moreover, with certain social change leading to somewhat greater attention towards the girl child in recent years, one would expect a further narrowing down of male female differentials in mortality.

The excess of males in India's population rose steadily and rapidly each census year from a difference of only 3.4 million in 1901 to 31.3 million in 1991. This widening of the gap has accelrated dramatically since 1951 except in 1981 when the pace of increase slighty slowed down, (Table 1.4) (Premi 1991).

Table 1.4

Population of Males and Females and Estimated Decada Male and Female Death Rates : India, 1901-91

	Population (thousands)		M - F	Estimated death rate for previous decade per 1000		
Year	Males	Females	(thousands)	Males	Females	F - M
1901	120,911	117,485	3426	50.4	49.9	-0.5
1911	128,385	123,708	4677	46.6	48.2	+1.6
1921	128,546	122,775	5771	52.8	53.5	+0.7
1931	143,055	135,922	7133	35.2	37.7	+2.5
1941	163,825	154,835	6990	27.2	29.4	+2.2
1951	185,528	175,560	9968	28.8	30.2	+1.4
1961	226,929	212,942	13351	20.5	23.4	+2.9
1971	283,937	264,013	19924	17.3	18.6	+1.3
1981	353,324	330,005	23319	15.0	15.2	+0.2
1991	437,598	406,333	31265			

Source : Premi, M.K. India's Population: Heading Towards a Billion, B.R. Publishing Corporation, 1991.

As for the undercount thesis is concerned, It has been argued that on national level, increase in the bias against female in census enumeration can explain the fall in the sex-rattio in a decade but not a declining trend over a period of 90 years (kundu and Sahu 1991). It would be difficult to sustain a thesis of progressive undercount of female from one census to the other. Premi (1991) also observe that estimates of percentage of undercount by sex derived for the post enumeration checks of 1951, 1971 and 1981 indicate that the differential between the males and females undercount hasnot widened (Table 1.5). As the post enumeration check of the 1961 did not tabulate the extent of undercount by sex, one cannot say that there was no deterioration in female enumeration from 1961 to 1971, specially when there was deterioration in the total count from a net undercount of 0.8 percent in 1961 to 1.7 percent in 1971.

Table 1.5

Sex Differential in underenumeration as Revealed by Post Enumeration checks

	Extent of underenumeration per 1000 population		Relative index of undercount
Year	Male	Female	F/M
1951	8.6	11.2	1.30
1971	15.3	18.3	1.20
1981	17.1	18.9	1.11

Source : Premi, M.K. India's Population: Heading Towards a Billion, B.R. Publishing Corporation, 1991.

The relatively sharper decline in sex ratio at birth in recent years could be due to amniocentesis which by itself would explain a substantial part of the decline. Raju and Premi (1992) refers a worthmentioning example in this regard. A sociological study in Bijnor district of Uttar Pradesh found that during the last decade, a number of clinical services with amniocenthesis facilities for sex identification of foetuses had appeared in north India, what is more shocking is that their distribution marked the cultural pattern where girls were devalued (Patel 1988). In fact, several investigative reports have shown that in India, between 1878 and 1982, about 78,000 female foctuses were aborted after sex determination tests (D'. Monte 1988 Bajapi 1990)

The above discussion reveals that on national level decline in sex ratio can be understood by a combination of all the obove said five reasons. No reason is sufficient in itself which can explain the declining sex ratio phenomenon fully on national level.

Viewed from the regional perspective the sex composition of India's population varied greatly from one part of country to another. Table 1.6 shows the sex ratio of various states. Important feature of the sex ratio is that it is considerably lower in the northern India say above $22^{o}N$ latitude while it is substantially above the national average in southern states (Premi 1991). The north-south

Table 1.6

Sex ratio (Females per 1000 males) 1901 - 1991

	1901	1911	1921	1931	1941	1951	1961	1971	1981	1991
India	927	964	955	950	945	946	941	930	934	929
Andhra Pradesh	985*	992*	993*	987*	980*	986*	981*	977*	975*	972*
Karnataka	983*	981*	969*	965*	960*	966*	959*	957*	963*	960*
Kerala	1004*	1008*	1011*	1022*	1027*	1028*	1022*	1016*	1032*	1040*
Madhya Pradesh	990*	986*	974*	973*	970*	967*	953*	941*	941*	932*
Orissa	1037*	1056*	1086*	1067*	1053*	1022*	1001*	988*	981*	972*
Tamil Nadu	1044*	1042*	1029*	1027*	1012*	1007*	992*	978*	977*	972*
Assam	919	915	896	874	875	868	869	896	910	925
Bihar	1054	1044	1016	994	996	990	994	954	946	912
Gujarat	954	946	944	945	941	952	940	934	942	936
Haryana	867	835	844	844	869	871	868	867	870	874
Himachal Pradesh	884	889	890	897	890	912	938	958	973	996
Maharashtra	978	966	950	947	949	941	936	930	937	936
Punjab	832	780	799	815	836	844	854	865	879	888
Rajasthan	905	908	896	907	906	921	908	911	919	913
Uttar Pradesh	937	915	909	904	907	910	909	879	885	882
West bengal	945	925	905	890	852	865	878	891	911	917

Note * Above national average

Source : - Census of India 1991, series 1, India's Provisional Population Totals, Paper 1 of 1991, New Delhi, Registrar General and census Commissioner, India, 1991

divide comes out sharply if we compare the four southern States of Kerala, Tamil Nadu, Karnataka and Andhra Pradesh with the four major northern states in Hindi belt ie Bihar, Uttar Pradesh, Madhya Pradesh, Rajasthan, Punjab and Haryana. The sex ratio for the southern states is much higher than that for the Hindi belt as a whole and this sharp differential is observable all through the present century. Kerala with 1040 females for every thousand males in the country had the distinction of being the only states in the country with excess of females over males.

According to Kundu (1991) at the state or district level, migration is the single most important factor explaning the temporal and cross sectional variation in sex ratio. It is a combination of three processes.

(1) Slowing down of outmigration

(2) Return migration and

(3) Continuance of male selective inmigrations in some areas.

It is important to note that despite the significant decline in sex ratio in Bihar over the past nine decades, particularly during the 60s and 80s, the figure works out to be higher than that of Uttar Pradesh, Haryana and Punjab and about the same as of Rajasthan and west Bengal. Bihar had the highest sex ratio (1054) among the larger states in the country in 1901. If the low sex ratio

in 1991 is a matter of shame for the state, its high figure in 1901 must, by the same logic, be viewed with satisfaction and pride. This, however would be too simplistic and erroneous since the high sex ratio of Bihar in the early 19th century can be attributed to outmigration of (able bodied) male (Kundu 1991). The same explanations holds for the high sex ratio in the state of Orissa (1037) as well in 1901. The continous decline in female male ratio since 1901 in these two states along with Uttar Pradesh can be attributed, at least partially, to slowing down of outmigration. Similar declines in the case of Maharashtra, Tamil Nadu, Madhya Pradesh and north estern states (except Tripura) are, however, due to inmigrations.

Besides Bihar, wherein the sex ratio fell sharply from 946 to 912 during 1981-91, the other backward states like Orissa, Madhya Pradesh, Rajasthan and Uttar Pradesh also experienced significantly decline - by about six per thousand males, on an average. Kundu (1991) observes that it can be explained largely in terms of slowing down of outmigration and returning of the outmigrants for Holi and other socio-plitical reasons, although the contribution of gender discrimination in the society cannot be ruled out. Their populations growth rates, significantly above the national average (except in Orissa) further confirms the thesis of return migration.

The four developed states, viz Gujarat, Tamil

Nadu, Karnataka and Maharashtra has also recorded declines in the number of females although the magnitude of decline is relatively less - four per thousnad males. The decline could partly be due to continuance of male selective imigration into their areas and certain developed states.

In Kerala and Himachal Pradesh, high female male ratio and its increase during 80s can be attributed to male selective outmigration.

Similarly Nagaraj (1991) attributes the very high sex ratio in Kerala partly to the fact that there is considerable male outmigration from the state. Another interesting point which can be noted in this context is that Kerala which has high sex ratio is area where the sizeable proportion of population adhered to christanity (Chandana 1988). Also in this area the fertility and mortality rates are fairly low and compare well with the advanced countries.

The above discussion reveal that on regional level sex differences can be understood by migration pattern.

Choice of Study Area

The sex ratio in India is charaterized by wide differences in its rural-urban components. The rural areas in india have a sex ratio of 941 females per 1000 males and the urban areas have a sex ratio of only 893 female per 1000 males according to 1991 provisional census result. Further, when we move from state level to district level pattern of

rural sex ratio, we find that an interesting phenomena is emerging in the case of rural sex ratio. The census Atlas of 1981 shows that in case of rural sex ratio a belt of contigious districts below national average 951 is emerging in the north-western region of India. These districts are one hundred and fourteen in number. There are also some more districts which have remained below 951 but they are not making any contigious belt as it is found in the north-western region. These pockets are distributed spordically. One more interesting point noted in the north western region is that it comprises developed as well as less developed areas of India. Punjab and Haryana represent the agriculturally well developed areas of India still they have very low sex ratios as compared to the less developed areas of northern Madhya Pradesh, Utter Pradesh and eastern and western parts of Rajasthan.

This region has posed some challenging questions in front of demographers and social scientists. Such as (i) why a contigious belt of low sex ratio is emerging in this region ? (ii) is it a historical phenomena or a recent one ? (iii) is it a some deep seated social, economic and cultural constraints in rural Indian society which are responsible for this phenomena ? and (iv) why do the female children suffer from special disadvantage in north western region as compared to south India ?

In the light of above discussion the low rural sex ratios and the related tangled questions assume importance. For the present study north-western region has been selected (figure 1.3 and 1.4)

Objective of the Study

(a) to probe further into the question of low sex ratio in the nroth-western region and try to trace the historical pattern there of

(b) to see if this region with an overall low sex ratio can be further subdivided and

(c) to explain the observed pattern of the sex ratio with the help of certain socio-economic variables.

Hypotheses

The following hypotheses have been proposed for the present study

1(a) Female participation in economic activites will have a positive bearing upon the sex ratio

(b) Female participate more in rice cultivation. The study area is essentially wheat-growing area. It may be hypothesised that percentage of net sown area under wheat would have a negative impact on sex ratio.

(2) It may be argued that women in relatively poor household will be economically more active. As such the sex ratio in such situations would be favourable to women.

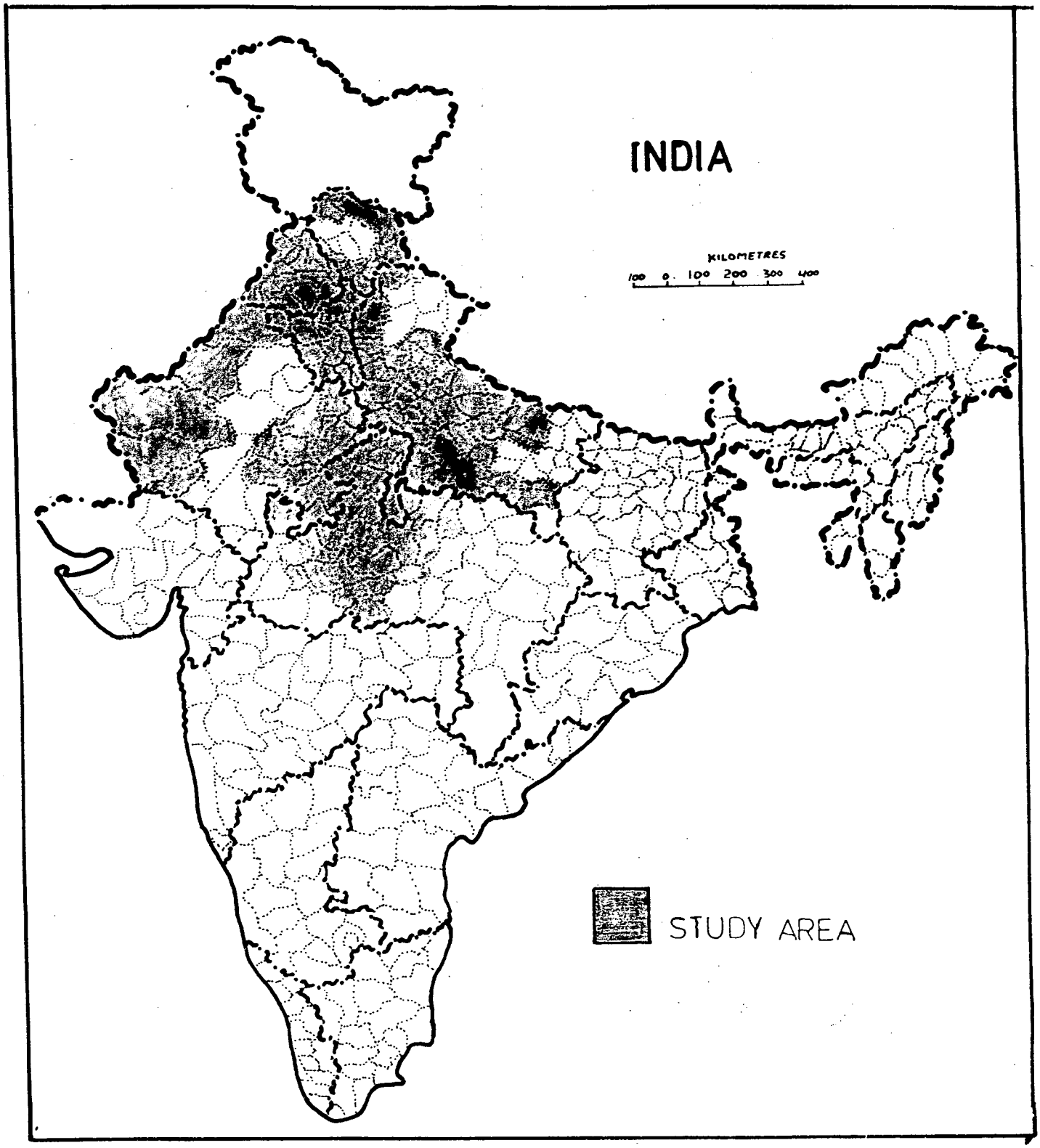
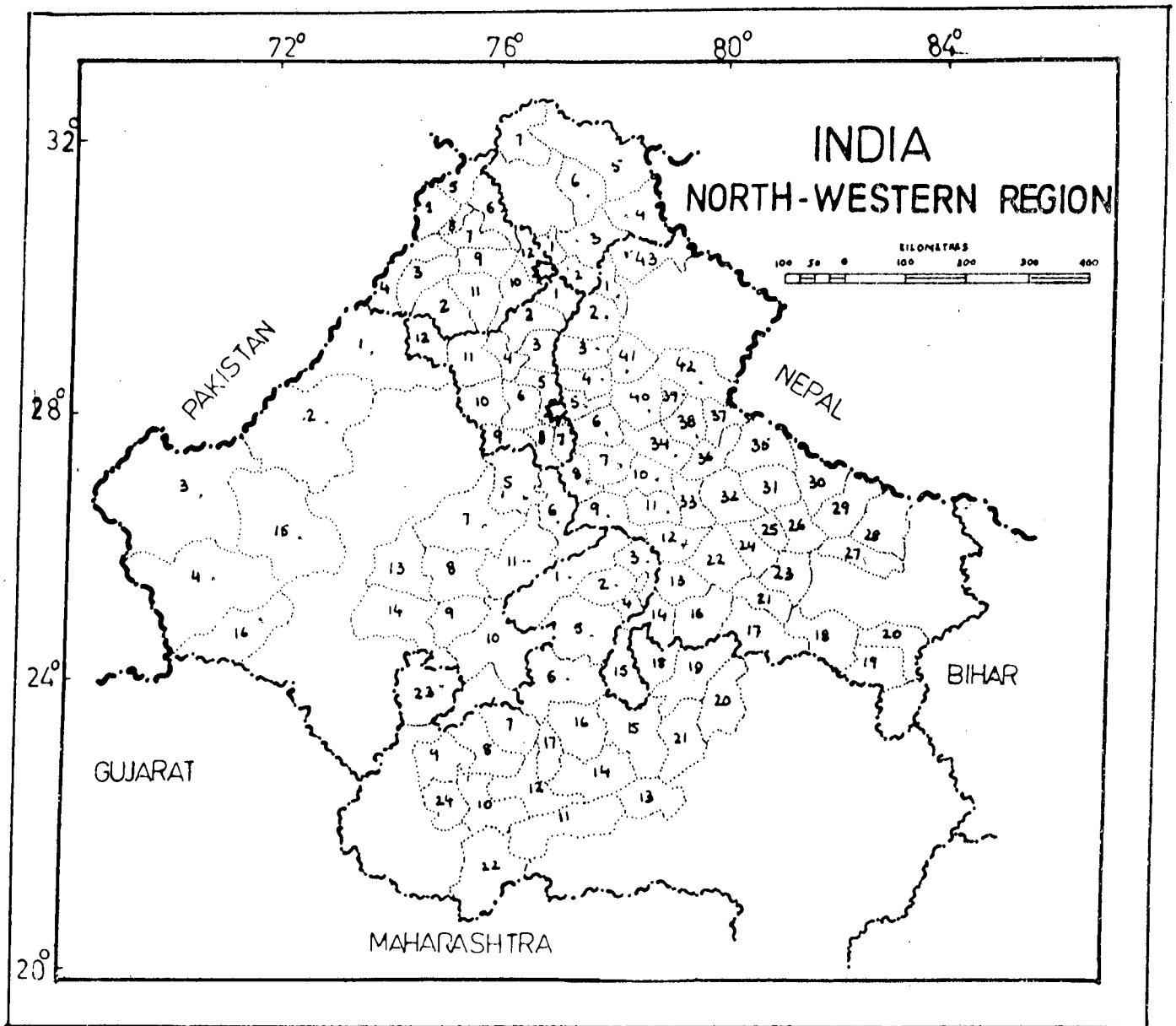


Fig 1·3



For Districts Name Refer Appendix 1

Fig 1.4

(3) Land productivity reflect better agricultural land and technological inputs and would be negatively associated with sex-ratio

(4) Presence of certain communities where women's status has been relatively lower would have an adverse impact on sex-ratios.

On the basis of hypotheses postulated, the following socio-economic Indicators have been selected.

1. Percentage of female workers to total female population or female participation rate
2. Percentage of net area sown under rice cultivation to total area
3. Percentage of net area sown under wheat cultivation to total area.
4. Percentage of (0-2 hectares) small landholding to total landholdings
5. Percentage of male agricultural labour in the total male main workers
6. Percentage of non agricultural male workers to total main workers.
7. Agricultural productivity perhectares for 19 major crops
8. Percentage of villages having medical facilities
9. Percentage of muslims to total population
10 Percentage of rural literacy rate
11. Percentage of schedule caste to total population.

Data Base

This study is based on the secondary source of data. Data pertaining to sex ratio and various dimensions of socio-economic worth of females have been collected from a number of census reports and other relevant source materials. For example sex ratio data has been collected from the population Tables of 1981 census. Agricultural statistics volume II has been used for districtwise data of area under wheat and rice cultivation. For landholding statistical Abstract of various states have been consulted. Medical data has been colleccted from the District census hand book of various states. For Agricultural productivity data from Bhalla and Tyagi (1980-83) have been taken into consideration. Data for social charateristics of population has been collected from social and cultural tables of census of India 1981.

Methodology

In the present study the methodology adopted for mapping and data analysis is as follows:

For the spatio-temporal distribution, rural sex ratios from 1951 - 1991 at district level have been shown with the help of choropleth maps. For getting meaningful and comparable spatial patterns of rural sexratio in the study area (north western region of India), the sex- ratios for the censuses prior to 1981 have been adjusted according to

the 1981 boundaries. For 1991, new districts, if formed, have been clubbed together according to the 1981 districts.

For statistical analysis and to see the relationship of sex - ratio with other socio - economic variables, the co-efficients of correlation between sex ratios and selected variables have been attempted. The tecniques of stepwise regression have also been taken into consideration. Whereever appropriate, data have been depicted through graphs also.

Plan of Study

The study has been divided into five chapters. Conceptual background of the present work is outlined in the first chapter. It deals with the introductory account of objectives of the study, methodology, data base, proposed hypotheses to be tested and the organization of study.

The second chapter deals with the review of literature under five main heading vig sex ratio, (b) mortality differentials in males and females, (c) social status of women in Indian society and its implication for sex ratios (d) Female survival and economic worth of women (e) women and agricultural development.

Third chapter looks at the spatio -temporal distribution of rural sex ratio in north western region using district level data or district as an unit. It also

attempts to discuss the possible reasons for the variation in rural sex ratio in north western region (study area).

The fourth chapter seeks to explore statistical relationship between rural sex ratio (dependent variable) and a number of socio - economic explanatory variables in the north western region. This part also picks up some of the key conclusions from the statistical analysis.

The last chapter ie fifth chapter summarises the study together with concluding remarks.

CHAPTER 2

LITERATURE REVIEW

Imbalances in Indian sex ratios have been a subject of great interest to scholars. They tried to explain this phenomenon specifically with respect to temporal changes as also with spatial variation in sexes in population. While trying for variables which may account for the observed patterns, sex-specific mortality rates, differential impact of developmental activities on gender i.e. literacy, health occupational opportunities etc, and agricultural ecologies also get much coverage. This is because the question of sex ratios is ultimately linked with conditions of females in a given society. Keeping in view the wide range of writting, this survey of literature is classified into five headings as follows:

i) Sex ratio
ii) Mortality differentials in males and females
iii) Social status of women in Indian Society and its implication for sex ratios
iv) Female survival and economic worth of women
v) Women and agricultural development

Sex Ratio

Several studies have been conducted on Indian sex ratio so far. Many of them are purely qualitative and deal

with smaller regions. Gosal (1961) analysed the variations in Indian sex ratio at all India level and has focused exclusively on regional pattern. Desai (1967) tried to explain the sex ratio in a historical perspective.

Similarly several others Ghose (1966), Aggarwal (1963), Kohli (1976), Sen (1963), Gulati (1970), Dandekar (1975), Dange (1976), aimed at explanations of sex ratios by taking at small regions. But the important one of them are the works of Dandekar and Dange.

Dandekar (1975) 's study is based on the field survey conducted in rural Maharashtra. In his study he attempted to show bias against health care of females. He observes that inferior kind and amount of medical care is given to girls as compared to boys. Relative tardiness by parents in cases of girl's illness, in approaching medical facilities even when they are accessible, premature stopping of medical treatment, more frequent recourse of faith healing and traditional medicine etc. are quite common. The study of Dange (1972) on sex ratios in Madhya Pradesh is focused on differences between tribals and non-tribals in the state. It is found that while the sex ratios of non-tribal people vary by region with more males relative to females in the wheat areas to the west than in the rice areas to the east, there is a relative deficiency of males over females among the scheduled tribes irrespective of crop-regions.

Visaria made a systematic study on sex ratio in 1961. The title of his study is "The sex ratio of the Indian Population". Using data from Indian census, Visaria analyses existing theories seeking to explain sex ratio imbalances in India. The most important of these concern migration, underenumeration of females and sex ratio at birth. He refutes the validity of all the three as important due to the following reasons.

Firstly migration may be partially responsible for regional variations in the sex ratio but the excess of males in the northern part of India is not primarily or mainly a result of sex selective mobility to those areas.

Secondly, he denies that the underenumeration of females is an important factor. For this, strong support for the rejection of underenumeration as explanatory factor comes from the findings of a Khanna study by Wyon and Gordan in 1971. Khanna study confirms that females are not undercounted but they are simply not alive to be counted. He also rejects the third factor i.e., differential sex ratio at birth. He demonstrates that variations in sex ratio at birth throughout the subcontinent are actually minor and cannot be used as an explanation for the wide imbalances found in the population. Having rejected all these theories, Visaria then considers the possibility of differentials in the mortality rates of males and females. This is the only explanation that the highly critical and careful author

accepts. After examining census data on mortality which he admits are faulty, and supporting evidence from the northern Khanna study and a southern study from Ramnagaram (Karnataka), Visaria concludes that : Evidence on excess female mortality is indeed impressive. The magnitude of such female disadvantage in chances of survival seems to be large enough to explain a major part and sometimes the entire excess of males in the population of the North-Western areas of the subcontinent. There is suggestive indication of regional differences in sex ratios of population being associated with differences in the sex-pattern of mortality. (Visaria ... :) Kelly (1975) observes from her studies in Punjab and Kerala that survival rates of daughters in Punjab are lower than those of Kerala. She makes a strong case for differentials in the treatment of girls and boys, especially in the allocation of medical care, as the immediate cause of impaired survival of girls in Punjab.

Another most commendable work on Indian sex-ratio is that of Mitra (1977) who has classified the states on the basis of their relative distance from the all India average sex ratio in each census year from 1901-1971 and showed that the states displayed a consistency in this regard over time. He was the first to point out that the regional pattern created by the sex ratio were independent of the regional pattern formed by cultural, linguistic or economic

variables. His writings on the low and declining sex ratio have been instrumental in bringing the attention of the academic community towards this phenomenon. He presented the data from several sources to highlight the extremely high levels of female mortality in the childhood and maternal ages. An appendix to his work brings out the historical material on sex-selectivity in famine or disease mortality in the early years of this century.

The study by Natarajan (1971) on the sex ratio is important as it surveys the sex ratio contained in a succession of census reports from 1871 onwards. The explanations for the low sex-ratio advanced by past census commission range from internal migration (1871), female infanticide, (underenumeration 1901 and later) to effects of food, climate and consogious marriage (1931). A comprehensive bibliography of sex-ratio studies in India was prepared in 1973 at the International Institute of Population Studies, Bombay by Pritviraj and Deshpande (1973).

From the above discussion it could be understood that scholars have attempted to explain low sex ratio of India by taking their own parameters. However, the most discussed parameter in this regard is the mortality pattern which is seen as highly unfavourable to women.

Mortality Differential in Males and Females :

In the Indian context, a mortality pattern highly unfavourable to women has been noted as a special feature.

The Sample Registration Survey and Indian census are the only sources of information for secular trends in life expectancy by sex. According the Sample Registration Survey, except for the period of 1981-85, the expectancy of life at birth for females has been consistently lower than for males from the decades 1921-30 onwards. This excess female mortality (right from the 1920's upto the beginning of the 1980's) has obviously left its cumulative imprints in the form of low sex ratio on India's population structure. The Sample Registration Survey (1987) observes that the excess female mortality does not occur in each and every age-group. For example, the female mortality rate is considerably higher than that of males among children in the age-group 0-4 and 5-9 years. Excess female mortality also occurs in the age-groups of 15-19, 20-24, 25-29 and 30-34, - the child bearing age groups among Indian women. Committee on Status of Women (1974) observes that maternal deaths are very frequent in the reproductive age-group. For instance, it points out that in about 35 percent of the districts of India, women's age of marriage is less than 15 years. In these districts it could be assumed that young girls between 15 and 18 are subjected to all kinds of physical and emotional burden of motherhood. A low level of development of health care system particularly for mother and child care

is observed and form an important factor in maternal deaths. The National Sample Survey data for the year (1986-87) clearly brings out the truth of this low infrastructure facility.

The discrimination towards females in terms of intrafamilial resources such as feeding, dispension of medical care etc. has also been observed to be a potential factor of high female mortality rate (Sen and Sengupta 1983). The system of patriarchy and the cultures where females are looked down mere as restricted to home and males to be the bread earners has observed to be perpetuating this discrimination. Thus, these underlying attitudes that the sons should be fed first and foremost and females to be fed later, found to be giving way to undernutrient or malnutrition of females. Various studies on the nutritional status of females reveal the above said fact.

Taylor and Gorden (1968) examine data from eleven Punjabi villages and four Guatemalian villages and study that the weaning period in both areas is highly correlated with the weaning diarrhea. They also explained the relationship between weaning diarrhea mortality and nutrition in their study. Although the feeding of contaminated food explains the increase in diarrheal episodes in the weaning and post-weaning periods. It does not in itself account for high mortality. Even given the factor of a higher dosage of infectious agents, experience

elsewhere is found to be indicating that such high death rates from diarrheal disease are not seen in populations of well-nourished children. The answer seemingly is in an existing synergism between nutrition and infection. Further malnutrition develops because of the poor weaning diet, acute diarrheal disease becomes increasingly likely to lead to death. At the same time, diarreheal disease observed to be reducing appetite, increases metabolic loss of nitrogen and leads to further dietary restriction, all of which has done the lowering of resistance to infection.

Another important study conducted in Khanna (Punjab) by Gorden, Sigh and Wyen (1965) observes that infantile diarrhea disease were much more widespread among infant girls. It observed that the greater presence of the disease among girls was paralleled by higher death rates for girls. Again death rates in the first year of life found to be 168.4 per 1000 live births for females and 144.6 for males. A much sharper distinction between death rates for males and females was evident in the second year of life when the rates were respectively 45.7 per 1000 population of that age and 103.8 or more than twice as great. Gordan et. al. have come to the conclusion that acute diarreheal disease is responsible for seven deaths of males and eighteen of females.

Levinson undertook the village Morinda Study in order to examine the determinants of malnutrition among the

children of Punjab. He studied seventeen villages with a total population of about 13,000 people within a five-mile radius of Morinda town of Ropar district. Having considered many variables that might affect the nutritional status of children aged 6-24 months (economic status, beliefs of the mother and literacy of the mother), he observes that the most statistically significant determinant of nutritional status is sex. In other words, a child's sex per se would more consistently account for variations in nutritional status than any of the other variables. Similarly sex found to have emerged as a determinant, although less statistically significant of calorie intake for the population as a whole, and of diarrheal infection among Jats.

Chen (1981) in his study of Matlab area in Bangladesh observed that male children receive greater share of their nutrional requirements than females. He also found that per capita food intake by males consistently exceeded that by females in every age-group, the average for all ages being 1927 for males and 1599 for females.

Gulati (1978) in her study of an agricultural labour household in Kerala compasses the daily calorie intake of the household head and of his wife (both of them are engaged in agricultural wage work) with ICMR'S standards of calorie intake. She notes on the days when both the man and the women are employed, there was a shortfall of 20

percent in case of women and 11 percent in case of males in the calorie intake, vis-a-vis the standards of Indian Council of Medical Research. Further, when both are unemployed, the relative shortfall are 50 percent for females and 26 percent for males respectively.

Another study which focuses on this issue is by Batliwala (1983). Her data relate to 560 households in six villages of Karnataka and were gathered by observers living in the villages under study. Batliwala compares calorific intake with a measure of requirements based on Basal Metabolic Rate (BMR) needs and activity levels for male and female household members. She found that while women have a shortfall of 100 calories per day, men have a surplus of 500 calories per day.

There are two important studies on malnutrition among children - one By sen and Sengupta (1983) in West Bengal and other by Taylor et.al. (1983) in Narangwal Punjab. On the basis of primary data from two villages, Sen and Sengupta found a systematic sex bias manifested in the higher deprivation (in diet) of girls vis-a-vis boys. This is apparent both in the greater prevalence of undernourishment of various degrees among girls than boys. In a study of ten villages of Narangwal in Ludhiana district, clinical responses of Punjabi children under the age five in July 1970 revealed that 15 percent of the males and 25 percent of the females were malnourished.

In a Punjab based study where an indepth nutritional survey of children aged 2-24 months was conducted among two caste groups in 17 villages, sex was found to be the most significant determinant of nutritional status, Again female infants were breastfed for a shorter time and given less supplementary milk and solid food. (Levinson 1974).

Miller (1981) highlighted a large amount of anthropological and ethnographic evidence from India to focus on the issue of sex differentials in child care (feeding, medical attention etc.) and mortality. The overall pattern noted is of much greater discrimination of all types against females in the northern states relative to the southern. Miller is particularly interested in the mapping of the rural juvenile sex ratio (i.e., children under ten years) by district, using the 1961 census data. This reveals a distinct pattern of deficit of females relative to males in the north, especially the north-west, while the southern states show sex-ratio which are either favourable to females or less unfavourable than in the north. This regional pattern in the juvenile sex ratio is related to differences in juvenile mortality and is supported by studies from north and south India. Miller quotes two Punjab-based studies which show female mortality rates among children and infants to be almost twice as high as for males; while in the southern study for Kerala the rates are only slightly higher for females.

Another area of intrafamilial resources allocation that has received attention is health care. Many studies on health and health care utilization focus on infants and children under five years old. Monica DasGupta (1987) observed from her field survey conducted on Khanna in Punjab that expenditure on medical care is more than twice as much spent on boys than on girls in the age group 0-1 year. Expenditure on clothing is also greater for boys than for girls of all ages. The study shows that boys were given better medical care than girls in the course of illness that ultimately led to their death.

Thus, the above discussion reveals that high female mortality is generally attributed to the bias against females. It is also observed that they are more malnourished and less likely to receive health care than boys. Data from a variety of sources reveal that young girls under the age of five are more likely to show signs of both acute and chronic malnutrition than boys. The nutritional deficiency suffered by groups may contribute only one result i.e. higher overall female mortality.

Natural Calamities :

As discussed earlier, the root cause of excess female mortality appears to be an outcome of a strong cultural bias favouring males, if indeed, preference for males determines mortality differentials, then it could seem

reasonable to assume that the female mortality disadvantage would increase in times of crisis. For example, there is evidence that sex bias in the family allocation of food increases whenever food is scarce, such as under conditions of seasonal scarcity, famine or chronic poverty. It has been observed that during epidemics in China, the death rate of girls is higher than that of boys (Long : 1946). Similarly, it is argued that in crisis periods, the relative mortality disadvantage of females increases (Miller, 1981; Visaria, 1961; Kelly, 1975). Inequalities in food intake relative to men are particularly exacerbated for women and children, especially female children under conditions of famine (Chen 1981, Aggarwal 1986, Schifield 1974, Sen and Sengupta 1983).

A fascinating study of how culture works to create a particular sex pattern of mortality during a famine has been done by Grenongh (1982). A large part of his Prosperity and misery in Modern Bengal : The Bengal famine 1943-1944 is devoted to a lengthy presentation of age and sex patterns of the victims. Using records of the Bengal famine relief committe, Greenough found that 1943-1944 famine in West-Bengal Victimization occurred in a patterned fashion; certain age and sex groups were found to be consistently worse than others. Adult males aged 20-40 years had the lowest mortality rate. Greenough also finds a consistency with regard to cultural emphasis on the maintenance of the "Kosta" (head of the family). During the period of famine, females aged (15-20) years had higher rates of mortality but

still compared favourably to other segments of the population, especially the very old of both sexes who fared the worst. An important feature of the juvenile death rate is that for both the 1-5 and the 5-10 categories girls have higher mortality rates than boys.

It is also revealed that under conditions of famine workload is increased substantially for females with their domestic work being squeezed to enable them to have more wage - earning or production. Further, in households where women and men are income earners, women rather than men are sent out to earn additional income (Gigenins 1986).

Famine also has a substantial impact on women's fertility conceptions which tend to peak in the famine seasons, lactations decreases or ceases altogether. Women's birth labour is more painful and risky because of their undernorishment (Dyson and Cook 1981, Drinks 1980).

It may be understood that given a harsh economic situation dictated by famine, cultural rules about who are at the greater value for the family, the bias is higher against females than males. These rules demand that able - bodied males be nourished first and then the able bodied females. Children are less valued than adults and among these girls are less valued than boys, while economic hardships determines that some people must die. It is culture that dictates who are to be the victims.

Female Survival and Economic Worth of Females

Having established that mortality and health differentials between the sexes do exist in the earlier sections, women's role and position (worth) in the society have been examined in this section. Sex differential of mortality by regions in India support the view that female death rates are closely related to the perceived economic value of women in the society. A relationship is implied in terms of higher regard for female life on higher economic returns from her. Earning capacity of females have been expressed in different ways by many scholars. They tried to explain the economic value placed on women and female children in the households (Bardhan, 1984; Rosenzweig and Schultz, 1982; Miller, 1981).

Rosenzweig and Schultz (1982) have related the differential survival chances of the female child to the expected employment or earning opportunities of female adults. This hypothesis was tested by these researchers with the data from 1331 rural households in India in 1971, collected by National Council of applied economic Research. Rosenzweig and Schultz in their two-stage regression analysis found that in the first stage there is a significant positive correlation between normal (district level) rainfall and the probability that a woman would be employed in rural India (thus supporting our hypothesis about wet agriculture being relatively intrusive in terms of

female labour) and the second stage confirms that the differential survival chance of the female child improves with higher female employment rate or with a lower male-female earning differential per day.

Bardhan (1984) draws support for his hypothesis from Rosenzweig and Schultz. He hypothesises that the differential survival chances of the female child would relate to the expected employment or earning opportunities of females adults and these in turn are hypothesised to relate to ecological variations in cropping patterns. The north-south difference in discrimination against females is thus seen as relating to the greater demand for females labour generated under rice cultivation which characterises much of south and east India relative to primarily wheat cultivation which characterises the north. He observes that in areas with paddy agriculture, the economic value of a women is more than in other areas.

Miller (1981) has made an attempt to relate the issue of the economic valuation of women and female children with patterns of crops grown, requirements for female labour in different crops, pattern of property holding and the question of marriage costs especially reflecting in the custom of dowry. On the basis of the evidence from a large number of anthropological and ethnographic evidence from across India, Miller identifies the Narmada-Satpura i.e. $22^{o}N$ latitude as a great divider of cultures and finds two

district regional ecological patterns in the Indian sex-ratio viz northern with low female growth rate, marriage payment from female to male and low sex-ratio and southern with high female work participation in a rice growing area, marriage payments more equal and high sex-ratio. The pattern that emerge from Miller's analysis is summarised in the table below

Categories	FLP	Marriage cost	JSR
Northern propertied	low	high	low
Southern propertied	low medium high	low Medium high	high
Northern unpropertied	high	low	medium
Southern unpropertied	high	low	high medium

Source : Miller (1981).

Using the data from the Rural Labour Enquiries 1964-65 and 1974-75, Krishanaji (1987) found that agricultural labour households had a better balance between the sexes than non-labour households in 1971 (i.e., estimated FMRS of 980 and 940 respectively) and labour households without land had higher proportions of females than those with some land (FMRS of 982 and 969 respectively in 1974-75). Further, he analysed the sex ratios by age groups and showed that among 15-49 year old (1000, compared with 1971), there was a more marked difference in the over 50 age group. Krishnaji also observed that differences in

the sex ratio between economic groups arose primarily from higher advent FMRS in labour households. Furthermore, he related the sex ratio to household size, and found an inverse correlation : the higher the FMR, the lower the household size (among landless labourer households). Among landholding households, the size increased with the amount of land held, but the sex ratio nevertheless decreased as landholding increased. In sum, big landholdings and big families were associated with a large imbalance between the sexes. Again looking at per capita monthly expenditure, Krishnaji found FMRS are highest in the lowest expenditure groups and vice-versa. However, the strength of this finding is confounded by the two way relationship that exists between per capita expenditure and sex proportions. A high female proportion may influence per capita income downwards, because of possible lower female employment and lower wages. Just as high income appears to depress the FMR, nevertheless, these trends at least do not conflict with the findings based on landholding.

The above discussion shows that where the female economic value is more their preservation as an adult labour is favourable for them. For instance, in rice cultivation where most of the activities in paddy field is done by women their the sex-ratio is in favour of them as compared to dry-area wheat cultivation. It is also revealed that in poor families the female participation is more and sex ratio is observed to be more or less in favour of them.

Social Status of Women in Indian Society and its Implication for Sex ratios

Social institutions such as kinship in terms of matrilineal and patrelineal types of societies and system of marriage payment (dowry) also have deep roots in the Indian society and it effects on the women's position and numbers. The best available study of matrilineal and patrileneal society in India is done by Karve (1965). According to her, there are three main kinship patterns in India. 1. The north which is strongly patriarchal and patrilocal and where the emphasis is on an extension of the existing kin. 2. The south in which is patrilocal/patrilineal and matrilocal/matrilineal where the emphasis is on a consolidation of the existing kin and 3. Caste which is more heterogeneous.

The high status of women in south and low status in the north could be inferred from the kinship pattern studied earlier.

Matrilineal group of the Nairs have been studied by many scholars. High status of the Nair women as compared to women in patrilinear communities was an uncritically accepted sociological phenomenon for a long time. Changes in the position of the Nairs women have been attributed to larger socio-economic changes in Kerala (Sardemani,: 1982).

Similarly, in agrarian economies, generally prosperity and high income lead to the withdrawal of women from work force, especially physical work outdoors. Darling (1947) observed that, in canal colonies of central Punjab (now in Pakistan), rising standards of living of peasant cultivators enabled their women to enjoy and expect more lavish style of life. A similar conclusion has been drawn by Tara Ali Baig. She found that withdrawal of wives from work is a common system of improved economic conditions. Pushpa Sunder is of the opinion that women's participation in workforce depends on her husbands or family income and employment status. Women going out to work is indicative of a lower social status. Boserup also found that a rise in male earnings would normally have the effect of making leisure more attractive and would thus discourage married women from entering the labour market. But at the sametime she hypothesised that higher female earnings than male will create more favourable conditions for their entrance in the labour market.

Process of sanskritization has invariably affected the women's conditions. Seclusion of women, which was earlier a value of upper caste and class being now is adopted by the lower castes who climbed the economic ladder. Yurolova (1981) stated that when well-to-do members of lower castes more up the caste hierarchy, they introduce restrictions for women in their families which they have not adhered to previously. She remarked that the position of men

largely depends on his wife. To marry a girl from a higher caste and to ensure the material welfare of the family without drawing one's wife into labour activities has always been considered a matter of prestige.

The question of marriage payment is also a complex one. Goody and Tambiah (1973) have shown that marriage payment in either direction is not a once for all phenomenon. In patrilocal society, dowry, with the bride's family paying more than the groom's is common. Miller (1981) also noted the similar view. Gupta and Srivastava (1983) have shown that bride price can be as exploitative for women as dowry. So dowry is widespread throughout India, but some difference is there in regional patterns. There are several cases in the north of dowry being given in same villages as bridewealth but such practice does not exist in south. This difference may be partially the result of the fact that, in the north, villages are usually multicaste and thus a wide variety of practices are more plausible whereas in the south single caste villages are common.

There are some other social evils which are prevalent in Indian society. The evils such as infanticide, Sati and Purdha which shows the low status of women. Panigarhi observes that female infanticide was confined generally in the northern part of India from Gujrat in the west to the eastern border of present day Uttar Pradesh. Pakrasi (1970) observes that infanticide was practiced in

the castes such as Jates, Gujars, Togas, Ahirs, Rajputs. These are all the intermediate castes.

The above discussion reveals that the status of women is a strong determinant in the sex ratio where female infanticide, sex determination tests, sati, etc are frequently existing. In these regions the status of women is low and it shows that the sex-ratio will not be in favour of females. The best example of this type is north western region i.e. Punjab, Haryana, Rajasthan etc. where these evils have roots for many centuries. This may be a reason that in this region sex ratio is low as compared to the southern region of India.

Women and Agricultural Development :

In India after the publication of women's Report (1974) the focus of research has shifted towards the women's role in economic production especially in the agricultural sector. Several studies on the effect of agricultural modernization and growth of agro based commercial industries show that women's technological backwardness and cultural biases have led to the exclusion of women from production as these activities have been commercially profitable. In a recent comprehensive overview of research on agricultural technology and employment in India, Basant (1987) has delineated three broad components of the relationship between agricultural technology and employment

a) effect on employment in crop production

b) effect on employment in allied agricultural activities such as processing, animal husbandry etc.

c) effect on employment in non-agricultural activities indirectly supporting agriculture, through forward and backward linkages such as transport, repaid facilities etc.

Further, there are two studies which have attempted to assess the impact of irrigation per se on female employment. One study conducted by Suryawanshi and Kapase (1985) assess the impact of the Ghod canal irrigation scheme in Maharashtra concludes that

i) there was an increase in total labour use

ii) the increased use of hired labour was more significant than that of family labour and

iii) the female unemployment period had decreased.

Second study conducted by Stanbury (1984) examines the impact of irrigation development in a north Indian village. It observes that there was increased labour are but that the increase was greater for female family labour. Not only was there a gender difference in the impact but also a case wise difference with relatively less employment benefits to the scheduled caste women.

Similarly, the growth of cash 'crops' from the middle of the nineteenth century and its impact on agrarian relations have been well-documented in the commercialization Literature Raj (1985). For instance the introduction of

cigarette tobacco in the early twenties had a dramatic impact on female labour as tobacco cultivation was largely dependent of female labour for transplanting, weeding de-pesting, harvesting and Curing (Mies 1984). For the first time large numbers of women were drawn to tobacco factories for grading de-steaming and Stripping tobacco leaves (Duvvury, 1986). Expansion of cotton cultivation in the Vidharba region also had a positive impact on female employment (Reddy, 1981).

In the last few years, there have been several studies accessing separately the implications of the green revolution, technology for the employment, wages and earnings of women. [Aggarwal, 1984; Stand, 1985; Joshi, and Alshi 1985; Ray, 1985;]. Most of these studies have established that

i) there is a significant increase in the demand for total labour time per acre across all regions and crops.
ii) the rise in demand for hired labour has been greater than the increase in demand for family labour.
iii) the rise in demand for female labour has been sharper than the increase in demand for male labour.
iv) the sharpest increase in demand for labour has been in the case of hired/causal female labour.

Aggarwal (1981) and Billings and Singh (1970) observed that mechanisation in harvesting and threshing

operations with the introduction of combine harvesters, wheat threshers and maize shellers does clearly displace haired labour, both male and female. The HYV temology as we have noted does increase demand for labour in certain agricultural operations. This is revealed by Rural Labour Enquiry (RLE) Reports. An interesting aspect brought out by Chatterji (1984) is that the growth of labour days of males and females labour were to in gender-specific operations.

The micro level studies present a conflicting picture. In fact, there is a wide regional variations in the absorption of female family labour. In some cases there has been a decrease in the utilization of female family labour with the adoption of HYV technology Aggarwal (1985). Where the absorption of female family labour increased. Its significance in total female time has been marginal or declined sharply. An interesting finding is that the peasantry after the introduction of new technologies gets polarized into class of agrarian capitalists and landless labourers (Lenin 1972). For example, the eviction of tenants and tendency of landlords to resume personal cultivation has been widely noted in India (Bhalla, 1976; DasGupta, 1977; Frankel, 1971; Bardhan and Rudra, 1978). Increase in the concentration of land, assets and incomes in the areas of HYV technology has also been observed by Dasgupta (1977).

From the earlier discussion it becomes clear that powerlessness of women vis-a-vis men exists. Scholars have

attempted to understand the subordination of women within the frameworks of their respective disciplines and so far no concrete framework has yet been evolved to explain this complex phenomenon. Women appears to be loosing their independent status as productive workers, although there is evidence that the ardousness and drearness of working life of poor women exerts a heavy drain on their energies, even where there is evidence of the crucial significance of women as workers and/or earners, we see that their authority and social position is severely limited. Also women in India do suffer from disadvantages as compared to males in matter of health care and nutritions, and their mortality is much higher. It is important to explore the extent to which speculations regarding the close relationship between productive roles and the sex ratio are justified. Though it is known that such a relationship exists it needs a detailed and accurate testing.

The present study attempts to examine some of the hypothesised relationships (as emerging from the literature review) between sex ratio and several socio-cultural and economic variables. The selection of such variables is constrained by the availability of published data and in that sense, this exercise is only exploratory in nature.

CHAPTER 3

SPATIO-TEMPORAL DISTRIBUTION OF RURAL SEX RATIO

This chapter deals with the spatio-temporal distribution of rural sex ratio in north western region. This region is made up of Punjab, Haryana and Western half of the Ganga plain i.e. Uttar Pradesh. It also comprises some districts of Rajasthan and the north western districts of Madhya Pradesh. It is bounded by the state of Jammu and Kashmir in the north, Bihar in the east and Maharashtra in the South. It shares international boundary with Nepal in the north east and Pakistan in the west.

Historically, the north western parts of the Indian subcontinent is an extension of the broad cultural region of west Asia. The rich and fertile plains of this region, irrigated by the major rivers of the indus system attracted many invaders which influenced many aspects of India's (particularly north western region) social, cultural and political life. It has also influenced the customs and traditions of the Indian people. For example, from the tenth century A.d. began a series of Muslim invasion and in the medieval period this region passed under Muslim rule and led the way to a new synthesis of Hindu and Islamic cultures.

In terms of both area and population, this is the largest region in the whole of India. It is also considered

as one of the most prosperous regions of India. For example, Punjab, Haryana state has a well developed infrastructure, including canal and tubewell irrigation system, roads, transport, electrification, health services and schools. Almost all the villages are interconnected by modern transport and have electricity as well as access to medical facilities and schools. The green revolution has transformed the countryside and both small and large scale industries have appeared in urban centres providing off-farm employment for many. But still it is a region of serious deficiency of females and it strikes a very distinct contrast with most of the rest of India. In the case of this region, there are extensive areas with even fewer than 850 females per 1000 males, such as the upper Ganga plain and parts of Punjab, Haryana Plains. This is a unusually lowest sex ratio. However, the ratio tends to increase towards the peripheries of the region to the east, the south and the north. Similarly, in the heart of the Indian desert in Jaisalmer, the female ratio is abnormally low (SR 820) gradually increasing with increasing distance from the desert southward.

It must be admitted that as yet there are no completely proven facts which can satisfactory explain this unusal deficiency of females in north western India. None the less, the documentary evidences that are available tend to indicate that the most important factors aggravating the imbalances between the two sexes are (i) relatively larger

excess of males over females at birth than anywhere else in India and (ii) higher rate of mortality among females especially during infancy and childhood.

Here an attempt has been made to explain the spatio-temporal distribution of rural sex-ratio in northwestern region of India from 1951-1991 with the help of choropleth maps. Temporal profiles of each district are prepared to observe the variations in sex ratio (fig. 3.8). The region under study is further subdivided in smaller units to get clearer picture in terms of variations in sex ratio.

Maps display a comparative view of the spatial distribution of rural sex ratio for the years 1951 to 1991 at the district level in the north western region of India. Sex ratio for the year 1951, 1961, 1971 has been worked out after adjusting rural male and female population to 1981 set up as the reference point. For 1991, new districts, if formed, have been clubbed together according to the 1981 districts.

All the districts have been grouped under seven categories.

	CATEGORIES	**GRADING ASSIGNED**
i)	940 and above	High
ii)	900 - 940	High Moderate
iii)	860 - 900	Moderate
iv)	820 - 860	Law Moderate
v)	780 - 820	Low
vi)	740 - 780	Very Low
vii)	Below 740	Lowest

The uniform ranges have been maintained for all the census years i.e. 1951-1991 so that comparability of the spatial patterns could be maintained.

The region under study is further subdivided on the basis of regional averages of rural sex ratio. (Appendix 3) The regional averages of rural sex ratio in respective census decades are as follows.

i) 893 in 1951
ii) 888 in 1961
iii) 875 in 1971
iv) 886 in 1981
v) 879 in 1991

On the basis of these regional averages the region under study is divided into three parts.

1. The district which have always remained above regional average in respective census decades.
2. The districts which have always remained below regional average in respective census decades.
3. The districts which have shown fluctuating tendency in respective census decades i.e. (1951-1991).

The districts which remained above regional average throughout the 1951-1991 decades have been grouped to form region 1. It includes 37 districts. The districts which have always remained below regional average have been included in region 2. This region consist of 36 districts. The districts which have shown fluctuating tendency in respective census decades are 41 in number and have been named, region 3. (Fig. 3.6)

Table 3.1

Spatial Profile of Rural Sex Ratio

(1951-1991)

States	Number of Districts				
	1951	1961	1971	1981	1991
Categories					
940 and above					
Haryana	1	1	0	0	1
Punjab	0	0	0	0	1
Uttar Pradesh	9	7	1	2	1
Rajasthan	2	0	0	3	3
Madhya Pradesh	10	7	1	3	1
Himachal Pradesh	3	2	1	1	2
Total	25	17	3	9	9
Percentage Share --->	21.93	14.92	2.63	7.90	7.90
900 - 940					
Haryana	1	1	1	2	1
Punjab	0	0	2	4	3
Uttar Pradesh	7	6	7	4	3
Rajasthan	7	8	9	7	4
Madhya Pradesh	8	9	13	10	12
Himachal Pradesh	1	3	3	3	3
Total	24	27	35	30	26
Percentage Share --->	21.07	23.68	30.70	26.32	22.80
860-900					
Haryana	4	5	6	7	6
Punjab	6	5	4	7	8
Uttar Pradesh	12	13	6	5	11
Rajasthan	4	5	5	4	6
Madhya Pradesh	4	6	7	6	6
Himachal Pradesh	1	0	1	2	0
Total	31	34	29	31	37
Percentage share ---->	27.20	29.82	25.44	27.20	32.45

(Contd...)

820-860					
Haryana	6	6	4	3	4
Punjab	3	6	6	1	0
Uttar Pradesh	12	14	22	26	22
Rajasthan	2	2	2	2	2
Madhya Pradesh	2	2	3	4	4
Himachal Pradesh	1	1	1	0	2
Tottal	26	31	38	36	34
Percentage Share ---->	22.8	27.2	33.33	31.57	29.83
780-820					
Haryana	0	0	1	0	0
Punjab	3	0	0	0	0
Uttar Pradesh	0	2	7	6	6
Rajasthan	1	1	0	0	1
Madhya Pradesh	1	0	0	1	1
Himachal Pradesh	1	1	1	0	0
Total	6	4	9	7	8
Percentage Share: --->	5.26	3.5	7.9	6.14	7.02
740-780					
Haryana	0				
Punjab	0				
Uttar Pradesh	1				
Rajasthan	0				
Madhya Pradesh	0				
Himachal Pradesh	0			1	
Total	1			1	
Percentage share --->	.87			.87	
740 and below					
Uttar Pradesh	1	1			
Total	1	1			
Percentage share --->	.87	.87			

Spatial Distribution Of Rural Sex Ratio In 1951

According to figure no. 3.1 in 1951, there are 25 districts in the highest range of 940 and above, located in the states of Madhya Pradesh (10*) Uttar Pradesh (9), Himachal Pradesh (3), Haryana (1), Rajasthan (2). 24 districts fall in the next lower category i.e. 900-940, shared one each by Haryana and Himachal Pradesh, seven by Uttar Pradesh and Rajasthan each and eight by Madhya Pradesh. The highest number of district i.e. 31 fall in the range of 860-900 and these are distributed over Haryana (4), Punjab (6), Uttar Pradesh (12), Rajasthan (4), Madhya Pradesh (4) and Himachal Pradesh (1). There are 26 districts in the range of 820-860 spatially located in the states of Haryana (6), Punjab (3), Uttar Pradesh (12), Rajasthan (2), Madhya Pradesh (2) and Himachal Pradesh (1). The range of 780-820 comprised of 6 district which are located one each in Madhya Pradesh, Himachal Pradesh and Rajasthan and three in Punjab. The lowest range of 740-780 and below 740 shares one district each both of which are located in Uttar Pradesh.

In terms of percentage the 940 and above category contains 21.93 percent of the total districts. The category of 900-940 occupies 21.07 percent and 860-900 contains 27.20 percent, 820-860 share 22.80 and 780-820 contains 5.26 percent and 740-780 and below 740 contains 0.87 percent each. (Table 3.1)

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* Districts are shown within parenthesis

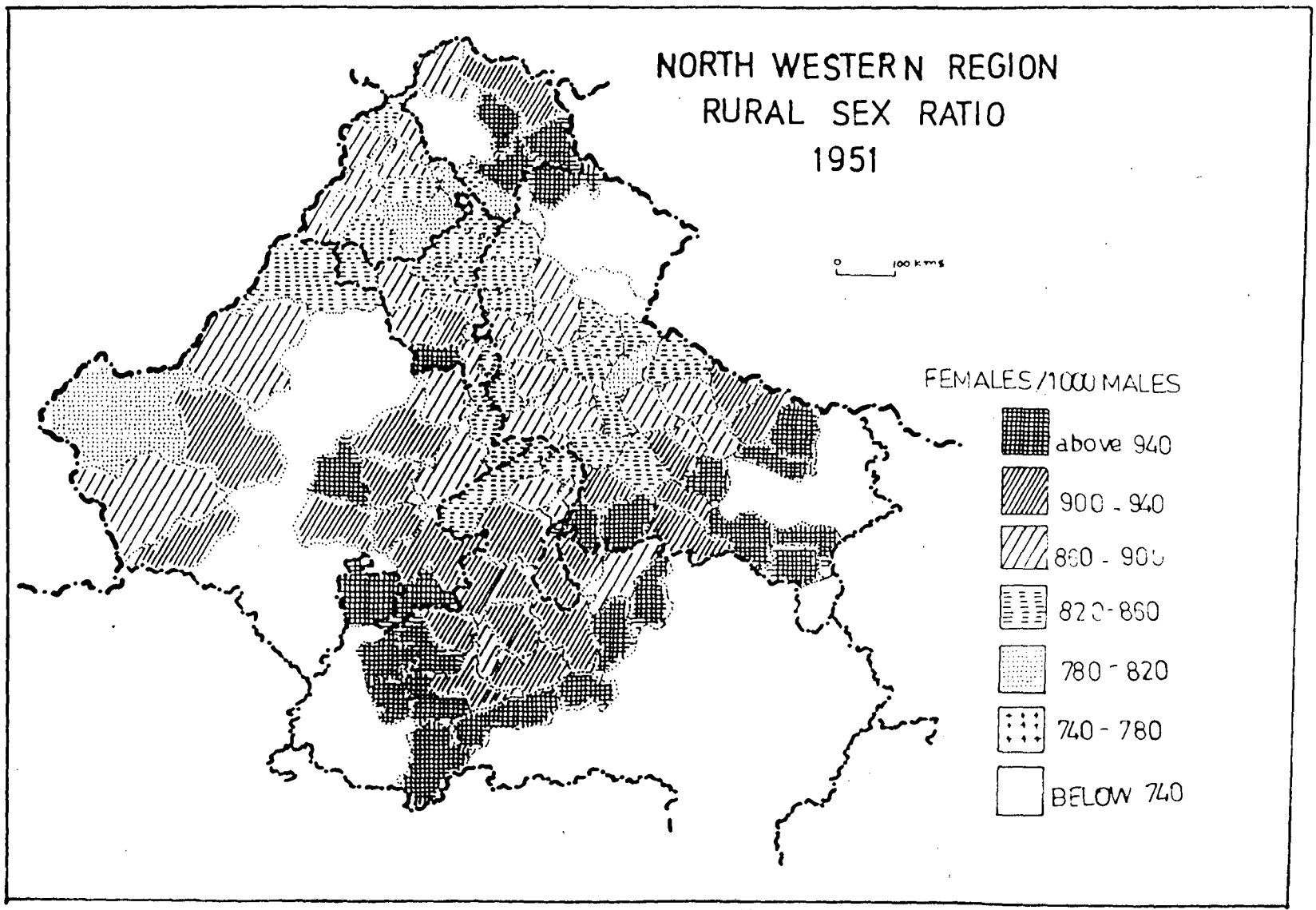

NORTH WESTERN REGION
RURAL SEX RATIO
1951
0
100 kms
FEMALES/1000 MALES
above 940
900 - 940
860 - 900
820 - 860
780 - 820
740 - 780
BELOW 740

Fig 3.1

Spatial Distribution of Rural Sex Ratio In 1961

In 1961, the spatial pattern of rural sex ratio bears a close similarity with that of 1951 with some variations. The figure number 3.2 shows that the highest range of rural sex ratio 940 and above in 1961 comprises 17 districts (4.92 percent) mainly located in the states of Haryana (1), Uttar Pradesh (7), Madhya Pradesh (7) and Himachal Pradesh (2). Undergoing a slight increase since 1951, the number of districts in the range of 900-940 are 27 i.e. 23.68 percent being mostly shared by Punjab (1), Uttar Pradesh (6), Madhya Pradesh (9), Rajasthan (8) and Himachal Pradesh (3).

In the next lower range 860-900, 34 districts i.e. 29.82 percent have been shared by the states of Haryana (5), Punjab (5), Uttar Pradesh (13), Madhya Pradesh (6) and Rajasthan (5).

The range of 820-860 accounts for 31 districts 27.20 percent of the total study area. These are located in Haryana (6), Punjab (6), Uttar Pradesh (14), Madhya Pradesh (2), Rajasthan (2) and Himachal Pradesh (1).

The range of 780-820 records 4 districtis i.e., 3.5 percent of the total study area. These districts lie in Uttar Pradesh (2), Himachal Pradesh (1) and Rajasthan (1). The lowest range i.e. below 740 has one district which belongs to Uttar Pradesh.

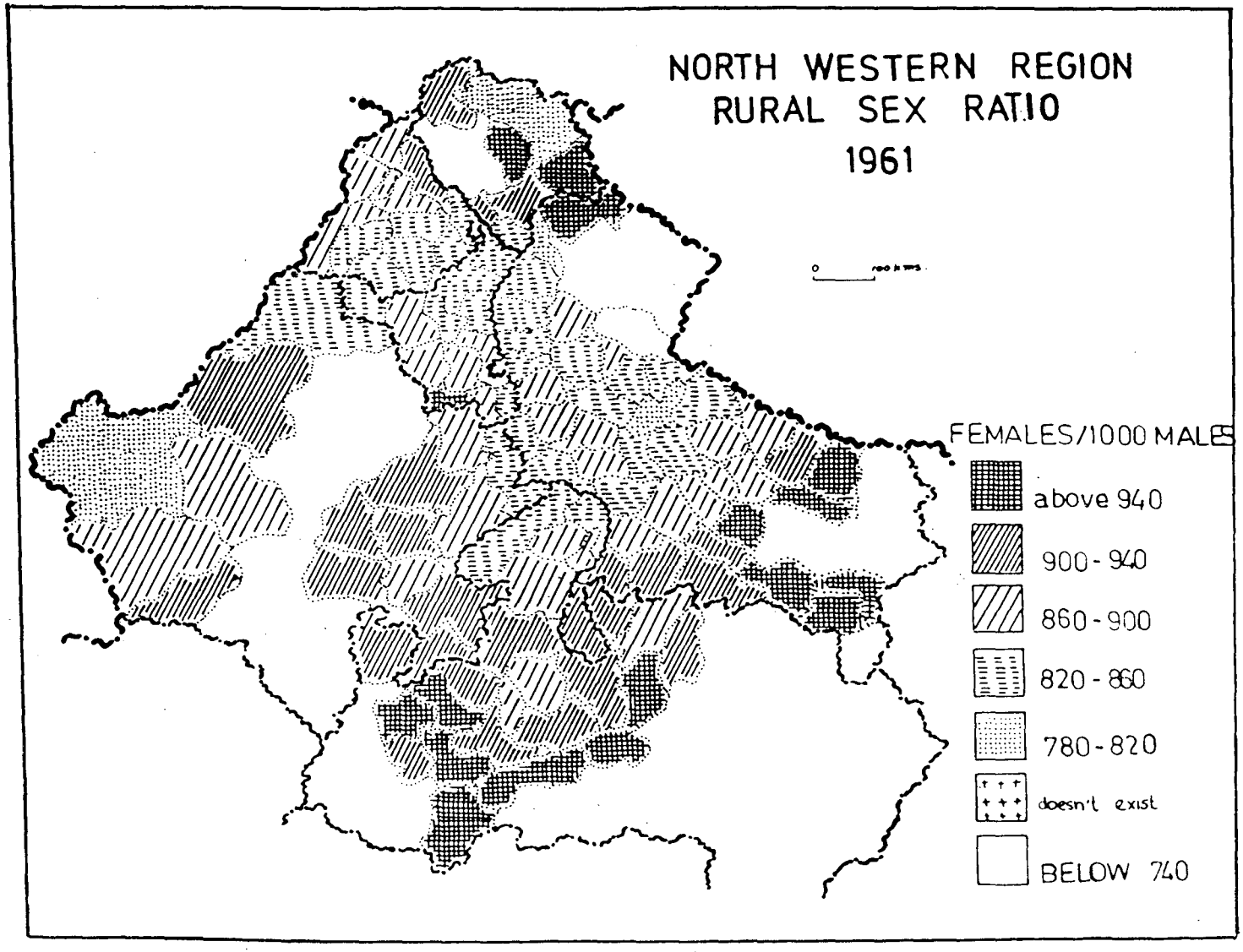

NORTH WESTERN REGION
RURAL SEX RATIO
1961
FEMALES/1000 MALES
above 940
900 - 940
860 - 900
820 - 860
780 - 820
doesn't exist
BELOW 740

Fig 3.2

Spatial Distribution of Rural Sex Ratio In 1971

In 1971, the spatial pattern of rural sex ratio took a drastic change in comparison to that of 1961 and 1951. According to figure number 3.3, 3 districts are falling under the highest category i.e. 940 and above, which is 2.63 percent of the total number of districts. They are shared by Uttar Pradesh, Himachal Pradesh and Madhya Pradesh. Udergoing a major increase since 1951, the number of districts in the range of 900-940 are 35 i.e 30.70 percent, mostly shared by Uttar Pradesh (7), Rajasthan (9), and Madhya Pradesh (13).

Undergoing a slight decrease since 1951, the number of districts in the range of 860-900 are 29 i.e. 25.44 percent, which belong to Haryana (6), Punjab (4), Uttar Pradesh (6), Rajasthan (5), Madhya Pradesh (7) and Himachal Pradesh (1). In 1971, the highest number of districts i.e. 38 falls in the category of 820-860 which is distributed in Haryana (4), Punjab (1), Uttar Pradesh (22), Rajasthan (2), Madhya Pradesh (3) and Himachal Pradesh (1) comprising of 33.33 percent of total number of districts of study area.

The lowest range i.e. 780-820 records 9 districts i.e. 7.90 percent of the total study area. These lie in Haryana (1), Uttar Pradesh (7) and Himachal Pradesh (1).

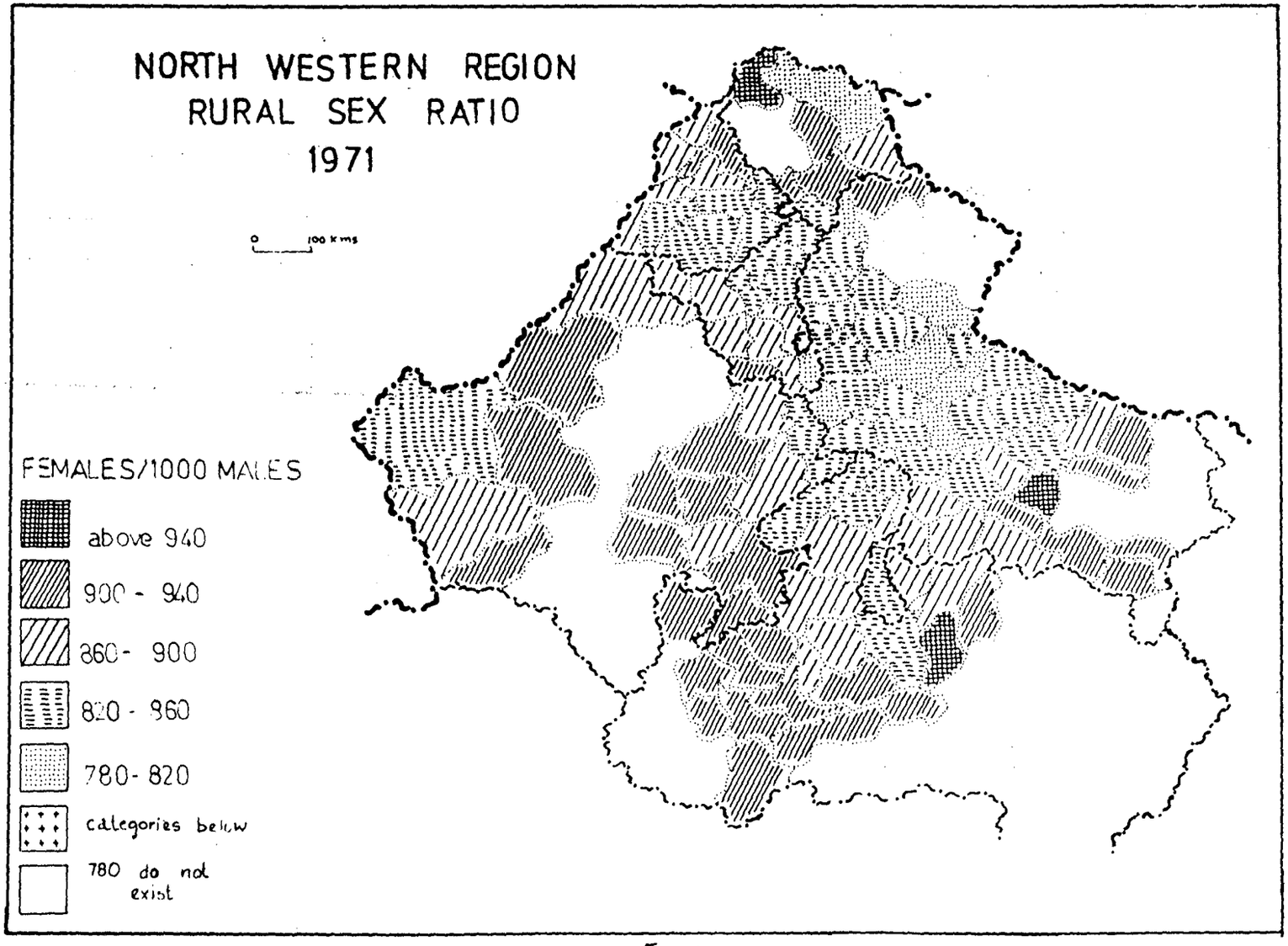

NORTH WESTERN REGION
RURAL SEX RATIO
1971
0 100 kms
FEMALES/1000 MALES
above 940
900 - 940
860 - 900
820 - 860
780 - 820
categories below
780 do not exist

Fig 3 3

Spatial Distribution of Rural Sex Ratio in 1981

In 1981, the spatial pattern of rural sex ratio bears a close similarity with that of 1971 with some variations. The figure number 3.4 shows that the highest range of rural sex ratio 940 and above in 1981 claims 9 districts i.e. 7.90 percent mainly located in the states of Uttar Pradesh (2), Rajasthan (3), Madhya Pradesh (3) and Himachal Pradesh (1).

In the next range i.e. 900-940, 30 districts i.e 26.32 percent have been shared by the states of Haryana (20), Punjab (4), Uttar Pradesh (4), Rajasthan (7), Madhya Pradesh (10) and Himachal Pradesh (3).

The range of 820-860 records highest number of districts i.e. 36 comprising 31.57 percent of the total study area. the majority of the districts are claimed by Haryana (3), uttar Pradesh (26) and Madhya pradesh (4).

The lowest range i.e. 780-820 comprises 7 districts i.e. 6.14 percent shared by Uttar Pradesh (6) and Madhya Pradesh (1). The range 740-780 contains one district of Himachal Pradesh.

Spatial Distribution of Rural Sex Ratio in 1991

In 1991, the spatial pattern of the rural sex ratio having close proximity with that of 1981. The figure number 3.5 shows that the highest range of rural sex ratio

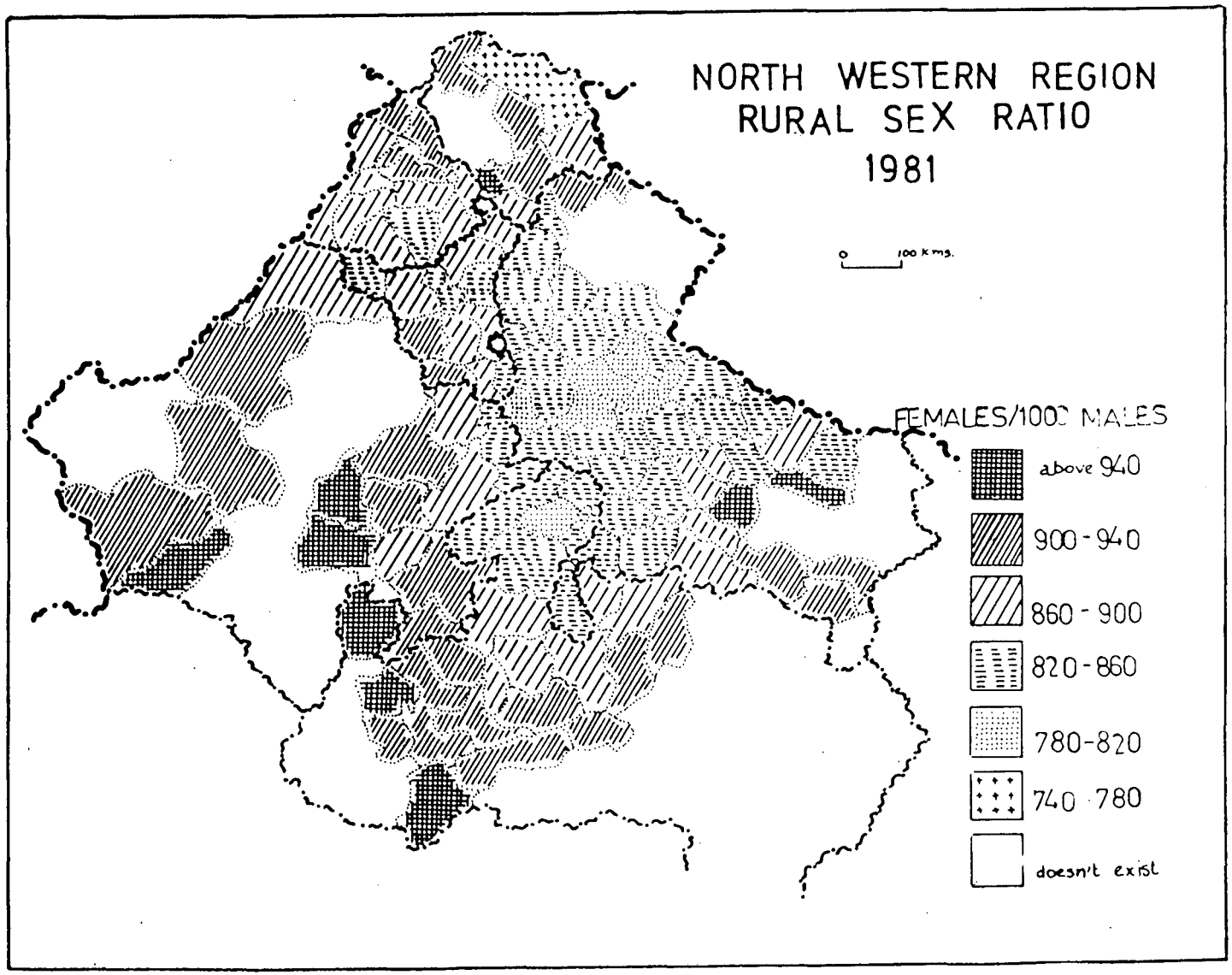

NORTH WESTERN REGION
RURAL SEX RATIO
1981
0 100 Kms.
FEMALES/1000 MALES
above 940
900 - 940
860 - 900
820 - 860
780 - 820
740 - 780
doesn't exist

Fig 3.4

940 and above in 1991 claims 9 districts i.e 7.90 percent , mainly located in Haryana (1), Punjab (1), Uttar Pradesh (1), Rajasthan (3), Madhya Pradesh (1) and Himachal Pradesh (2).

The range of 900-940 acounts for 26 districts i.e 22.80 percent distributed among Haryana (1) Punjab (3), Uttar Pradesh (3), Rajasthan (4), Madhya Pradesh (12) and Himachal Pradesh (3).

The range of 860-900 contains maximum number of total districts 37 i.e. 32.45 percent. The majority of the districts are claimed by Haryana (6), Punjab (8), Uttar Pradesh (11), Rajasthan (6), and Madhya Pradesh (6).

The range of 820-860 contains 34 districts i.e. 29.83 percent being shared by Haryana (4), Uttar Pradesh (22), Rajasthan (2), Madhya Pradesh (4) and Himachal Pradesh (2).

The range of 780-820 contains 8 districts ie. 7.02 percent of the total study area. Uttar Pradesh claims (6) districts and Rajasthan and Madhya Pradesh claims one district each. The lower categories i.e. 780-820 and 740 and below disappeared in this census decade.

The above discussion reveals that sex ratio in these five decades has undergone considerable change. If we look at the figure number 3.7 and temporal profile (Figure

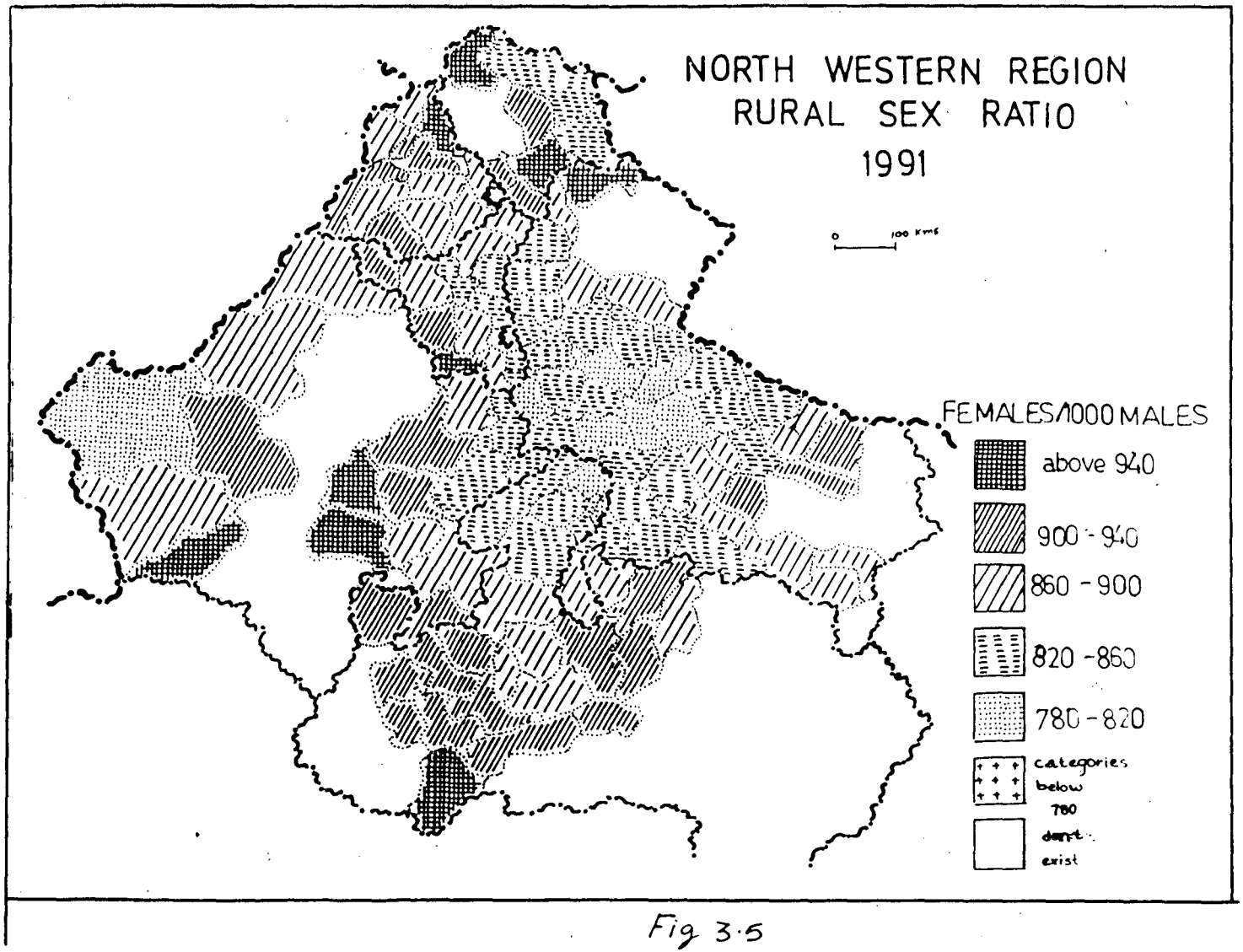
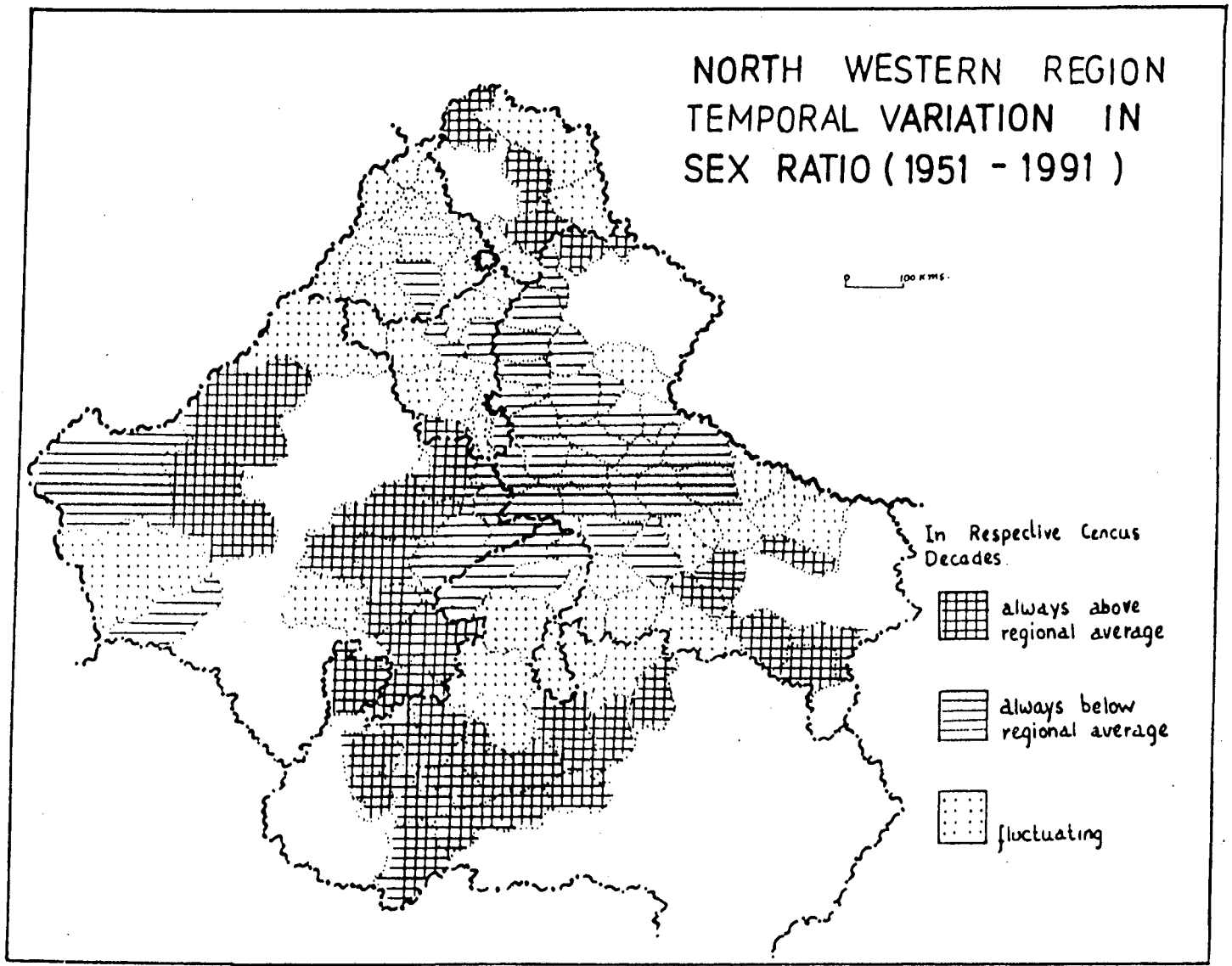

NORTH WESTERN REGION
RURAL SEX RATIO
1991
0
100 Kms
FEMALES/1000 MALES
above 940
900 - 940
860 - 900
820 - 860
780 - 820
categories
below
780
don't
exist

Fig 3.5



For Region's District Name refer Appendix 2

Fig 3.6

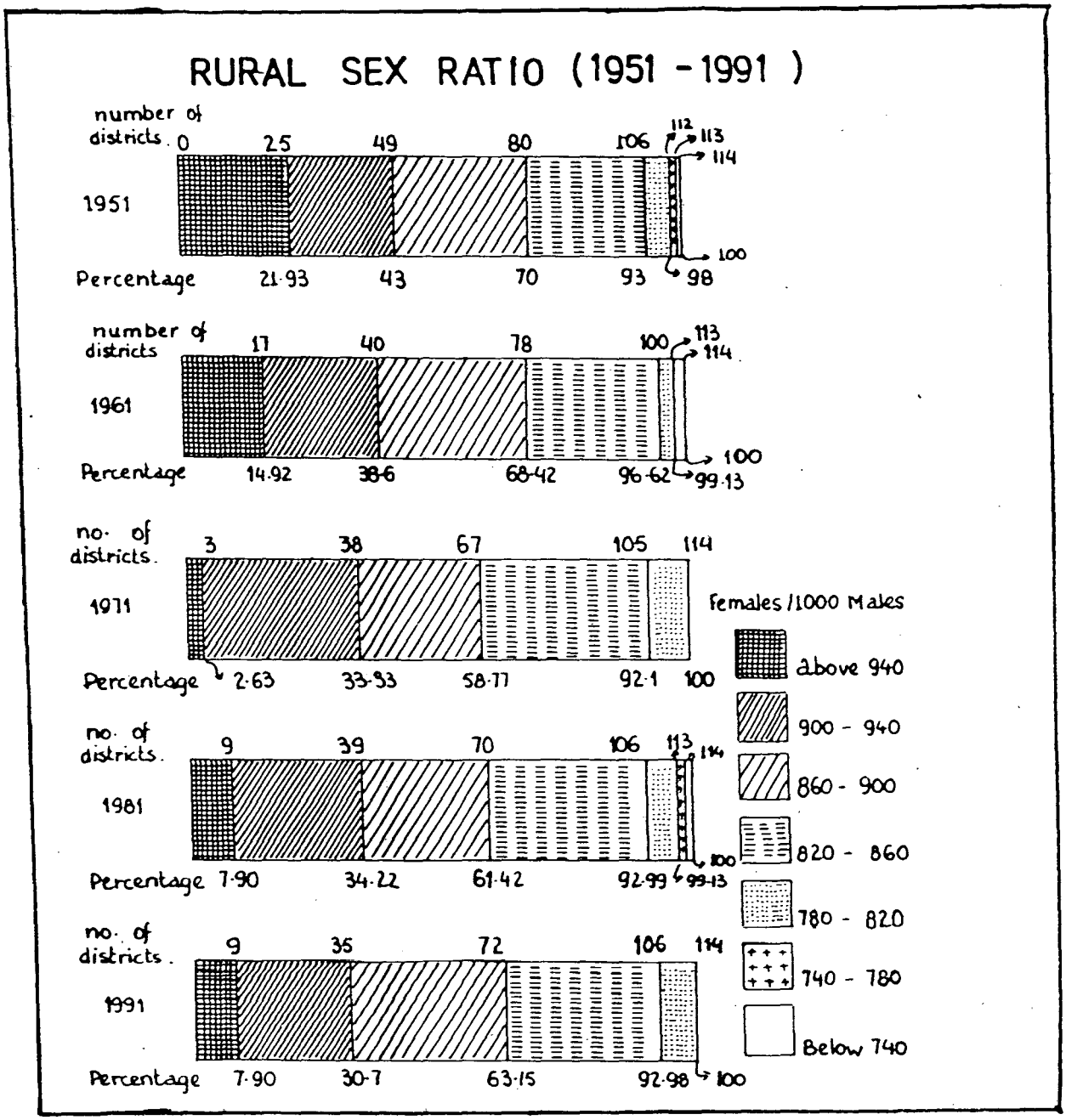

RURAL SEX RATIO (1951 - 1991)
number of districts
1951
0
25
49
80
106
112
113
114
100
Percentage
21·93
43
70
93
98
number of districts
1961
17
40
78
100
113
114
100
Percentage
14·92
38·6
68·42
96·62
99·13
no. of districts
1971
3
38
67
105
114
Percentage
2·63
33·93
58·77
92·1
100
no. of districts
1981
9
39
70
106
113
114
100
Percentage
7·90
34·22
61·42
92·99
99·13
no. of districts
1991
9
35
72
106
114
Percentage
7·90
30·7
63·15
92·98
100
Females /1000 Males
above 940
900 - 940
860 - 900
820 - 860
780 - 820
740 - 780
Below 740

Fig. 3·7

3.8), we observes that in 1951, the districts in the category of 940 and above were twenty five. These were Mahendragarh, Uttarkashi, Allahabad, Jhansi, Hamirpur, Rae Bareli, Faizabad, Basti, Varanasi, Mirzapur, Ahjmer, Jhalawhar, Panna, Damoh, Mandasur, Ujjain, Shajapur, Dewas, Indore, Hoshangabad, Narsimhapur, East Ninar, Kullu, Shimla, and Kannur. In 1961, they were 17 only and in 1971 which declined further to only three in number. The major cause behind this in 1971 could be the underenumeration of females (Premi 1991) . In 1981 and in 1991 it has started showing increasing trend. It is interesting to note from temporal profile that Rae Bareli has maintained status quo upto 1981 and in 1991 it has declined to lower category i.e. 900-940.

Mahendragarh, Uttarkashi and Faizabad more or less have maintained their position in this category i.e. 940 and above. One more interesting point is that in 1951 Dehradun was in the category of 740-780 and Nanital was in the category below 740. But in 1961 Nanital remained in the same category but Dehradun shifts to higher category i.e. 780-820. In 1971 and 1991 the categories 740-780 and below 740 disappeared.

It is observed from the temporal profile (Fig. 3.8) that all the districts of Punjab are showing positive trend, that is, increasing trend in sex ratio from 1951-1991. The increase in the sex ratio in this state can also be partly attributed to their unstable socio-political

conditions and the consequent slowing down of male-selective immigration reflected in a decline in their population growth (Kundu and Sahu 1991).

It is also noted that the sex ratio has declined in districts that are poor in terms of agricultural and educational development. The districts like Banda, Gonda, bahariach, are some of the least developed districts. The poor development could be the one cause for decline in sex ratio. Similarly, the districts of Panna and Raisen have experienced much decline in sex ratio. These are all very backward districts. Greater sex discrimination in the provision of health and other facilities and larger undercount of women in the relatively less developed districts could have played a role in depressing the sex ratio (Kundu and Sahu 1991).

The above discussion reveal that in northwestern region rural sex ratio is remarkably uneven during 1951-91. It shows a diversified pattern of sex ratio in this region.

FIGURE NO. 3.8

TEMPORAL PROFILE OF RURAL SEX RATIO IN THE STUDY AREA (1951-1991)

	1951	1961	1971	1981	1991
Gurdaspur					
940 & above					
900-940				x	
860-900		x	x		x
820-860	x				
780-820					
Amritsar					
940 & above					
900-940					
860-900	x	x	x	x	x
820-860					
780-820					
Firozpur					
940 & above					
900-940					x
860-900	x	x	x	x	
820-860					
780-820					
Ludhiana					
940 & above					
900-940					
860-900				x	x
820-860	x	x	x		
780-820					
Jalandhar					
940 & above					
900-940				x	x
860-900	x	x	x		
820-860					
780-820					
Kapurthala					
940 & above					
900-940			x	x	x
860-900	x	x			
820-860					
780-820					

Hoshiarpur

940 & above				x
900-940		x	x	x
860-900	x			
820-860				
780-820				

Rupnagar

940 & above				
900-940				
860-900			x	x
820-860		x	x	
780-820	x			

Patiala

940 & above				
900-940				
860-900			x	x
820-860		x	x	
780-820	x			

Sangrur

940 & above				
900-940				
860-900				x
820-860		x	x	x
780-820	x			

Bathinda

940 & above				
900-940				
860-900			x	x
820-860	x	x	x	
780-820				

Faridkot

940 & above				
900-940				
860-900	x		x	x
820-860		x	x	
780-820				

Ambala

940 & above					
900-940					
860-900				x	x
820-860	x	x	x		
780-820					

Kurukshetra

940 & above					
900-940					
860-900				x	x
820-860	x	x	x		
780-820					

Karnal

940 & above					
900-940					
860-900					
820-860	x	x	x	x	x
780-820					

Jind

940 & above					
900-940					
860-900					
820-860	x	x	x	x	x
780-820					

Sonipat

940 & above					
900-940					
860-900	x	x	x	x	
820-860					x
780-820					

Rohtak

940 & above					
900-940	x				
860-900		x	x	x	x
820-860					
780-820					

Faridabad

940 & above					
900-940					
860-900					
820-860	x	x		x	x
780-820			x		

Gurgaon					
940 & above					
900-940					
860-900	x	x	x	x	x
820-860					
780-820					
Mahendragarh					
940 & above	x	x			x
900-940			x	x	
860-900					
820-860					
780-820					
Bhiwani					
940 & above					
900-940				x	x
860-900	x	x	x		
820-860					
780-820					
Hisar					
940 & above					
900-940					
860-900	x	x	x	x	x
820-860					
780-820					
Sirsa					
940 & above					
900-940					
860-900			x	x	x
820-860	x	x			
780-820					
Uttarkashi					
940 & above	x	x			x
900-940			x	x	
860-900					
820-860					
780-820					

Dehradun

940 & above					
900-940					
860-900					x
820-860				x	
780-820		x	x		
740-780	x				

Nainital

940 & above					
900-940					
860-900					x
820-860				x	
780-820			x		
740 & below	x	x			

Saharanpur

940 & above					
900-940					
860-900					
820-860	x	x	x	x	x
780-820					

Muzaffarnagar

940 & above					
900-940					
860-900					
820-860	x	x	x	x	x
780-820					

Bijnor

940 & above					
900-940					
860-900	x	x			x
820-860			x	x	
780-820					

Meerut

940 & above					
900-940					
860-900					
820-860	x	x	x	x	x
780-820					

Ghaziabad

940 & above					
900-940					
860-900	x				
820-860		x	x	x	x
780-820					

Bulandshar

940 & above					
900-940					
860-900	x	x			
820-860			x	x	x
780-820					

Moradabad

940 & above					
900-940					
860-900	x				
820-860		x	x	x	x
780-820					

Rampur

940 & above					
900-940					
860-900		x			
820-860	x		x	x	x
780-820					

Budan

940 & above					
900-940					
860-900					
820-860	x	x			
780-820			x	x	x

Bareilly

940 & above					
900-940					
860-900					
820-860	x	x			x
780-820			x	x	

Pilibhit					
940 & above					
900-940					
860-900					
820-860	x	x	x	x	x
780-820					
Shahjahanpur					
940 & above					
900-940					
860-900					
820-860					
780-820	x	x	x	x	x
Aligarh					
940 & above					
900-940					
860-900	x	x			
820-860			x	x	x
780-820					
Mathura					
940 & above					
900-940					
860-900					
820-860	x	x			
780-820			x	x	x
Agra					
940 & above					
900-940					
860-900	x				
820-860		x	x		x
780-820				x	
Etah					
940 & above					
900-940					
860-900	x	x			
820-860			x		
780-820				x	x

Mainpuri

940 & above					
900-940					
860-900	x	x			
820-860			x	x	x
780-820					

Farrukhabad

940 & above					
900-940					
860-900					
820-860	x	x		x	
780-820			x		x

Etawah

940 & above					
900-940					
860-900					
820-860	x	x	x	x	x
780-820					

Kanpur

940 & above					
900-940					
860-900		x			
820-860	x		x	x	x
780-820					

Fathepur

940 & above					
900-940	x	x	x		
860-900				x	x
820-860					
780-820					

Allahabad

940 & above	x	x			
900-940			x	x	
860-900					x
820-860					
780-820					

Jalaun

940 & above					
900-940	x				
860-900		x	x		
820-860				x	x
780-820					

Jhansi

940 & above	x				
900-940		x			
860-900			x		
820-860				x	
780-820					x

Lalitpur

940 & above					
900-940	x	x			
860-900					x
820-860			x	x	
780-820					

Hamirpur

940 & above	x				
900-940		x			
860-900			x		
820-860				x	x
780-820					

Banda

940 & above					
900-940	x	x			
860-900			x	x	
820-860					x
780-820					

Kheri

940 & above					
900-940					
860-900					
820-860	x	x	x	x	x
780-820					

Sitapur

940 & above					
900-940					
860-900	x	x			
820-860			x	x	x
780-820					

Hardoi

940 & above					
900-940					
860-900	x				
820-860		x	x	x	
780-820					x

Unnao

940 & above					
900-940	x				
860-900		x	x	x	x
820-860					
780-820					

Lucknow

940 & above					
900-940					
860-900	x	x		x	x
820-860			x		
780-820					

Rai-Barali

940 & above	x	x	x	x	
900-940					x
860-900					
820-860					
780-820					

Bahraich

940 & above					
900-940	x				
860-900		x			
820-860			x	x	x
780-820					

Gonda

940 & above					
900-940	x	x			
860-900			x	x	x
820-860					
780-820					

Barabanki

940 & above					
900-940					
860-900	x	x			
820-860			x	x	x
780-820					

Faizabad

940 & above	x	x		x	
900-940			x		x
860-900					
820-860					
780-820					

Basti

940 & above	x	x			
900-940			x		x
860-900				x	
820-860					
780-820					

Varanasi

940 & above	x	x			
900-940			x	x	
860-900					x
820-860					
780-820					

Mirzapur

940 & above	x	x			
900-940			x	x	
860-900					
820-860					
780-820					

Ajmer

940 & above	x			x	x
900-940		x	x		
860-900					
820-860					
780-820					

Ganganagar

940 & above					
900-940					
860-900			x	x	x
820-860	x	x			
780-820					

Bikaner

940 & above					
900-940		x	x	x	
860-900	x				x
820-860					
780-820					

Alwar

940 & above					
900-940					
860-900	x	x	x	x	x
820-860					
780-820					

Bharatpur

940 & above					
900-940					
860-900					
820-860	x	x	x	x	x
780-820					

Sawaimodhapur

940 & above					
900-940					
860-900	x	x	x	x	
820-860					x
780-820					

Jaipur

940 & above					
900-940	x	x	x	x	x
860-900					
820-860					
780-820					

Tonk

940 & above					
900-940	x	x	x	x	x
860-900					
820-860					
780-820					

Jalor

940 & above				x	x
900-940	x	x	x		
860-900					
820-860					
780-820					

Jodhpur

940 & above					
900-940	x		x	x	x
860-900		x			
820-860					
780-820					

Jaisalmer

940 & above					
900-940					
860-900					
820-860			x	x	
780-820	x	x			x

Barmer

940 & above					
900-940				x	
860-900	x	x	x		x
820-860					
780-820					

Bundi					
940 & above					
900-940	x				
860-900		x	x	x	x
820-860					
780-820					
Kota					
940 & above					
900-940	x	x	x	x	
860-900					x
820-860					
780-820					
Jhalawar					
940 & above	x				
900-940		x	x	x	x
860-900					
820-860					
780-820					
Bhilwara					
940 & above				x	x
900-940	x	x	x		
860-900					
820-860					
780-820					
Morena					
940 & above					
900-940					
860-900					
820-860	x	x	x	x	x
780-820					
Bhind					
940 & above					
900-940					
860-900					
820-860	x	x	x	x	
780-820					x

Gwalior

940 & above					
900-940					
860-900	x	x			
820-860			x		x
780-820				x	

Datia

940 & above					
900-940					
860-900	x	x	x		
820-860				x	x
780-820					

Shivpuri

940 & above					
900-940	x				
860-900		x	x		
820-860				x	x
780-820					

Gunna

940 & above					
900-940	x	x			
860-900			x	x	x
820-860					
780-820					

Tikamgarh

940 & above					
900-940	x	x			
860-900			x	x	x
820-860					
780-820					

Chhatarpur

940 & above					
900-940					x
860-900	x	x	x	x	
820-860					
780-820					

Panna

940 & above	x				
900-940		x	x	x	
860-900					x
820-860					
780-820					

Sogar

940 & above					
900-940	x	x	x		x
860-900				x	
820-860					
780-820					

Damoh

940 & above	x	x	x		
900-940				x	x
860-900					
820-860					
780-820					

Mandsaur

940 & above	x			x	
900-940		x	x		x
860-900					
820-860					
780-820					

Ujjan

940 & above	x	x		x	
900-940			x		x
860-900					
820-860					
780-820					

Shajapur

940 & above	x	x			
900-940			x	x	x
860-900					
820-860					
780-820					

Dewas					
940 & above	x	x			
900-940			x	x	x
860-900					
820-860					
780-820					
Rajgarh					
940 & above					
900-940	x	x	x	x	x
860-900					
820-860					
780-820					
Vidista					
940 & above					
900-940	x				
860-900		x	x	x	x
820-860					
780-820					
Bhopal					
940 & above					
900-940					
860-900	x	x	x	x	x
820-860					
780-820					
Sehore					
940 & above					
900-940	x	x	x	x	x
860-900					
820-860					
780-820					
Raisen					
940 & above					
900-940	x	x	x	x	
860-900					x
820-860					
780-820					

Hosangabad

940 & above	x	x			
900-940			x	x	x
860-900					
820-860					
780-820					

Narsimhapur

940 & above	x	x			
900-940			x	x	x
860-900					
820-860					
780-820					

Indore

940 & above	x				
900-940		x	x	x	x
860-900					
820-860					
780-820					

East Nimar

940 & above	x	x		x	x
900-940			x		
860-900					
820-860					
780-820					

Chamba

940 & above			x		x
900-940		x		x	
860-900	x				
820-860					
780-820					

Kullu

940 & above	x	x			
900-940			x	x	x
860-900					
820-860					
780-820					

Lahul & Spiti

940 & above					
900-940	x				
860-900					
820-860					x
780-820		x	x		
740-780				x	

Shimla

940 & above	x				x
900-940		x	x	x	
860-900					
820-860					
780-820					

Solan

940 & above				x	
900-940		x	x		x
860-900					
820-860	x				
780-820					

Sirmaur

940 & above					
900-940					x
860-900				x	
820-860		x	x		
780-820	x				

Kinnaur

940 & above	x	x			
900-940					
860-900			x	x	
820-860					x
780-820					

CHAPTER 4

CORRELATION AND DETERMINANTS OF SEX RATIO : AN EXPLANATION

In the third world countries like India low sex ratio is influenced by socio-cultural and economic factors. As pointed out by Miller (1981), the sex ratio is largely dependent on the social and cultural biases of the community. Quantification for certain social and cultural variables which would explain variations in sex ratio is a difficult task because of non-availability of such data in Indian census. However, surrogate data can be used. The present chapter makes an attempt towards this. The number of districts with which the analysis has been carried out in 97. Few districts have been left deliberately due to the non availability of data for them. Wherever data are not available for the reference census decade, i.e., 1981 data relating to the time point closest to the census year have been used.

The following socio-economic variables have been taken to observe and analyse their relationship with sex ratio in north western region of India.

1. Percentage of female workers to the total female population or female participation rate (PFMW).
2. Percentage of net area sown under rice cultivation to total area (PARC)

3. Percentage of net area sown under wheat cultivation to total area (PAWC)
4. Percentage of (0-2 hectares) small landholding to total landholdings. (LHO-2)
5. Percentage of male agricultural labour in the total mole main workers (PMAL)
6. Percentage of non agricultural male workers to total main workers (PNAMW)
7. Agricultural productivity per hectare for 19 major crops (AGPRD)
8. Percentage of villages having medical facilities (VHMF)
9. Percentage of Muslims to the total population (PRMUS)
10. Percentage of rural literacy (PRLR)
11. Percentage of schedule castes to the total population (PSC)

The nature of relationship of these variables with rural sex ratio will confirm or reject the hypotheses set out in chapter 1.

Sex Ratio and Female Participation Rate

Several scholar have stated that participation of females in production does affect the survival of females. Bardhan (1974) has postulated that the economic value of women varies with the ecological zone and that, where her value is high the female offspring is seen as less burdensome. Miller (1981) argued that there should be a

close correlation between the two factors showing that the participation of females in production does affect the survival of females. She put forth a hypothesis that where female labour participation is high there will always he high preservation of female life but where female labour participation is low female children may or may not be preserved. For instance for her argument is that in Swidden and wet agriculture the high demand for labour implies at a social level the recognition of need for female children combined with marriage practice of greater reciprocity and inclusion of female in property rights. The female child is seen less as a burden, resulting in balanced juvenile sex ratio. In contrast, in areas of dry cultivation with its low demand of labour and also the exclusion of females in property rights along with marriage costs a greater preference for sons seems to exist resulting in unbalanced Juvenile sex ratio. Further the differential survival rate of a female child is seen as positively correlated with female employment and level of gender wage differential. On the basis of these observations we have formulated several hypotheses.

Table 4.1 to 4.4 present the results of correlations between sex ratio and explanatory variables. It may be recall that the entire region designated as macro region is further subdivided into three subdivisions : regions 1,2 and 3. The correlations are attempted for the

region as a whole as well as for the three subregions separately.

Table 4.1 shows that there is a significant correlation between female participation rate and sex ratio. Further, the coefficient of correlation is significant at 1 percent level of significance. The r value in this case is .56. Thus, at macro level the hypothesis relating sex ratio to female labour participation stands confirmed and it can be concluded that sex ratio and female participation is correlated.

At subdivision level Table 4.2, 4.3, 4.4 show the result of correlation between female participation and sex ratio. It is observed from Table 4.3 that, in Region 2, there is a significant correlation between female participation rate and sex ratio. The r value comes out to be .33 which is statistically significant at 10 percent level of significance. In other regions it does not show any correlation. So the hypothesis seems to be confirmed in Region 2, in other regions it is against our expectations.

Table 4.1

Coefficient of Correlation Between Sex Ratio and Explanatory Variables (N 97)

Explanatory variables	Coefficient of correlation
PARC	- .03
PAWC	- .28***
PMAL	.06
PSC	- .06
PRMUS	- .30***
PFMW	.56***
PRLR	- .06
LH 0-2	- .23**
VHMF	- .01
AGPRD	- .30***
PNAMW	.14

Note : *** Significant at 0.01 level
** Significant at 0.05 level

Table 4.2

Coefficient of Correlation Between Sex Ratio and Explanatory Variables, Region 1 (N 30)

Explanatory variables	Coefficient of correlation
PARC	.06
PAWC	- .40**
PMAL	- .02
PSC	- .20
PRMUS	- .35*
PFMW	.09
PRLR	.03
LH 0-2	.10
VHMF	.14
AGPRD	- .07
PNAMW	.13

Note : *** Significant at 0.01 level
** Significant at 0.05 level
* Significant at 0.10 level

Table 4.3

Coefficient of Correlation Between Sex Ratio and Explanatory Variable, Region 2 (N 32)

Explanatory variables	Coefficient of correlation
PARC	- .02
PAWC	- .01
PMAL	.39**
PSC	.22
PRMUS	- .11
PFMW	.33*
PRLR	.25
LH 0-2	- .46***
VHMF	.64***
AGPRD	.06
PNAMW	.31

Note : *** Significant at 0.01 level
** Significant at 0.05 level
* Significant at 0.10 level

Table 4.4

Coefficient of Correlation Between Sex Ratio and Explanatory Variables, Region 3 (N 35)

Explanatory variables	Coefficient of correlation
PARC	.32*
PAWC	.02
PMAL	- .11
PSC	- .01
PRMUS	.07
PFMW	- .21
PRLR	.03
LH 0-2	- .03
VHMF	- .12
AGPRD	.15
PNAMW	.15

Note : *** Significant at 0.01 level
** Significant at 0.05 level
* Significant at 0.10 level

Sex Ratio and Agricultural Productivity/development

Agricultural development of an area is likely to have an adverse effect on female participation rate. This may happen due to the following reasons. Firstly, with an increase in output the general income level increases which discourages physical work for both male and female because a physical labour is considered as a sign of low status. Secondly, with development the economic burden on females is reduced and they are not compelled to do labour. Thirdly, the agricultural development in green revolution pockets of india has also resulted in the mechanisation of agricultural operations. Aggarwal (1981) says that mechanisation in harvesting and threshing operations with the introduction of combine harvesters, wheat threshers and maize shallers does clearly displace hired labour both male and female on the basis of this we had proposed a hypothesis taking agricultural productivity (assumed to reflect the development inputs in agriculture) and sex ratio.

Table 4.1 brings out the coefficient of correlation between agricultural productivity and sex ratio as -.30 which is negatively correlated and the r value is significant at one percent level of significance, thus confirming the hypothesis. On the otherhand, it is observed from Table 4.2, 4.3, 4.4 that this variable does not show any relationship with sex ratio when this broad region is further divided into three sub regions.

Sex Ratio and Muslim Population

It is often suggested that the north and north western parts of the Indian subcontinent are an extension of the broad cultural region of west Asia and the impact of Islamic culture was consolidated in these areas over the centuries of Muslims rule. This may have resulted in the differential status of women among Muslim and non-Muslim women and the higher incidence of female child mortality. According to Sopher (1980), A Syllogism goes like this : The Muslim population is highly masculine: there is a much larger proportions of Muslims in the northern population than in southern one therefore ceteris paribus, the northern population will be more masculine than the southern one. On the basis of this we put forth a hypothesis that in certain communities where female status is low sex ratio will be adverse to female. Table 4.1 shows the negative sign between there two variables (i.e. sex ratio and Percental of Muslim Population to total population) which is according to our expectations. The r value is - .30 which is significant at 1 percent level of significance. it can be observed from Table 4.2 that this variable has shown some significant relationship with sex ratio for Region 1. It is statistically significant at 10 percent level of significance. Table 4.3 and 4.4 does not show any relationship although Region 2 does exhibit a weak negative association.

Sex ratio and percentage of area under wheat and rice cultivation

Several scholars hypothesised a wheat/rice dichotomy in Indian agriculture. The dichotomy is broadly coincident with north south differencies in female employment pattern and a reverse association with sex ratios suggesting differential treatment of women in the two agricultural regions. Accordingly, the following hypothesis has been put forth that as the area is predominantly wheat growing in nature so the sex ratio would be negatively correlated. Table 4.1 confirms the above hypothesis. This variable is significant at 1 percent level. Also, at subdivisional level it is observed from the table 4.2 that this variable is according to our expectations in Region 1 and confirms our hypothesis. Its r value is -.45 which is statistically significant at 5 percent level of significance. However, no such association seems to exist in other micro regions.

Sex ratio and small landholding

Small operational land holdings are generally cultivated with the help of family labour. Hired labour is rarely employed. lack of sufficient income in their case generally compel them to employ all their family resources including women and children to extract maximum possible sustenance from the land. Moreover, work by females in

their family farms with their own menfolk is not as strongly resented as in the case of hiring out of labour on other's field but the same is not true in the case of bigger farmers. They generally restrict their concern exclusively to household work. Thus it is likely that higher number of smaller holdings will result in a higher female work participation rate and hence enhance sex ratio. Table 4.1 shows that the coefficient of correlation between percentage of small land holdings and sex ratio is -.24 which is negatively correlated.

It is against the hypothesis. this value is significant at 5 percent level of significance. Similarly on micro level it is observed from the table 4.3 that this variable is highly significant at one percent level of significance but again it shows negative sign which is against our expectations. Table 4.2 and 4.4 doesnot show any correlation between these two variables.

Sex Ratio and villages having medical facilities

It is often suggested that as development takes place, sex ratio shows some improvement. it is observed from the table 4.2 and 4.3, that this variable i.e. villages having medical facilities have shown some positive correlation with sex ratio. Table 4.3 shows that this variable is highly significant at 1 percent level of significance. In Table 4.2 it shows a positive relationship but not significant. On the other hand, table 4.1, 4.4 do

not show any correlation between these two variables.

Sex ratio and the percentage of male agricultural labour and non agricultural male labour

From Table 4.3 it could be observed that there is a correlation between percentage of male agricultural labour and sex ratio. The r value is .39 which is statistically significant at 5 percent level of significance. Similarly, there is a positive correlation between percentage of non male agricultural workers and sex ratio. The r value is .32 which is statistically significant at 10 percent level of significance. But, on the other hand Table 4.1, 4.2 4.4 does not show any correlation between these variables.

From the above discussion it could be revealed that variable such as percentage of female workers to female populations or female participation rate, percentage of Muslims population to total population, percentage of area under wheat/rice cultivation show their significant relationship as hypothesised at the regional as well as sub-regional level. A few interesting results has also emerged from the above correlations. Table 4.3 gives some interesting results. Here, it could be observed that the sex ratio is positively correlated with villages having medical facilities and percentage of male agricultural labour and percentage of non agricultural male labourers. The variables such as percentage of schedule caste to total population and rural literacy rate does not show any

relationship with sex ratio at any level.

Regression Results

Coefficient of simple correlation between sex ratio and other explanatory variables separately gives relationship in each case where other variables are not taken into consideration. Multiple regression method removes this drawback where the impact of multiple explanatory variables on dependent variables i.e. sex ratio can be assessed. Regression coefficient of a particular independent variable is the partial coefficient correlation measuring the change in dependent variables with respect to a unit change in that independent variable when all other variables are kept constant.

Step wise Regression

Step wise multiple regression results for rural sex ratio are presented in Table 4.5, 4.6, 4.7. It is observed from the Table 4.5 that in the first step explanatory variable taken is female participation rate. This comes out to be a very important explanatory variable and explanatory power (R^2) of the variable is 31 percent.

Table 4.5

Sex Ratio and Some Important Variables (N 97)

Equation Number	Constant term	PFMW	PRMUS	PAWC	Coefficient of determination R^2	Adjusted co-efficient of determination R^{-2}	F-value
I SR	857.09	+2.889*** (6.63)			.316	.309	44.08
II SR	864.92	+2.6714*** (6.08)	-.727** (-2.15)		.349	.335	25.20
III SR	878.35	+2.463*** (5.30)	-.749** (-2.22)	-.403 (-1.325)	.361	.340	17.52

Variations explanned 36%

*** Significant at .01 level

** Significant at .05 level

* Significant at .10 level

PFMW - Percentage of Female workers to total female population or female participation rate.

PRMUS - Percentage of Muslim population to total population

PAWC - Percentage of area under wheat cultivation to total area

Table 4.6

Sex Ratio and Some Important Variables, Region 1 (N 30)

Equation Number	Constant term	PAWC	PRMUS	Coefficient of determination	Adjusted co-efficient of determination	F-value
				R^2	R^{-2}	
I SR	936.85	-.635*** (2.3)		.164	.134	5.51
II SR	943.59	-.588** (-2.27)	-1.286** (-1.95)	.267	.213	4.93

Variation explanned 26%

*** Significant at .01 level

** Significant at .05 level

* Significant at .10 level

PAWC - Percentage of Area under wheat cultivation

PRMUS - Percentage of Muslim population to total population

Table 4.7

Sex Ratio and Some Important Variables, Region 2 (N 32)

Equation Number	Constant term	VHMF	PFMW	Coefficient of determination	Adjusted co-efficient of determination	F-value
				R^2	R^{-2}	
I SR	823.88	+.657*** (4.68)		.422	.402	21.92
II SR	821.69	+.610*** (4.16)	+1.18 (1.08)	.444	.406	11.60

Variation explanned 44%

*** Significant at .01 level

** Significant at .05 level

* Significant at .10 level

VHMF - Village having medical facilities

PFMW - Female participation rate

The Regression coefficient of female participation rate shows positive relation with sex ratio in north western region and this variable is highly significant at one percent level of significance. In equation II, the variable entered is percentage of muslims to total population which slightly improves the explanatory power of the regression equation. The Regression coefficient Percentage of Muslim Population to total Population has shown expected negative sign but significant only at 5 percent level of significance. Similarly, in step third new variable entered is percentage of area under wheat cultivation which further improves the explanatory power of the regression equation. So from the above table we can conclude that at the regional level around 36 percent variation in sex ratio is explained by the variables such as percentage of female participation, percentage of muslim population to total population and area under wheat cultivation.

For region 1, it is observed from table 4.6 that variation explained by the variables like percentage of area under wheat cultivation and percentage of muslim population to total population is only 26 percent. In this analysis the first variable entered is percentage of area under wheat cultivation whose explanatory power is only 16 percent. Regression coefficient of percentage of area under wheat cultivation is showing negative relation with sex ratio and this variable is significant at 5 percent level of significance. In equation II the variable entered is

percentage of muslim population which further improves the explanatory power of the regression equation. Regression coefficient of area under wheat cultivation is showing negative relation with sex ratio and this variable is significant at 5 percent level of significant. In equation II the variable entered is percentage of muslim population to total population which further improves the explanatory power of the regression equation . Regression coefficient of this variable has shown negative sign according to our expectaions. For region II it has been observed from table 4.7 that variables like villages having medical facilities and female participation rate are significant. The total variation explained by these variables is 44 percent. In this the variable first entered in the equation is villages having medical facilities whose explanatory power is 42% and it shows a positive relation with sex ratio. This variable is highly significant at 1 percent level of significance. In the equation II the variables entered is female participation rate which further slightly improves the explanatory power of the regression equations.

Thus from the forgoing step wise regression analysis it can be concluded that in north western India, the most important explanatory variables at regional and sub regional level is female participation rate. Other variable such as villages having medical facilities and percentage of muslim population to total population are important in some regions.

CHAPTER - 5

SUMMARY AND CONCLUSION

The present study is an analysis of cross-sectional data on rural sex ratio for 1981 census in north western region of India. The purpose of the study is to examine the variation in rural sex ratio at district level in north western region. Further, attempt has also been made to explain the variation in rural sex ratio with the help of some selected socio-economic variables.

From a look at the geographical distribution of rural sex ratio in India, it is clear that the sex ratio is high in South which gradually decreases as one moves towards north and north-west. The 20^{o} N latitude is seen as the dividing line between low and high sex ratios. In northern parts only the tribal districts of Madhya Pradesh and hilly districts of Uttar Pradesh have high sex ratio.

Region selected for the present study is based on the rural sex ratio of 1971, 1981, given in census Atlas of India. When we observe these maps, especially 1981, then an interesting phenomena emerges : a contigious belt of sex ratios below national average (951 in 1981) is present in the north western region of India. This belt comprises the states of Punjab, Haryana, Uttar Pradesh, North eastern Himachal Pradesh, Northern Madhya Pradesh and eastern and western portion of Rajasthan. This region also comprises the

most developed and less developed states of India. For example, Punjab, Haryana represent the developed states and Rajasthan and Madhya Pradesh represent less developed states. However, as a whole this region shows low sex ratios as compared to the south India.

For identification of districts we have taken into consideration 1981 rural sex ratios on the basis of this, we have taken all those districts which have remained below national average (951). Accordingly one hundred and fourteen districts (shown in figure no. 1.3 and 1.4) are identified. This broad region is further divided into three regions on the basis of the temporal profile of sex ratios in each districts. Those districts where the observed sex ratios have always remained above the regional average throughout the reference period i.e., 1951 to 1991 have been grouped to form region 1. conversely Region 2 consists of those districts which always exhibited sex ratios below the regional average. Region 3 covers those districts which had fluctuating sex ratios through the reference period.

From the available literature on sex ratio it has been noted that discrimination between sexes is one of the most important problems faced by the world in general and the developing countries in particular. It has been observed that disparities in intrafamily allocation of food and nutrition and health care exists in indian household or indian society. Several scholars have collected data in this

regard at the general household level and have attempted to explain this discrimination phenomenon. Cultural antropologist like Miller has also collected some scattered evidence, but they are only qualitative and impressionistic. Among the most careful and detailed quantitative studies are the ones for Matlab Thana in Bangladesh reported by chen. According to this study, male daily per capita calorie consumption was on an average 16 per cent higher among children under five years. This significant female disadvantage in terms of food intake remains even after adjustment for sex specific food requirement. This also shows up in the anthropometric assessment of nutrional status; by using the weight-for-age standard, a much larger percentage of female children was classified as severely or moderately malnourished than that of males.

There are remarkable regional contrasts within India on the differential chances of survival for the female child. This differential mortality is also reflected in the remarkable regional differences in the sex ratio of rural population. The number of males per 1000 females among the rural population under age ten is the highest in north west India and it clearly decreases as one moves south and east. Historically, the practice of female infanticide has been known to exist in north and northwest India. The practice has died out, but the long - ran legacy of general neglect (conscious or unconscious)of girl children in terms of

undernutrition and discrimination in making use of medical facilities may have persisted in this region to a larger extent than in east or south India.)

(Status of women in a society is substantially determined by their economic position and the role played by them in productive activities.) Scholars like Bardhan, Miller and Rosenweig have tried to explain economic position of women in terms of ecological variations in crop production and economic activity in general. For example, in all the states of east and south India (except Karnataka) the predominant crop is paddy, which -- unlike wheat and dry-region crop - tends to be relatively intensive in female labour. Transplantation of paddy is an exclusively female job in many paddy areas, besides, female labour plays a very important role in weeding, harvesting, threshing, and various kinds of processing of paddy. By contrast, in dry cultivation. So in areas with paddy agriculture, the economic value of a women is more than in other areas - so that the female is regarded as less of a liability than in, say north and northwest India.

The question of the economic value of a women and regional variations in it is also linked with variations in the institutions of dowry and marriage payments (Miller 1981).

It is generally believed that in poverty stricken houses female ratio to male ratio is more because for

survivalness, female has to work for sustenance. So in that case female is not regarded as burden.

It has also been noted that green revolution (especially in Punjab, Haryana and Western , Uttar Pradesh) has not increased much job opportunity for women.

Thus the differential chance of survival of a female child will depend on a variety of related and economically important factors, such as the wealth position of the household, its inheritance and marriage payment practice and female employment prospects, apart from the educational and caste status of the household, the degree of prevalence of hypergamy (usually involving large dowries) and the process of sanskritization through which the lower castes try to upgrade themselves by adopting upper-caste practices like dowry and work taboo for women).

On the basis of this several hypotheses have been formulated, where relationship between female labour force participation and sex ratio has been explored. The existing literature links sex ratios with poverty, specific agricultural ecology (rice / wheat controversy), developmental scene and various social groups. In this study, several of these expositions have been tested. It must be admitted that in the absence of relevant data, surrogate variables (not always the most appropriate ones) have been used. Thus, percentage of small landholders (0-2

hectares) and percentage of male agricultural workers are proposed to indicate poverty. Similarly, percentage of non-agricultural male workers (indicating diversified rural economy), agricultural productivity and literacy are expected to capture the level of development. Other variables such as villages having medical facilities , or Muslims/Scheduled caste population are self-evident.

After choosing the variables, statistical techniques like correlation and regression analysis were adopted for the analysis part i.e. between rural sex ratio and socio-economic explanatory variables. Correlation between sex ratio and the explanatory variables verifies or reject our hypothesis set up in the present study (Chapter 1).

It is observed from the choropleth maps of rural sex ratio from 1951-91 that in 1951 the districts with sex ratio 940 and above are located in the periphery i.e. outer areas of the north western region (figure 3.1). Total number of districts in this category was twenty five. In 1961, it slightly changed but in 1971, it changed drastically whereby the number came down to three only. The reason behind this could be the underenumeration of females in the 1971 census. In 1981 and 1991 it has again started showing upward trend. One more interesting point is that in 1971 districts in the category of 740 and below disappeared. In other categories, districts have shown fluctuating trend in the 5 decades

under study. But all the districts of Punjab showing the positive trend in Rural Sex ratio.

It is observed from the correlation results that rural sex ratio is positively associated with variable such as female participation rate. The value in this case turns out to be .563 which is statistically highly significant at one per cent level of significance.

It is further noted that on macro level as well as micro level (three regions individually) sex ratio is positively correlated with percentage of non-agricultural male workers (except in Region 1). However, at macro level it is not significant, whereas at micro level it is statistically significant.

Negative relationship is found between sex ratio and percentage of Muslim Population to total population, agricultural Productivity and area under wheat cultivation. These correlations are according to our expectations and are statistically significant.

The result of correlation between sex-ratio and small landholding 0-2 hectare turns out to be contrary to our expectations. This variable is showing negative relationship with the sex-ratio.

At micro level, some of our hypotheses seem to be proved. We get some interesting results. For example in Region 2 which comprised districts of western Uttar Pradesh

(Meerut, Bulandshar, Muzzafarnagar, Moradabad and Rampur), medical facilities exhibit positive correlation with sex ratio. Further, it is statistically highly significant. The value in this case turn out to be .649, which is significant at one per cent level of significance. In region 1 and region 3 we do not get statistically significant correlation between sex ratio and other explanatory variables. Although we do get positive and negative signs which as per our expectations, but statistically they are insignificant.

Results of stepwise regression brings out two important explanatory variables at macro as well as micro level : female participation rate and percentage of Muslims to total population.

At Macro level the following variables (1) Female participation rate, (ii) Percentage of Muslims to total population and (iii) Percentage of area under wheat cultivation jointly explain 36 percent variation.

At micro level i.e. (for Region 1) variables like percentage of area under wheat cultivation and percentage of Muslim to total population explains 26 per cent variation.

In Region 2, Female participation rate and villages having medical facilities explain 44 per cent of variation jointly.

It may be seen that the total variation explained

is not substantial. Part of the problem lies in the limitation of data. However, it is gratifying to note that in region 2 (which is of special concern to us as it consists of districts with chronic lower - than regional average sex ratio), female participation in labour force of (female participation rate) and availability of medical facilities emerge as having significant positive bearing upon sex ratio. To sum up, in the present work we tried to explore the nature of rural sex ratio and have attempted to explain this with socio-economic explanatory variables in the north western region. However, we could not fully explain this low sex ratio phenomenon in the north-western region of India. The problem is more sociological and deep rooted in historical part which needs close investigations including field surveys and problem into other anthropological aspects. This analysis was further constrained by the available published data.

However, one thing is clear that steps have to be taken to improve the position of females vis-a-vis males in all aspects of their lives. One such step should be that more opportunities should be provided to them to improve their skill and education. Training in modern farming, techniques through extension services, and reservation in technical service sectors is likely to improve the position of women which would ultimately have bearing upon societal attitude towards and perception towards females. The long term impact may be reflected in improved sex ratios.

The problem is much more complex though, in addition to direct measures to improve the lot of females, a whole range of efforts will have to be made to change/improve the deep seated biases in the society towards its female members including girl children.

APPENDIX I

District Identification (Study Area)

Location Code	Name of the District	Location Code	Name of the District
PUNJAB		**HARYANA**	
1	Amritsar	1	Ambala
2	Bathinda	2	Kurukshetra
3	Faridkot	3	Karnal
4	Firozpur	4	Jind
5	Gurdaspur	5	Sonipat
6	Hoshiarpur	6	Rohtak
7	Jalandhar	7	Faridabad
8	Kapurthala	8	Gurgaon
9	Ludhiana	9	Mahendragarh
10	Patiala	10	Bhiwani
11	Sangrur	11	Hisar
12	Rupnagar (Ropar)	12	Sirsa

Location Code	Name of the District	Location Code	Name of the District
	UTTAR PRADESH		
1	Deharadun	25	Lucknow
2	Saharanpur	26	Barabanki
3	Muzaffarnagar	27	Faizabad
4	Meerut	28	Basti
5	Ghaziabad	29	Gonda
6	Bulandshar	30	Bahraich
7	Aligarh	31	Sitapur
8	Mathura	32	Hardoi
9	Agra	33	Farrukhabad
10	Etah	34	Budaun
11	Mainpuri	35	Kheri
12	Etawah	36	Shahjahanpur
13	Jalaun	37	Pilibihit
14	Jhasi	38	Bareilly
15	Lalitpur	39	Rampur
16	Hamirpur	40	Moradabad
17	Banda	41	Bijnor
18	Allahabad	42	Nainital
19	Mirzapur	43	Uttarkashi
20	Varanasi		
21	Fathepur		
22	Kanpur		
23	Rae-Bareli		
24	Unnao		

Location Code	Name of the District	Location Code	Name of the District
RAJASTHAN		**MADHYA PRADESH**	
1	Ganganagar	1	Morena
2	Bikaner	2	Gwalior
3	Jaisalmer	3	Bhind
4	Barmer	4	Datia
5	Alwar	5	Shivpuri
6	Bharatpur	6	Guna
7	Jaipur	7	Rajgarh
8	Tonk	8	Shajapur
9	Bundi	9	Ujjan
10	Kota	10	Dewas
11	Sawai Madhopur	11	Hoshangabad
12	Jhalawar	12	Schore
13	Ajmer	13	Narsimhapur
14	Bhilwara	14	Raisen
15	Jodhpur	15	Sagar
16	Jalor	16	Vidisha
		17	Bhopal
		18	Tikamgarh
		19	Chattarpur
		20	Panna
		21	Demoh
		22	East Nimar
		23	Mandsaur
		24	Indore

Location Code	Name of the District	Location Code	Name of the District
HIMACHAL PRADESH			
1	Solan		
2	Sirmaur		
3	Shimla		
4	Kinnaur		
5	Lahul and Spiti		
6	Kullu		
7	Chamba		

APPENDIX II

REGION'S DISTRICTS NAME

Region I	Region II	Region III
Above average	Below average	Fluctuating
Mahendragarh	Sangrur	Gurdaspur
Uttarkashi	Kurukshetra	Amritsar
Fathepur	Karnal	Firozpur
Allahabad	Jind	Ludhiana
Rai-Bareli	Faridabad	Jalandhar
Faizabad	Hisar	Kapurthala
Varanasi	Dehradun	Hosiarpur
Mirzapur	Saharanpur	Rupnagar
Ajmer	Muzzafarnagar	Patiala
Bikaner	Bijnor	Bathinda
Alwar	Meerut	Faridkot
Jaipur	Ghaziabad	Ambala
Tonka	Bulandshar	Sonipat
Jalor	Moradabad	Rohtak
Jodhpur	Rampur	Gurgaon
Bundi	Budan	Bhiwani
Kota	Bareilly	Sirsa
Jhalawar	Pilibhit	Nainital
Bhilwara	Shajahanpur	Jalaun
Panna	Aligarh	Jhansi
Sagar	Mathura	Lalitpur
Damoh	Agra	Hamirpur
Mandasur	Etah	Banda
Ujjan	Mainpuri	Unnao
Shajpur	Faridabad	Lucknow
Dewas	Etawah	Bahraich
Rajgarh	Kanpur	Gonda
Bhopal	Kheri	Barabanki
Sahare	Sitapur	Basti
Raisen	Hardoi	Ganganagar
Hosangabad	Bharatpur	Barmer
Narsimhapur	Sawaimadhopur	Datia
Indore	Jasalmer	Shivpuri
East Nimar	Morena	Gunna
Chamba	Bhind	Tikamgarh
Kullu	Gwalior	Chattarpur
Shimla		Vidisha
		Lahul & Spiti
		Solan
		Sirmaur
		Kinnaur

APPENDIX III

RURAL SEX RATIO IN STUDY AREA

		1951	1961	1971	1981	1991
1.	Ambala	849	851	852	865	886
2.	Kurushetra	846	847	856	864	867
3.	Karnal	856	850	850	849	858
4.	Jind	854	856	859	854	843
5.	Sonipat	887	889	866	869	848
6.	Rohtak	905	898	897	885	862
7.	Faridabad	848	848	820	850	850
8.	Gurgaon	895	893	887	882	888
9.	Mahendragarh	958	949	920	938	948
10.	Bhiwani	880	884	886	908	902
11.	Hisar	870	867	868	872	867
12.	Sirsa	842	846	867	887	889
13.	Gurdaspur	857	886	893	908	864
14.	Amritsar	871	877	866	876	883
15.	Firozpur	861	862	876	885	904
16.	Ludhiana	846	859	859	879	895
17.	Jalandhar	882	897	885	905	916
18.	Kapurthala	887	896	905	919	919
19.	Hoshiarpur	885	910	904	922	957
20.	Rupnagar	813	838	856	866	893
21.	Patiala	812	831	844	864	893
22.	Sangrur	816	828	832	854	875
23.	Bhatinda	835	834	849	867	887
24.	Fridkot	866	852	860	888	885
25.	Uttarkashi	996	977	915	909	950
26.	Dehradun	767	810	811	839	878
27.	Nainital	725	714	805	848	887
28.	Saharanpur	832	837	829	835	847
29.	Muzaffarnagar	831	845	828	837	856
30.	Bijnor	881	873	847	855	867
31.	Meerut	848	850	834	831	844
32.	Ghaziabad	866	860	842	835	838
33.	Bulandshar	885	884	853	860	860
34.	Moradabad	862	860	831	833	844
35.	Rampur	837	875	828	829	846
36.	Budan	841	835	807	798	797
37.	Bareilly	843	832	810	818	825
38.	Pilibihit	858	840	825	843	851
39.	Shajahanpur	819	819	786	801	803
40.	Aligarh	863	865	834	834	838
41.	Mathura	850	840	819	805	808
42.	Agra	862	851	825	812	821
43.	Etah	870	865	830	819	820
44.	Mainpuri	865	863	833	825	838

45.	Farrukhabad	833	836	813	821	815
46.	Etawah	842	848	824	825	829
47.	Kanpur	857	865	851	852	844
48.	Fathepur	917	917	903	898	885
49.	Allahabad	979	965	925	909	890
50.	Jalaun	911	892	861	835	855
51.	Jhansi	942	920	876	855	826
52.	Lalitpur	930	907	858	855	862
53.	Hamirpur	948	928	881	856	840
54.	Banda	928	909	875	869	844
55.	Kheri	853	856	825	846	839
56.	Sitapur	864	865	829	845	829
57.	Hardoi	864	858	823	824	814
58.	Unnao	905	895	891	891	873
59.	Lucknow	890	889	854	862	861
60.	Rae-Bareli	959	968	946	948	939
61.	Bahraich	910	900	841	853	838
62	Gonda	935	938	878	893	873
63.	Barabanki	899	896	852	859	856
64.	Faizabad	986	998	939	949	936
65.	Basti	961	952	906	832	917
66.	Varanasi	995	997	940	927	900
67.	Mirzapur	987	954	923	904	887
68.	Ajmer	946	934	931	948	943
69.	Ganganagar	947	852	886	888	884
70.	Bikaner	900	906	908	906	896
71.	Alwar	898	895	892	900	897
72.	Bharatpur	832	845	840	828	830
73.	Sawaimadhopur	874	872	966	867	856
74.	Jaipur	921	901	903	910	905
75.	Tonk	909	910	911	933	928
76.	Jalor	914	921	934	948	947
77.	Jodhpur	901	898	916	928	922
78.	Jasailmer	820	795	823	822	820
79.	Barmer	866	868	892	911	898
80.	Bundi	905	897	884	886	889
81.	Kota	935	910	902	905	896
82.	Jhalawar	951	929	922	930	921
83.	Bhilwara	935	909	915	948	958
84.	Morera	848	842	839	835	828
85.	Bhind	844	854	838	829	820
86.	Gwalior	889	866	832	818	823
87.	Datia	889	895	878	848	840
88.	Shivpuri	908	889	868	856	848
89.	Gunna	917	901	886	882	875
90.	Tikamgarh	909	906	876	882	868
91.	Chhattarpur	892	893	866	866	902
92.	Panna	941	940	926	918	884
93.	Sagar	937	935	903	899	908
94.	Damoh	984	974	948	931	908
95.	Mandasur	951	937	929	947	937
96.	Ujjan	975	947	935	941	920
97.	Shajpur	967	948	936	934	933
98.	Dewas	962	942	933	936	938

99.	Rajgarh	919	918	908	935	928
100.	Vidisha	915	895	886	883	869
101.	Bhopal	897	890	877	886	879
102.	Schore	927	920	909	913	902
103.	Raisen	913	910	902	912	884
104.	Hoshangabad	968	949	928	921	905
105.	Narsimhapur	975	961	931	935	915
106.	Indore	970	934	918	930	938
107.	East Nimar	959	948	940	943	944
108.	Chamba	899	906	952	938	958
109.	Kullu	947	952	935	936	936
110.	Lahul & Spiti	933	786	818	767	840
111.	Shimla	960	905	909	923	949
112.	Solan	839	918	939	949	929
113.	Sirmaur	806	935	837	876	903
114.	Kinnaur	1070	969	887	885	859

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