3. PROFILE OF THAR DESERT REGION

Thar desert region has its own fascination, unique features and resources ; this land has unique problems as well. The problems are many and varied. Meager availability of water, intense heat, wind erosion hazards and high degree of biotic pressure imposes severe constraints on human, animal and plant life. In fact, desert conditions have condemned whole rural population in *Thar* to a low standard of living. As the present problem for investigation has been identified for *Thar* desert, therefore, in the interest of clear understanding of the region and in order to facilitate reasonable interpretations of findings of the study, it has been imperative to have the knowledge of its physical features, socio-economic structure, demographic profile, educational and literacy trends, etc. No extensive discussion on all these characteristics of the region is attempted in the present chapter. The purpose is to present brief scenario of *Thar* desert region with emphasis on the features relevant to context of present study.

Despite incessant efforts, the separate precise statistics for landuse, population, literacy etc. of *Thar* desert region could not be obtained, therefore, author had to collect primary data from various sources other than the informations available in libraries. The statistics presented in this chapter was thus computed from these primary data. More over, many other informations given in this chapter are based on the more than 12 years' research experience of author in the field of community nutrition in *Thar* desert region.

3.1 LOCATION AND DISTRIBUTION

Lying between 24^{o} - 30^{o} N latitude and 70^{o} - 74^{o} E longitude, the arid western Rajasthan, which accounts for more than 60% of hot arid region of India is spread over in an area of 1,96,150 Sq. Km and is better known as *Thar* desert. It occurs between Aravalli ranges on east and south-east, and *Thal* desert of Pakistan on the west. In fact, *Thal* desert is nothing, just a name given to *Thar* desert portion of Pakistani side (before partition, the whole region was named as *Thar* desert), which extends upto Sulaiman - Kirthar ranges in extreme west (Rode 1964).

Thar desert region involves 12 out of 31 districts of Rajasthan state, mainly located in western and north - western parts. With exception of Pali district (located in extreme eastern parts of *Thar* desert region, bordering Aravalli ranges) which has more or less semi- arid climate with degree of aridity around 48%, the degree of aridity is 96% in district Ganganagar, Hanumangarh, Bikaner, Barmer, Jaisalmer, Jodhpur and most places of Nagour ; 86% in district Jalore; 69% in district Jhunjunu and churu ; and 65% in district Sikar (Tewari et. al., 1989). Though sand dunes are dominant

formation of the region, intensities of dunes vary from place to place. The sand covered **Thar** extends 640 km from north - west to south - east with average width of 300 km from west to east.

3.2 CLIMATE

Climatologically, *Thar* desert region is quantitatively different from other deserts, being located directly in the region of lowest pressure during the monsoon season (Jain 1986). The major part of rainfall is received during this season i.e., from late June to mid September. The contribution of this seasonal rainfall to annual rainfall is as high as 91-96% in *Thar* desert region (Ramakrishana et. al., 1992). The mean annual total rainfall varies from 150 mm in extreme western part (Jaisalmer district) to 450 mm in eastern fringes (Pali district). Thus while condition is hyper arid in Jaisalmer district, in Pali district it is more or less semi-arid. In general, the rainfall is precarious and erratic, and frequent draughts due to complete failure of rainfall is also not uncommon.

In general *Thar* desert region experiences very high temperature during summer season (mean maximum temperature = 40^{o} C), touching a maximum of 48^{o} - 50^{o} C. Winters are very cool and dry (the mean winter season temperature varies from 14^{o}C to 16^{o}C), and minimum temperature some time goes down as low as 0^{o}C to -2^{o}C. Wind speeds are very high during summer months and dust storms are quite frequent. Thus over all climate conditions are very inhospitable in entire region.

3.3 LANDUSE PATTERN

The recent landuse statistics of *Thar* desert region of Rajasthan are given in Table 3.1. Of the total area of *Thar* desert region, only 1.3% is under forest cover. The net sown area increased by 54.1% from early nineteen fifties to early eighties (Malhotra et.al., 1983). This trend of growth in net sown area further intensi- fied during last decade and net sown area increased by 11.7% as compared to early eighties. As a consequence of this, barren, cultivable and uncultivable wastelands, permanent pastures and fellow lands declined substantially. There was a significant decline in grazing land area as marginal lands were brought under cultivation in recent years (Venkateswarlu et. al., 1992).

Because of low and erratic precipitation, restricted to very short period, only one crop i.e. 'Kharif crop' is sown in a year in larger parts of *Thar* (Shankarnarayan 1984). The common crops are : pearl millet (bajra), cluster bean (gaur), moong bean (moong), moth beam (moth) and sesamum (til). In the areas where well irrigation is available, 'Rabi crop' is also taken. However, in command areas of 'Indira Gandhi Nahar Pariyojana' (formerly known as Rajasthan Canal), mainly in Ganganagar and parts of Bikaner districts intensive cropping has been well established. In Pali district, where the climate is more of semi-arid type, 'Rabi crop' is grown in substantial parts. The most common 'Rabi Crops' are : rapeseed and mustard, gram, barley, cumin and wheat.

The landuse patterns of *Thar* desert region has witnessed several changes since medieval times. Dhir (1982) has shown that incidence of

Tabel 3.1 Landuse patterns in *Thar* desert region.

Major Landuse	Category	Area ('000 ha)	% of reported area
Forest	-	243	1.3
Area not available for cultivation	Land put to non agricultural uses	908	4.6
	Barren uncultivable lands	103	0.5
Other uncultivated lands	Permanent pastures /grazing lands	913	4.7
Cultivable waste lands	Salt affected areas	121	0.6
	Water logged areas	75	0.4
	highly sandy tract	4546	23.3
Fellow lands	Current fallows and others	3513	18.0
Net sown area	-	9086	46.6
Total reported area	-	19508	100.0
Total area of *Thar* desert	-	19615	-

Source : Modified from Anonymous (1994)

agricultural-holdings during late medieval times was only one - fifth of today. The process of rapid expansion of agriculture started with increase in population. By 1951 much of the agriculturally-usable land was brought under plough. However, the predominant system was then fallow farming. The trend since then in already established agricultural tract has been intensification of farming and breaking of new lands in the environmentally marginally suited parts of the region.

3.4 THE POPULATION

Since the vast arid expanse south of the Ghaggar is blank on Chalcolithic and Iron age maps of India, it seems that human occupation of the region was thin and depended upon hunting and limited pastoralism (Dhir 1995).Historians are generally of the view that organized settlements in the region began in the 4th century BC, following Alexander's invasion. A number of tribes migrated from the fertile Indo - Gangetic plains into this environmentally hostile, but otherwise secure tract in response to waves of the invasions from the west. The settlements increased and expanded, and by the 6th or 7th century AD much of the *Thar* desert region was not only settled but also politically organized. Jaisalmer tract, the driest in the area, was being ruled by a Rajput clan in the 10th century. About the same time Bikaner had several pastoral settlements (Tod 1832). However, the population must have been very thin then. Tod put the population of Marwar state at around 2 million in 1820 (Tod 1832).

From the analysis of available authentic records the population of *Thar* desert region registered an increase of 4.9 times from 1971 to 1991

(Malhotra 1978, Census of India - 1991, series- 1 paper 2, 1992). The total population of *Thar* desert region, according to 1991 census was slightly more than 17.5 million, of which 52.2% were males and 47.8% were females (Table 3.2). The Ganganagar district (including newly created district Hanumangarh) which is located in northern part of *Thar* desert region, accounts for 15.0% of total population of *Thar,* while Jaisalmer district, situated in extreme western part of the region (the largest district of India) has only 2% population. On the basis of 1991 census data on population, *Thar* desert region constitutes 39.8% of the total population of Rajasthan and 2.1% of the total population of India.

The patterns of rural and urban population and their distribution in *Thar* desert region are set in Table 3.3 of the total population of *Thar* desert region, 77.7% is living in the rural areas and 22.3% in urban areas. Thus the population in the region is pre- dominantly rural. The total rural population of the region is 13606125, of which 7068622 are males and 6537503 are females (Table 3.4). Thus males and females constitute 52.0% and 48.0%. respectively of the total rural population of *Thar* desert region.

Decennial variation in population from 1901 - 1991 in *Thar* desert region is given in Table 3.5. The growth rate of population between 1901 - 1971 had been of the order of 186% as compared to 150% increase for Rajasthan and 132% increase for whole country (Malhotra 1978). In fact, from the year 1921 a phenomenal increase took place in population growth. The population more than doubled during the forty year period between 1921 and 1961, and redoubled in less than thirty years thereafter. The population

Table 3.2 Human population in *Thar* desert region.

District	Males	Females	Total	% of total population of *Thar* desert region
Ganganagar including Hanumangarh*	1397133	1225644	2622777	15.0
Bikaner	642550	568590	1211140	6.9
Churu	796736	746475	1543211	8.8
Jhunjunu	819448	762973	1582421	9.0
Sikar	947232	895682	1842914	10.5
Jaisalmer	190687	153830	344517	2.0
Jodhpur	1138537	1014946	2153483	12.3
Nagour	1104576	1040234	2144810	12.2
Pali	759816	726616	1486432	8.5
Barmer	759007	676145	1435222	8.2
Jalore	588457	554106	1142563	6.5
Total	9144249	8365241	17509490	99.9

* Hanumangarh district is created recently, earlier it was a part of Ganganagar district.
Source: Modified from census of India - 1991,Series-1, paper 2 (1992).

Table 3.3 Trends of rural and urban population in *Thar* desert region.

District	Rural population	% of total Rural population	% of total population	Urban population	% of total urban population	% of total population
Ganganagar including Hanumangarh*	2070665	15.2	11.8	552112	14.2	3.2
Bikaner	729998	5.4	4.2	481182	12.3	2 7
Churu	1097172	8.1	6.3	446039	11.4	2.5
Jhunjunu	1257377	9.2	7.2	325044	8.3	1.9
Sikar	1455393	10.7	8.3	387521	9.9	2.2
Jaisalmer	290917	2.1	1.7	53600	1.4	0.3
Jodhpur	1388933	10.2	7.9	764550	19.6	4.4
Nagour	1802174	13.2	10.3	342636	8.8	2.0
Pali	1163085	8.5	6.6	323347	8.3	1.8
Barmer	1291056	9.5	7 4	144166	3.7	0.8
Jalore	1059355	7.9	6.0	83208	2.1	0.5
Total	13606125	100.0	77.7	3903365	100.0	22.3

* Hanumangarh district is created recently, earlier it was a part of Ganganagar district.

Source: Modified from census of India - 1991,Series-1, paper 2 (1992).

Table 3.4 Male and female population in rural sector of *Thar* desert region.

District	Rural Males	% of total Rural males population	% of total rural population	Rural population	% of total rural females population	% of total rural population
Ganganagar including Hanumangarh*	1099488	15.6	8.1	971177	14.9	7.1
Bikaner	385349	5.4	2.8	344649	5.3	2.5
Churu	565036	8.0	4.2	532136	8.1	3.9
Jhunjunu	647340	9.2	4.7	610037	9.3	4.5
Sikar	745770	10.5	5.6	709623	10.8	5.2
Jaisalmer	160298	2.3	1.2	130619	2.0	1.0
Jodhpur	725812	10.3	5.3	663121	10.1	4.9
Nagour	924447	13.1	6.8	877727	13.4	6.4
Pali	589854	8.3	4.3	573231	8.8	4.2
Barmer	680997	9.6	5.0	610059	9.3	4.5
Jalore	544231	7.7	4.0	515124	7.9	3.8
Total	7068622	100.0	52.0	6537503	99.9	48.0

* Hanumangarh district is created recently, earlier it was a part of Ganganagar district.

Source: Modified from census of India - 1991,Series-1, paper 2 (1992).

Table 3.5 Decennial variation in population growth of *Thar* desert region from 1901 to 1991..

Year	Growth rate (%)
1901	-
1911	+ 8.70
1921	- 7.80
1931	+ 19.81
1941	+ 23.16
1951	+ 16.73
1961	+ 29.84
1971	+ 27.95
1981	+ 36.70
1991	+ 30.70

Source : Malhotra (1978) ; Census of India - 1991, Series-1, paper 2 (1992) ; Anonymous (1994).

growth rate for 1971 - 1981 and 1981 - 1991 were 36.7% and 30.7%, respectively which was appreciably higher than that for the country as a whole (Dhir 1995).

From the mentioned statistics on population, one thing is quite evident that population pressure in *Thar* desert region is increasing with much greater pace. The changes in density of population in *Thar* desert region between 1971 and around 2000 AD is as follows :

Year	Population density
1971	48 person per km^2
1981	69 person per km^2
1991	89 person per km^2
2000*	101 person per km^2

* Projected value

This density of population is quite high as compared to other desertic regions of the world. However, this trend of population density is highly variable from area to area in *Thar* desert region. Though the variations in densities of population occur on account of topography, soils, land, occurrence of minerals, accessibility of terrain, etc., water is most important factor determining the distribution and density of population. The population density in Ganganagar district (including Hanumangarh) is much higher due to availability of surface water through Indira Gandhi Nahar (formerly known as Rajasthan Canal). Likewise in Pali district, which has high annual total rainfall

and also has canal, well and tank irrigation, the density of population is higher compared to other areas having less availability of water.

3.5 FACTORS RELATED TO POPULATION GROWTH

The major factor responsible for such a phenomenal growth of population is the widening gap between birth and death rates. By and large the external migration has played relatively insignificant role in population dynamics of *Thar* desert region. **In - migration** has been very limited because of the absence of factors like productive lands and large scale industries. Inspite of heavy push factors viz., excessive overcrowding on the already saturated lands, etc. there has not been much of the **out - migration** mainly due to the lack of pull factors (like absorption in big industries or other urban vocations), and also due to the backwardness of people, poor means of communication and the sway of social institutions like joint family system, caste system, early marriages, conservatism of people and illiteracy (Malhotra 1977).

Social values are pre-disposed (Malhotra 1976) for having more children and positive sanctions for fertility outnumber the negative ones. Early marriage and begetting of children are integral part of social ethos of the rural folk of *Thar* desert region. The present and the prospective role of women in this region is no better than what has been described by *Romilla Thapar* more than three decades back, as : "*she should never be independent, her father has authority over her in childhood, her husband has authority over her in youth and in old age her son(s) has authority over her*" (Thapar 1964). The deep rooted adherence to social customs, coupled with

natural adversities (like inhospitable climate, low productivity of land, etc.) and a complex web of ignorance - illiteracy - poverty and- backwardness made direct impact on such rapid population growth.

3.6 SETTLEMENT PATTERN

The natural form of settlement in India is the compact village type with traditional outlook specific to particular region/area, which seems to establish itself in different region/area as a part of cultural heritage. This pattern of settlement both influences and is influenced by the physical, social and economic factors. As an interplay of these factors the form of settlement in *Thar* desert region is of distinct nature (Mann 1977). The villages in the region of *Thar* desert are scattered over long distances, human habitations springing up only where conditions permit sedentarization.

Tracing the history of settlement pattern in arid zone villages. it has been observed that the sequence of settlement has been initially for the compact system to grow around the houses of first few settlers (Bose and Malhotra 1961, Bose and Malhotra 1963, Malhotra 1978). Later, people moving seasonally to their agricultural fields and finally established households there. Other factors were, kinship ties, the protection to settled farmers, tradition and desire of the Jagirdar (erstwhile feudal landlords), etc. In general, the settlement pattern of the population falls in three categories viz., entirely compact, entirely scattered, and villages having both compact settlement and scattered homesteads. Majority of villages fall in last category.

Scattered homesteads are locally known as *'dhanis'*. People living in *dhanis* have greater economic advantages through close and continuous contact with the land, while the people living in compact settlement at core enjoy a richer social life (Malhotra 1977). Households living at core make greater use of the community facilities, while household living in *dhanis* are inadequately covered (Bose and Malhotra 1962).

Due to inherent difficulties caused by inadequate transport facilities and poor economic condition of people, mostly the indigenous plant materials and other locally available materials are utilized for the construction of houses. The nature and type of housing at core and that of *dhanis* differs in several ways, a characteristic of *Thar* desert region. At the core, different families live close to each other and few houses of persons of satisfactory economic background are also built of sandstone having some urban touch. However, in *dhanis* most of the families live in *'jhupas'*. The *jhupas* are generally circular in structure with the walls made up of mud and conical roofs and are skillfully thatched with stalks of locally available plant material. The central pole of a *jhupa* which supports the apex of roof is also made out of the wood from the stumps of local trees like *'Khejri'(Prosopis cineraria)* and *'Rohida' (Tecomella undulata)*. A household may have one or more *jhupas* depending upon the needs and socio-economic status of the inhabitant. The influence of caste in housing design is noticeable. For example, in castes where women folk strictly observe the tradition of *Purdah* (e.g., Rajputs and Mahajans), a separate inner wing out off from main outer room is built. In case of people who can afford, an additional room is often kept for receiving guests and visitors. However, in general household convenien-

ces are not upto the mark that can be termed as facilities. In majority of houses there are no provisions for bathrooms and latrines. Several houses often do not have separate kitchen. Cattle are usually tied in a portion of house as a precaution against cattle thefts.

3.7 FOOD PATTERN

The food pattern of rural folk of *Thar* desert region has been studied in detail by only few workers (Krishnamachari et.al., 1992, Tewari 1993, Tewari 1995a). The staple food of rural folk is pearl millet, commonly known as *bajra.* In general *bajra* flour is used to prepare chapatis (Indian bread), better known as *Sogra* in the region. The common menu for diet includes *Sogra* and *dal* (mung bean and/ or moth bean pulses, which are cultivated locally). Intake of vegetables is very limited, only well-off persons eat vegetables and that too is not frequently. Fruit intake is almost negligible. However, locally available vegetables like *guar pods, kair, gunda, kachra,* etc. and local fruit like *Mattira* (a type of water melon, which grows on farmers' field through out *Thar* desert region) are eaten during the season of their availability.

In addition to above mentioned food staffs, air dried pods and seeds of some local trees like *khejri (Prosopis cineraria), kummat (Acacia senegal),* etc. are often used for preparation of curries. In the villages located near by towns or cities or small urban centres, people with better economic back-ground also use wheat flour for preparation of chapatis. Tewari (1993) observed that the diet of people in this region though satisfies the appetite but it is nutritionally quite unbalanced.

3.8 LIVELIHOOD SOURCES

Inspite of the erratic and unevenly distributed rainfall agriculture in mainstay of the village population. Other occupations followed broadly confirm to the caste composition. Though agriculture and other forms of casual labour are followed without restriction by any caste but, there are others which are traditional to certain caste. Bose and Malhotra (1964) observed that traditional occupations specific to particular castes are recognized in the village and it is unusual for a household to follow an occupation which in traditional to other caste. In fact, caste is still the most pivotal social institution in *Thar* desert region.

In whole Rajasthan state, on an average, across all the districts, the percentage of working population is as low as 30.8% (Anonymous 1994). In *Thar* desert region, the percentage of working population to total independent population is as follows :

Cultivators	63.2%
Agricultural labourers	6.7%
Industrial labourers	3.3%
Others	26.8%
Total working population out of the whole population of the region	29.7%

From the above mentioned statistics, it is quite evident that agriculture forms the primary sector of livelihood in the region. On the national level,

cultivator constitute 41.6% of total workers, in *Thar* desert region it is as high as 63.2% which indicates that proportion of landless labourers in the region is extremely low, probably lowest in India. Of the total 69.8% (cultivators + agriculture labourers) of workers engaged in agriculture sector in the region, the share of female population ranged from 0.39% (Barmer district) to 12.5% (Jodhpur district) (Anonymous 1988). This is in fact a clear under-estimate of female participation in this life support sector because women's role is just considered as mothers and housewives, though they are highly involved in farm operations.

In revenue records, lands in the region are categorized into four types viz., *barani* (unirrigated), *sewaj* (land where rain water accumulates and is cultivated when water dries up), *chahi* (land irrigated by wells) and *nahari* (land irrigated by canal). The distribution of agricultural holding by size exhibits the presence of fairly large holdings, the average size of an agricultural holding with a cultivator being 5 to 7 ha (Anonymous 1994, Saha 1993). Subsistence farming is practised in the region. Major crops of the region have been described in earlier discussion. In general 'Kharif crops' are taken in all above mentioned land categories, however, 'Rabi crops' are taken only in *chahi* and *nahari* land categories. In *sewaj* land, though 'Rabi crops' are taken many times but they are basically devoted to vegetable production.

Next to land, livestock constitutes the most important asset of the cultivators. On the basis of trend analysis of livestock population between 1956 and 1977, the number of livestock projected to be 29.6 million by the year 2000 (Venkateswarlu et.al., 1992). The details regarding livestock

population fluctuation in *Thar* desert region between 1956 and 1977, and projected values for the year 1995 and 2000 are as follows :

Animal	Population (million)			
	1956	1977	1995*	2000*
Cattle	3.91	4.13	3.18	3.39
Buffaloe	0.75	1.38	1.67	1.78
Sheep	4.75	6.68	7.47	7.88
Goat	3.49	6.17	13.25	15.61
Total livestock+	13.40	19.13	26.42	26.66

* Projected population
+ Total livestock includes other animals like camel, etc.

Though the animal husbandry in the region is considered subsidiary to agriculture but the magnitude of this sector can be easily judged by the above said statistics. On an average a household has 1.32 bullock, 2.28 cows, 1.48 cow young stock, 0.62 buffaloes, 0.38 buffaloe young stock, 6.48 sheep, 6.50 goats and 0.49 camels.

A recent study by Tewari (1995b) on percentage participation of male and female human population in agriculture and animal husbandry sectors in *Thar* desert region indicated that while the participation rate of male population in agriculture sector is of high order(around 60-70%), in animal husbandry sector participation rate of female population is as high as 80-95%. In the same study, it was also shown that adult males spent

pre-dominant part of their time (63 to 68%) on the activities related to farm operation and/or other income generating activities like trade, business etc., adult females spent their time mainly on animal husbandry related activities (36.4%) and house hold chores (35.0%).

The other sources of livelihood are caste occupation like carpentry, blacksmithy, oil pressing, tailoring, pottery making, tanning, leather work, dyeing, goldsmithy, shopkeeping and money lending. In rural sector, government jobs are more or less negligible, they are restricted to urban areas only. Industrialization has been very slow in entire *Thar* desert region and therefore, the proportion of industrial workers is also low. Most of the industrial workers are engaged in cottage industries or low and medium scale industries. Such workers are mainly concentrated in urban centres.

3.9 EDUCATION AND LITERACY

In the phased scheme of education primary and secondary education are the two initial stages but highly important from over all education point of view. During the period 1992-93, in *Thar* desert region the total number of primary schools was 11624 and that of upper primary (middle schools) was 3711 (Table 3.6). The total number of students enrolled at primary and upper primary school level was around 21.26 million. In whole Rajasthan state the boy and girl student ratio (in primary and upper primary schools) was 5:2, the same ratio in *Thar* desert region was around 8:1. This clearly reflected the very poor state of girls' education in the region. The student and teacher ratio in primary schools and upper primary schools was 41.5 : 1 and 33.7 : 1, respectively.

Table 3.6 Primary and secondary education in *Thar* desert region

District	Primary			Upper Primary			Secondary		
	Schools	Stu. ('000)	Teacher ('000)	Schools	Stu. ('000)	Teacher ('000)	Schools	Stu. ('000)	Teacher ('000)
Ganganagar including Hanumangarh*	1929	165.0	4.6	677	156.0	4.9	190	50.9	2.3
Bikaner	811	85.5	2.5	231	58.5	2.3	91	30.5	1.3
Churu	888	111.5	22.5	323	81.1	2.2	102	24.4	1.1
Jhunjunu	1091	129.0	3.1	377	96.6	2.8	140	46.8	1.7
Sikar	1190	149.0	3.2	408	106.8	2.8	137	42.8	1.6
Jaisalmer	438	29.0	0.8	77	16.4	0.6	23	5.1	0.3
Jodhpur	1236	161.6	4.3	466	133.8	4.3	138	50.6	1.8
Nagour	1305	156.5	3.0	385	105.0	2.9	143	43.7	1.6
Pali	845	108.3	2.4	299	89.3	2.5	107	36.1	1.3
Barmer	1202	90.0	2.7	273	63.0	1.9	72	193.3	7.9
Jalore	689	81.2	1.4	195	53.8	1.3	49	12.9	0.6

Sources : Modified from Anonymous (1994)

* District Hanumangarh is created recently, earlier it was a part of Ganganagar District.

During the year 1992-93, total number of secondary schools (i.e., upto X standard level) was 1192 and total number of students enrolled was around 0.54 million in *Thar* desert region. In secondary school level the ratio of boy : girls students in entire Rajasthan state was 12 : 5, while in *Thar* desert region it was still poorer. In *Thar* desert region the student : teacher ratio at secondary school level worked out to be 33.7 : 1. There were 382 higher secondary schools (i.e, upto XII standard) in the region and total number of students enrolled during the above said period at higher secondary level was around 0.29 million. The student : teacher ratio at this level was 14.6 : 1.

The scenario of higher education in this part of Rajasthan state is not much satisfactory. At the moment there are only 69 undergraduate/post-graduate colleges in the region to cater the need of higher education particularly in the domain of science, arts, commerce, education, etc. As far as higher professional education is concerned, there are two medical colleges, one engineering college and five polytechnics (of which two are exclusively of women - women's polytechnic).

In the region, there is one traditional university located at Jodhpur having under-graduate and post-graduate courses in various subjects of science, arts, commerce and law, and some other important professional discipline like business management, tourism, home science, computer application, etc. This university is well equipped for doctoral and post-doctoral researches in various fields/subjects. More over, the region is privileged having the head quarter of Rajasthan Agricultural University (RAU) at Bikaner with an array of colleges (veterinary, agriculture, home science, etc.)

The literacy rate in *Thar* desert region is amongst the lowest bracket as per 1991 census records (Table 3.7). Of the total population (aged 7 and above) of the region, the literacy rate on an average, across all the twelve districts worked out to be 35.78%. The individual literacy rate of male and female population was 52.24% and 17.7%, respectively. As far as district wise population is concerned, the maximum literacy rate was observed in district Jhunjunu and minimum was in district Barmer.

The urban population, which accounts only for 22.3% of the total population of the region, though had better literacy rate (59.43% for the population aged seven and above) but, it was far below the national average of 73.01% (for urban population aged seven and above) (Table 3.8). On an average, male and female literacy rate in urban sector of the region was 74.72% and 41.86%, respectively. The literacy scene appeared to be very gloomy in rural sector of the region (Table 3.9). Analysis of literacy rate of rural population, on district level revealed that in 12 districts of *Thar* desert region of Rajasthan, it ranged between 18.79% for Barmer district to 44.65% for Jhunjunu district. The scenario of female literacy in rural sector of the region is still worse. The male literacy rate in rural sector of the region was worked out to be 45.14% and that of female was 10.69%. Thus over all literacy rate in the rural population of *Thar* desert was 29.45%. The female literacy rate in rural population of district Barmer was observed to be lowest in the country.

The difference in over all literacy rate between national average and that of *Thar* desert region, and between Rajasthan and *Thar* desert region

Table 3.7 Literacy rates of population (aged 7 years and above) in *Thar* desert region.

District	Total population (%)	Male population (%)	Female population (%)
Ganganagar including Hanumangarh*	41.82	55.29	26.39
Bikaner	41.73	56.63	27.03
Churu	34.78	51.30	17.32
Jhunjunu	47.60	68.32	25.54
Sikar	42.49	64.13	19.88
Jaisalmer	30.05	44.99	11.28
Jodhpur	40.69	56.74	22.58
Nagour	31.80	49.35	13.29
Pali	35.96	54.42	16.97
Barmer	22.98	35.56	7.68
Jalore	23.76	38.97	7.75

Source: Modified from census of India - 1991, series-1, paper 2 (1992)

* District Hanumangarh is created recently. earlier it was a part of Ganganagar district.

Table 3.8 Literacy rates of Urban population (aged 7 years and above) in *Thar* desert region.

District	Total population (%)	Male population (%)	Female population (%)
Ganganagar including Hanumangarh*	64.18	74.17	52.36
Bikaner	67.01	78.70	53.47
Churu	53.89	69.83	36.88
Jhunjunu	58.79	76.01	39.36
Sikar	55.40	72.70	36.82
Jaisalmer	66.49	80.89	47.21
Jodhpur	66.33	78.44	51.93
Nagour	51.05	67.64	32.54
Pali	56.91	74.27	37.68
Barmer	59.84	76.96	39.40
Jalore	53.86	72.32	32.79

Source: Modified from census of India - 1991, series-1, paper 2 (1992)

* District Hanumangarh is created recently, earlier it was a part of Ganganagar district.

Table 3.9 Literacy rates of rural population (aged 7 years and above) in *Thar* desert region.

District	Total population (%)	Male population (%)	Female population (%)
Ganganagar including Hanumangarh*	35.75	50.07	19.50
Bikaner	24.07	37.59	8.84
Churu	26.89	43.60	9.31
Jhunjunu	44.65	66.23	22.04
Sikar	39.03	61.80	15.42
Jaisalmer	29.10	37.92	4.71
Jodhpur	26.00	43.82	6.49
Nagour	28.14	45.76	9.75
Pali	30.13	48.63	11.47
Barmer	18.79	30.83	4.20
Jalore	21.36	30.26	5.85

Source: Modified from census of India - 1991, series-1, paper 2 (1992)

* District Hanumangarh is created recently, earlier it was a part of Ganganagar district.

worked out to be 22.20% and 8.57%, respectively. Similarly, there was a difference of 11.96% between literacy rate of male population at national level and *Thar* desert region. This difference of literacy rate between male population of Rajasthan state and that of *Thar* desert region was 2.75%. In case of female population, the difference of literacy rate between national average and that of *Thar* desert region was 21.40% and between whole Rajasthan state and *Thar* desert region was 2.65%. The literacy situation of female population in entire *Thar* desert region is very pathetic. Even the difference between literacy rate of rural female population of whole Rajasthan state and that of the rural female population of *Thar* desert region was as high as 7.10%. Thus this poor female literacy rate in *Thar* desert region is a matter of great concern.

Though in general, Rajasthan is educationally back-ward state, the exceptionally high order of educational backwardness in case of women population of *Thar* desert region is due to many reasons. The region is composed of closed 'societies'. Conservatism and tradition strongly prevent women's educational development. The gender roles or definitions of 'male' and 'female', work as strongly as an impediment to female participation in education. The 'family roles' of women, reinforce the perception that 'education' is less important for women than men. Another fact responsible for such higher female illiteracy in *Thar* desert region, is overall under-development. Where water is an acute problem, people do not found enough time to think beyond their very basic needs.

3.10 NUTRITION AND HEALTH SCENE

The population in draught prone areas and arid regions are considered as vulnerable section as far as nutritional problems and associated health disorders are concerned (Shukla 1982). More than two decade back, a large scale survey of rural population in arid tract of Maharastra (Anonymous 1974) revealed that during food scarcity (which may be either due to crop failure as a consequence of draught or poverty) the dietary consumption was further lowered in protein, vitamin and energy. The anaemia was found to be prevalent amongst the vulnerable section (i.e., women and children). In addition to anaemia, diseases related to PCM (protein - calorie malnutrition) and vitamin deficiencies were quite common. A recent study of Krishnamachari et. al., (1992) involving sample population for all age groups irrespective of sex and socio-economic consideration, from rural sector of six districts of *Thar* desert region further substantiated these two decades old findings. The calorie deficits in diet was found to be significant in hyper arid areas like Barmer and Jaisalmer districts. On an average, across all the districts involved in this study, protein deficiency was observed in all age groups of the population, irrespective of sex. The results of study clearly demonstrated that in *Thar* desert region nutritionally worst affected population groups ate pre - schoolers, teenage girls, and lactating and expectant mothers.

Rapid clinical examination conducted randomly on women and children in rural areas of *Thar* desert region revealed that a large percentage of population in this segment of the society is suffering from deficiency of

one or more nutrients (Tewari 1996). Protein deficiency was more pronounced in children, where as micro-nutrient deficiency i.e., iron and folic acid leading to anaemia, was commonly prevalent in women. Cases of vitamin - A and vitamin - D deficiency were also found in both children and women.

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