Vol 3 Issue 9 Oct 2013

ISSN No : 2230-7850

Monthly Multidisciplinary Research Journal

Indian Streams Research Journal

Welcome to ISRJ

RNI MAHMUL/2011/38595 **ISSN No.2230-7850**

Indian Streams Research Journal is a multidisciplinary research journal, published monthly in English, Hindi & Marathi Language. All research papers submitted to the journal will be double - blind peer reviewed referred by members of the editorial Board readers will include investigator in universities, research institutes government and industry with research interest in the general subjects.

Address:-Ashok Yakkaldevi 258/34, Raviwar Peth, Solapur - 413 005 Maharashtra, India
Cell : 9595 359 435, Ph No: 02172372010 Email: ayisrj@yahoo.in Website: www.isrj.net

Indian Streams Research Journal
Volume-3, Issue-9, Oct-2013
ISSN 2230-7850

Available online at www.isrj.net

Water Availability And Its Use In Sikar District, Rajasthan

Rajesh Kumar Abhay
Research Scholar, Department of Geography, University of Delhi, Delhi.

Abstract:The present study reflects water availability and its utilisation pattern in the Sikar district of Rajasthan state. Natural conditions like arid climate, high temperature and low amount of rainwater affect the availability of surface water. The paper argues that groundwater is the major source of water which mostly fulfills the demands of rural and urban households. In result, groundwater condition is overexploited because of over-extraction through tubewells for irrigation purpose. In rural areas, maximum households are engaged in agriculture and use maximum water for irrigation. In urban areas, water is more utilised for domestic purpose in which maximum water is used for hygienic purpose. In domestic water utilisation, drinking and cooking category is the major consumer of water both in rural and urban areas. The study has revealed that all the income groups are dissatisfied with the water supply in rural areas. Therefore, the rationale utilisation of water is the urgent need for the sustainable use of this precious gift of nature.

Keywords: Water Availability , utilisation pattern , hygienic , economies.

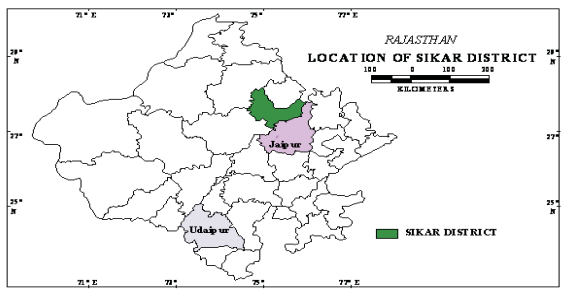
1.INTRODUCTION:

Water is used for different purposes throughout our economies and natural ecosystems. Water is used for agricultural, domestic, industrial purpose etc. Agriculture is the largest consumer of water used by humans worldwide (Gleick, 2003). Water use, being a function of demand and supply, varies from region to region and place to place. Maximum water is utilised where water is available in plenty and in scarce areas consumption is less. Water utilisation pattern also differs in rural and urban areas. In urban areas, modernisation of culture is increasing the demand for water while in rural areas it use is maximum in irrigating agricultural fields. In the Sikar district, the major part of agricultural land depends upon direct rainfall which totally depends upon the erratic monsoon. The rivers of the Sikar district are seasonal. Therefore, the major source of water in the district is groundwater which mostly fulfills the demands of the rural and urban households. The surface water is very limited and is available only during three months of monsoon. Thus, the present paper is an attempt to examine water availability and its various usages in the Sikar district of Rajasthan State.

Water managers and planners are slowly beginning to change their perspective and perceptions about how best to meet human needs for water; they are shifting from a focus on building supply infrastructure to improve their understanding of how water is used and how those uses can best be met. In the field of water utilisation, geographers have laid more stress on irrigation and their associated problems and management (Bilas, 1988; Kumar and Avinash, 1993; Sharma and Sharma, 2003; Nagarajan, 2003; Vaidyanathan, 2006). But very few studies have been made on water utilisation in the arid and semi-arid areas of India. This study, thus, attempts to study water utilisation in the semi-arid district of Rajasthan, which will be useful to planners and managers in managing the water resources of the area in a better way.

2. THE STUDY AREA

The Sikar district is located in the north-eastern part of Rajasthan (Figure1) between 27o21' and 28o12' North latitudes and 74o44' and 75o25' East longitudes at an average height of 432 m above the mean sea level. Sikar is the important town in the Shekhawati region of Rajasthan. It is bounded in the north by Jhunjhunun district, on the north-west by Churu district, on the south-west by Nagaur district and on the south-east by Jaipur district and a small section of the district forms state border with Mahendragarh district in Haryana State on its northeast corner. The Sikar district spreads over 7,732 sq km. Sikar, besides being the district headquarters, administratively, includes six tahsils, namely, Fatehpur, Lachhmangarh, Sikar, Danta Ramgarh, Neem Ka Thana, Sri Madhopur and eight blocks, namely Fatehpur, Lachhmangarh, Dhond, Piprali, Danta Ramgarh, Khandela, Neem Ka Thana and Sri Madhopur (Figure.2).



The district is divided into two main topographic regions. The western part is characterised by sand dunes and the eastern by hill ranges. There are no perennial rivers in the district. The main seasonal rivers are Kantli and Mendha. The climate of the district is characterised by a hot summer, scanty rainfall, chilly winter season and general dryness of the air except during monsoon season. The rainfall is very low, highly indefinite and variable.

The total population of the district is 2.6 million (Census of India, 2011) with the density of 346 persons per sq km, which is quite high in comparison to the State density (201 persons/ sq km). The growth rate of population is low in comparison to other districts of the state, which was 17.04% in the 2001-11 decade. The Sikar district is facing rapid increase of population while the water availability is quite limited and scarce. Therefore, the gap between water requirements and total utilizable supply is increasing day-by-day. Thus, the Sikar district is selected for the study. Besides, deep familiarity with the area is another aspect for selection of the district.

3. OBJECTIVES OF THE STUDY

The objectives of the paper are to explain the spatial variations in the water availability and to examine the rural-urban water utilisation pattern in the study area.

Figure 2: Sikar District: Administrative Divisions, 2011

4. DATA AND METHODS

The Study is based on both primary and secondary sources of data. The secondary data has been collected from various government departments like, Department of Irrigation and Water Resource Agriculture (Sikar and Jaipur), Central Groundwater Board (CGWB, Jaipur), Department of Agriculture, Sikar; Public Health and Engineering Department (PHED, Sikar) and so on. From these departments various data and reports have been collected and reports from many other private institutes were obtained for presenting the factual information. Besides, books, thesis, journals, articles, newspaper, internet websites were also consulted.

The water utilisation patterns have been examined on the basis of primary data in both rural and urban areas. The primary unit to analysis is village in the rural area and town for the urban areas. Stratified proportionate random sampling has been used to collect the primary data and the sample size is 2.5 percent. Total 25 villages out of 992 villages have been selected randomly, and 4 towns (total 9 towns in the district) have been selected for primary survey. Nine households have been selected randomly in each selected unit of analysis and total 261 households (225 rural and 36 urban) have been covered. Households have been stratified on the basis of their income into three income groups – high, middle and low groups. Data results have been represented with the help of various cartographic, techniques like bar graphs, pie charts etc. Various softwares have been used for representing maps like- ArcView3.1, and the preparation, processing of databases has been done in MS-Excel.

5. ANALYSIS AND DISCUSSION

5.1 Water Availability

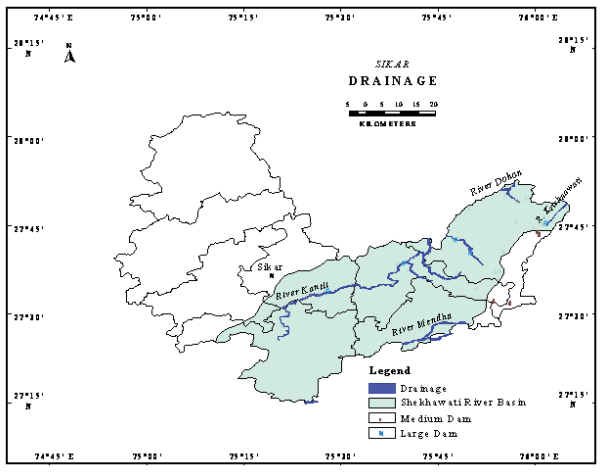
The sources of water in the Sikar district are mainly- groundwater and surface water. Physical conditions like arid climate, high temperatures and low amount of rainwater affect surface water availability which is 221 mcm (Tahal Report, 1998) (Table 1). Surface water availability is more in central and eastern parts due to the presence of seasonal rivers. But it is available only during rainy season (Figure 3). The share of groundwater to total water is 58.5 per cent on which major population depends. The depth of groundwater level varies from 2.7 m in November to 66.5 m in August. In the period of pre-and post-monsoon, groundwater of maximum wells goes down by 2 m. The rise in groundwater is not much but some parts, where rainfall is more, have experienced rise by 4 m (CGWB, 2005). The groundwater quality is poor in northwestern part mainly in Fatehpur block resulting into safe groundwater availability. Fluoride level is quite high than the desirable level (CGWB, 2007). Groundwater is overexploited through tube wells for irrigation purpose except Fatehpur block. Thus, the amount of water in the district is limited and water demands are mostly fulfilled by groundwater only.

Table 1: Water Availability in Sikar District

Source	Availability (in mcm)	Percent
1. Surface water Availability		
Shekhawati river basin	99.0	18.57
Mendha river basin	122.0	22.89
2. Total surface water	**221.0**	**41.46**
3. Groundwater Availability		
Groundwater	**312.02**	**58.54**
Total Water Availability (2+3)	**533.02**	**100.0**

Sources: Compiled from Tahal Report on Water Resource Planning for the State of Rajasthan: Shekhawati River Basin, 1998, Government of Rajasthan and CGWB, Western Circle, Jaipur, 2005

Figure 3: Sikar: Drainage System



5.2 Water Use

In ancient times, towns and villages were invariably situated on or near waterbodies, preferably the banks of streams from which they can get water easily. But in time span, when population increased and extended inside the country, lacking natural supplies; artificial methods of securing the requisite supply became necessary. Consequently, they developed different water drawing methods. Sources of water supply depend almost upon groundwater. The partial source of water is rainfall and the resulting water bodies like rivers and ponds. Water bodies are influenced by the geological structure which enables certain rocks to store that part of the rain which percolates through the soil.

In the rural areas, water is basically utilised for agricultural purposes. The agricultural water use is defined as the amount of water used by the plants in a given area from natural as well as from artificial source (i.e. irrigation) (Srivastava, 1991). It is also clear that in rural areas of the study area, maximum water is utilised for irrigational purpose (73 per cent) and then for domestic use (27 per cent) (Figure 4). On the other hand, in urban areas, the use of water is primarily for domestic purpose (Figure 5). The use of water for other purposes like industrial is negligible because of water scarcity (Thakur and Abhay, 2009).

Figure 4

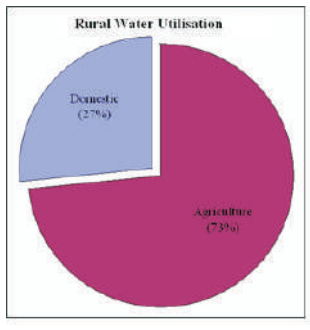
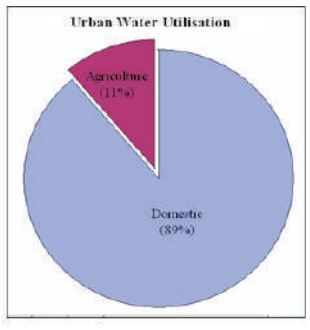


Figure 5



5.2.1 Water use in rural area

a. Agricultural water use

Agriculture is the major sector in which maximum water is utilized through irrigation. It is also an important source of income for the people residing in the rural areas. In Sikar, two agricultural seasons are main - rabi and kharif. In rabi season the major crops are wheat, mustard, gram, barley, vegetables (potato, onion, chilly) and in kharif season bajara, gowar, pulses (moong, moth, chaula), Oilseeds (sesame, groundnut) are grown. Water utilisation in the district depends on the farming characteristics like- size of holdings, sources of irrigation, and purpose of cultivation of the households. These are discussed below:

Irrigation: In agriculture, water is used for irrigating the fields. The availability of water in any region determines the cropping pattern of the area. The availability of water and availability of various sources of irrigation is also a dominant factor in deciding the use of water. Figure 6 illustrates that out of the total net sown area, only 21 per cent area is irrigated where various sources for irrigating the fields are adopted. Farmers are still lacking modern sources of irrigation. On 79 per cent of the net sown area, still, traditional source of irrigation is used, i.e. rain. 21 per cent farmers use canals, wells, tube wells, drips and sprinklers in their field (Table 2). Still, 94 per cent irrigated area is irrigated through wells, the old technique, but now the farmers attach engines with it and are extracting groundwater according to requirements. Only 1.25 per cent area is irrigated through drips and sprinklers in the district.

Figure 6

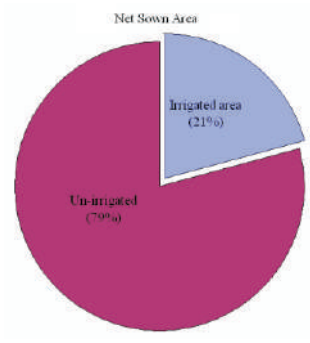


Table 2 : Sources of Irrigation

Mode	Irrigated Area (in ha.)	Per cent
Canals	40	0.02
Wells	238989	94.18
Tube wells	11540.24	4.55
Drips	69.76	0.03
Sprinklers	3130	1.22
Total	253769	100

Source: District Statistical Handbook, 2004

The farmers have inadequacy of funds and awareness about the various programmes and schemes, provided by the government for irrigation development. Farmer uses sprinklers by fitting engine in their wells. Thus, due to seasonal availability of surface water the farmers still show dependency on the natural source (rainfall) of irrigation. The maximum irrigation takes place through tube wells from groundwater due to the seasonal availability of surface water.

Size of holdings and purpose of cultivation: The use of water is determined by the size of holdings and purpose of cultivation. Large fields require large amount of water for irrigation since crops are grown for marketing as well as for subsistence purpose. Small size farms require, comparatively, low amount and fulfills only domestic requirement of food. The field size in the district are of marginal size (74 per cent) (Figure 7), 8 per cent households have more than 2 acre land (medium size). The small (18 per cent) and medium size holdings farmers do agriculture in both seasons (rabi and kharif) because they have accessibility to the modern sources of irrigation like tube well. The role of these farmers (26 per cent) is important in water consumption because they supply water to the fields when it is not available from rainfall. Thus, they extract groundwater and supply it more than the requirement of fields. In this regard, it is important to see the purpose of cultivation which depends upon the means of irrigation.

Figure 7

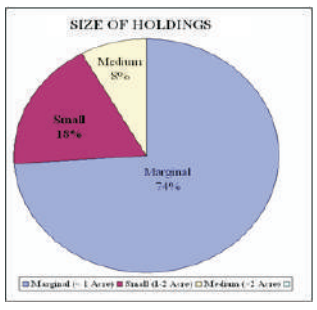
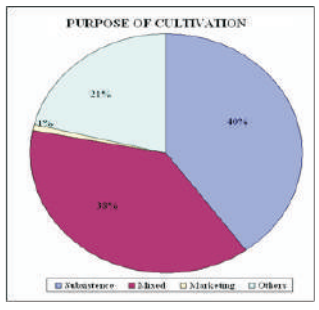


Figure 8

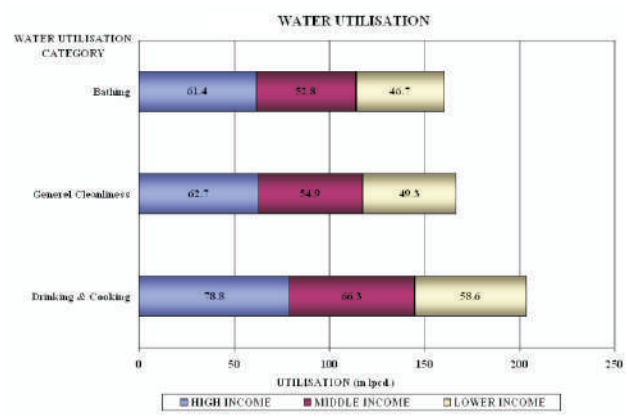


The marginal farmers are mainly engaged in subsistence agriculture (40 per cent) (Figure 8). These farmers do not have access to modern irrigation facilities and, thus, they are totally dependant upon rain. The large percentage (38 per cent) of farmers are practicing agriculture for both, subsistence as well as marketing purposes and harvest two crops in a year. They exploit maximum groundwater for rabi crops. 21 per cent farmers are landless and work as a tenant farmer. They share production with the owner of land, therefore, want to get maximum production by using maximum water.

b. Domestic water utilisation

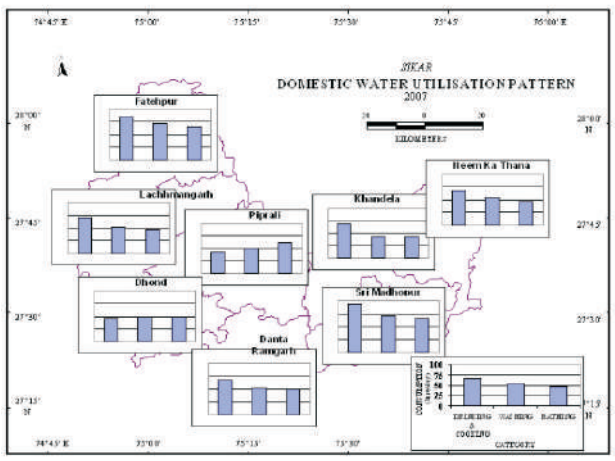
The major use of water in the domestic field is for drinking and cooking. This category shows maximum water utilisation in all income groups. In all categories high income group households use almost 79 litre water per capita per day (lpcd) for drinking and cooking purposes while lower income households use around 58.6 litre water per day (Figure 9). Almost all high income group households possess private ownership of water and they use maximum water for cooking, while lower income group uses common source of water. High class households use more water in comparison to other categories in the general cleanliness category. The same trend is also found in bathing category. Most of the lower income households are engaged in primary activities in which they didn't have time for bathing. They used to bath in alternate days or sometimes once in a week. Due to this they use less water for bathing (46.7 litres/ day). This is less because they have large families behind them. On the other hand, upper class households use more water for bathing (61.4 litres) daily. Daily bathing is due to engagement in secondary activities and effects of caste.

Figure 9



The spatial variation in domestic water utilisation pattern highlights that in all income groups, average family size is around of 7 members, so in all the blocks except Piprali and Dhond, water utilisation for drinking and cooking is almost or above 60 litres per capita (Figure 10). It is also clear that in Fatehpur and Lachhmangarh blocks water utilisation per capita is more than 50 litres for all three income groups, due to salinity and enough groundwater availability. But as we move east and south, utilisation in two categories, except drinking and cooking, is less due to overuse of groundwater resulting into depletion of water sources. In Sikar, as a whole, 67.5 litres water are used for drinking and cooking purposes, while 55.7 and 53.9 litres are used for washing and bathing purposes, respectively.

Figure 10



Relationship between ownership and utilisation of water: It has been found that upper and middle income groups have more than 70 per cent private ownership on water sources and they use almost 200 litres water daily (Table 3). On the other hand, lower income group have maximum per cent in common ownership (41.3 per cent). But it is interesting that if upper and middle income groups have private source of water, the household use water per day is more, and it decreases when they have common ownership. The reason is that they don't want to bring water from a common source where all the caste people fill their pots. The lower income people use more water if water is commonly available (171.3 lpd). Thus, it can be concluded that ownership and water utilisation are related to each other according to income groups. High class uses more water if they have personal ownership while lower uses more when it is commonly available.

Table 3: Sikar: Ownership and Utilisation of Water

Income Category	Private Ownership (per cent)	Utilisation (litres /day)	Common Ownership (per cent)	Utilisation (litres /day)
High	73.3	219.0	26.7	191.75
Middle	70.7	196.4	29.3	188.6
Low	**58.7**	**159.6**	**41.3**	**171.3**
Total	67.6	191.7	32.4	183.9

Source: Field survey

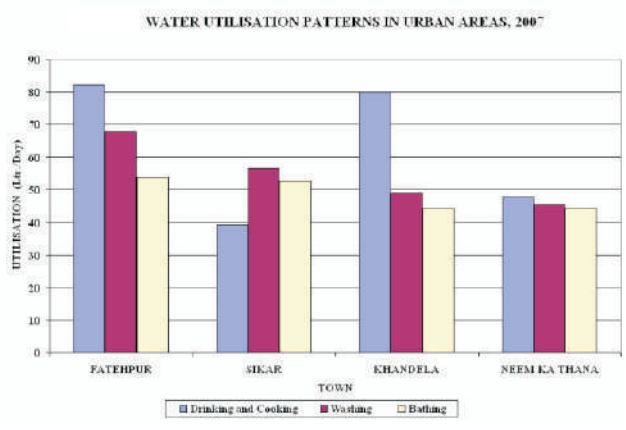
5.2.2 Water use in urban areas

Based on the primary data analysis it is found that in urban areas water is used mainly for domestic and industrial purposes. For this data has been collected from four towns out of nine towns in the district. Selected towns are Fatehpur, Sikar (the district headquarters), Khandela and Neem Ka Thana. The detailed analysis of urban water use is discussed below:

a. Domestic water use

Water utilisation pattern: Urban water utilisation pattern shows that water use in two towns (Fatehpur and Khandela), for drinking and cooking purposes is more than 80 lpd while other two (Sikar and Neem Ka Thana) uses less than 50 lpd (Figure 11). Other two water utilisation categories show decline in the use from west to east direction in the study area. Fatehpur town located in north-western part has enough groundwater availability, thus, uses more than 50 litres water on washing and bathing. But towards east in Sikar, Khandela and Neem Ka Thana use of water on both washing and bathing declines, respectively. This is due to less availability of water. This can also be linked to groundwater availability which is overexploited in the central and eastern part of the district. Western blocks covering, Lachhmangarh and Fatehpur are not much exploited due to presence of saline water.

Figure 11

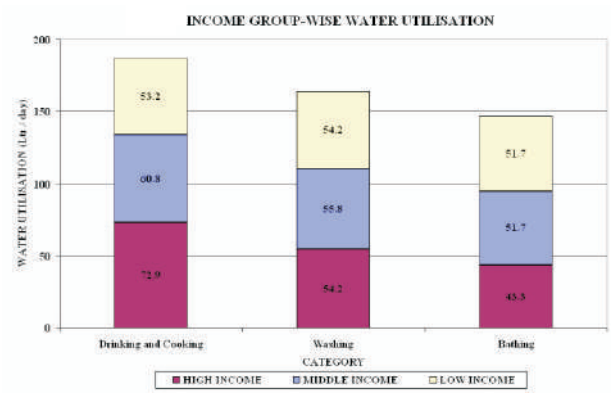


Income level and water use: The positive relation has been found with income level and water use. Higher income group households consume more water for different purposes in comparison to lower and middle income groups (Figure 12). With respect to per capita use of water on bathing and washing, they use less water in comparison to middle income group. Lower class uses around 50 litre water per day for each purpose. The maximum water is utilised on drinking and cooking purposes (176.9 litre) than washing (168.3 litre) and bathing (159.8 litre). Since drinking and cooking are essential for sustaining life, water is utilised at any cost; but, for other purposes they uses less water because of water scarcity. Thus, water utilisation is linked with its availability.

In urban areas, 11 per cent people are engaged in agriculture and use water in irrigation. The large share of the population is engaged in secondary and tertiary activities, therefore, utilizes maximum water in domestic sector.

Thus, in rural areas water is used both in agriculture and domestic purpose, while in urban area in domestic purpose. Similarly, water is used more for hygienic in comparison to other uses in both rural and urban areas. The amount of water used for different purposes varies from village to village, urban to urban and village to urban also. The amount which is used in irrigation is more than domestic needs in urban areas. In rural areas, the second major use of water is in domestic purpose, mainly for drinking and cooking. In rural households, 67.5 litre/day, while 62.3 litre in urban household is utilised for this purpose.

Figure 12



At present, changing lifestyle of the people forces them to consume more water and water use is shifting and increasing for other purposes. For example, in rural areas water utilisation for irrigation is shifting towards other uses like cleaning and washing (hygienic). In urban areas, water is consumed more for cleaning and washing of utensils, clothes in houses and ablution purposes. The field survey has revealed that households in towns are more concerned about the hygienic use of water. In rural areas water crises increases in summer due to less water supply or by depletion of groundwater. The village community tries to dig well deeper or they arrange water from the nearby places. Economically, better off people living in rural and urban areas manage water from non-traditional sources, i.e. water from tankers on paid basis in summer season. The worst sufferers are lower income people in rural and urban areas. It has been observed that villages, not connected with road face more problems.

6. CONCLUSIONS

It is concluded from the discussion that the water utilisation pattern in semi-arid region differs from other climatic regions. In semi-arid region, more water is used for irrigation purpose in rural areas and for domestic purpose in urban areas. The analysis of survey suggests that the district's water utilisation pattern is changing because of the changing lifestyle of the people in both areas. Major changes have taken place in the irrigation water use in rural areas and in urban areas it is related to hygienic purpose. Water distribution system is highly uneven in the district and water supply is inadequate to fulfill domestic requirements of the households. The higher income group households use more water daily due to high percentage of private ownership on the water resources. Water use is still poorly understood and inadequately measured and reported. The present study, therefore, helps and will be useful to planners and managers in managing the water resources of the area.

REFERENCES

I.Bilas, R. (1988): Rural Water Resource Utilisation and Planning: A Geographical Approach in Varanasi District, New Delhi: Concept.

II.Census of India (2011): Provisional Population Totals, Paper-I, Rajasthan.

III.Central Ground Water Board Report (2005): Dynamic Groundwater Resources of Rajasthan: 2005, Western Region, Jaipur.

IV.Central Ground Water Board Report (2007) Groundwater Yearbook, 2005-06: Rajasthan, Western Region, Jaipur, March.

V.Gleick, P.H. (2004): "Water use", Annu. Rev. Environ. Resour., 28: 275–314.

VI.Kumar, M. and Avinash, R. (1993) "Surface water resources and its utilisation for irrigation in India" Irrigation and Power Journal, 50(4):143-146.

VII.Nagarajan, R. (2003) Drought: Assessment, Monitoring, Management and Resource Conservation, New Delhi: Capital Publishers.

VIII.Sharma, H. S. and Sharma, G. (2003) "Drought and depletion of water resources in Rajasthan: A strategy for sustainable development", in D. N. Singh et al. (eds) Water Crises and Sustainable Management, Varanasi: Tara Book Agency, 122-139.

IX.Srivastava, R.C. (1991) "Water utilisation and agricultural productivity", in P.C. Mathur and R.K. Gurjar (eds) Water and Land Management in Arid Ecology, Jaipur: Rawat, 386-398.

X.Tahal Report on Water Resource Planning for the state of Rajasthan: Shekhawati River Basin, 1998, Government of Rajasthan, 1-30.

XI.Thakur, B. and Abhay, R.K. (2009) "Water scarcity management in the Sikar district, Rajasthan", in A. Kumar, R.S. Kushwaha and B. Thakur (eds) Earth System Sciences: Felicitation volume in Honour of Professor V.K.Verma, New Delhi: Concept, 228-253.

XII.Vaidyanathan, A. (2006) India's Water Resources: Contemporary Issues on Irrigation, New Delhi: Oxford University Press.