RESEARCH FRONT

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

IMPACT OF DROUGHT ON AGRICULTURAL PRODUCTIVITY: A CASE STUDY OF SATARA DISTRICT (MAHARASHTRA)

Dr. D.G. Gatade - Associate Professor and Head, Department of Geography, D. P. Bhosale College, Koregaon,Dist-Satara. Email Id: dggatade@gmail.com

Mr. Amol M. Pawar- Associate Professor, Dept. of Geography, Sangola College, Sangola , District Solapur. S. Email Id: amolpawar.gis@gmail.com

ABSTRACT

In the present research paper an attempt has been made to show primary productivity of agriculture area by selecting Satara district of Maharashtra as case study. Present research approach is utilized as a long term causes of drought in the study region. These study to changes in the study region of land use land cover pattern, nature complex, region variation, achieved high quality to extent, water insufficiency, environmental crises, agriculture productivity and its future prediction. These help in planning and development of sustainable land for use. To generate water control management plan using GIS and RS cell for the Satara district.

KEYWORDS: RS, GIS Cell, water control plan, drought control management, satellite images.

1. INTRODUCTION

Drought is natural disaster, which harmfully affects nature as well as humans. Drought frightens of large scale in livelihood, livestock and has a negative impact on local, regional economies. Dry situation affected by the nature, animal and human structure, huge loss of the natural topography on earth surface.The shortage period of rainfall is occurred decrease high water level. Basin catchment areas receive very low rainfall in a short period. Dry Manganga and Yerala rivers usually result from abnormally shortage rainfall and high temperature. The small amount of release of rainfall water was insufficient to fulfill the water storage networks in affected study region.

Drought of the study area depends on number of cause and its impact on the basic of the human and natural life. Constructions structure of nature its worst effect on the human life cycle in the study area. The basic pattern of the study area is dry basins, naturally loss of streams, open pattern of soil, low canopy of vegetation and scarcity rainfall due to drought and dry regimes. During the drought year 2004-2005 was affected in Manganga and Yerala basins in Satara district particular tehsils are Man, Khatav, Phaltan, Khandala and eastern part of Koregon, Karad tehsils etc.

2. STUDY AREA Satara district lies in the south part of Maharashtra state in India. It is situated in the south western part of the state and western limit of the Deccan table land. The geographically extends between 17°50' to 18°10' N latitude and 73°33' to 74°54' E longitude. The area covers of the district are 10480 sq.km. The district is bounded by Pune district on the north, Solapur district on the east, Sangli district on the south and Ratnagiri district of Konkan region on the west. The district has 15 towns and 1,739 villages, having population of 3,003,741 of which males constitute 50.29 per cent and females 49.70 per cent.

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

According to 2011 Census population density of 271.77 persons per sq. km. administratively the district is divided in four sub-division including eleven tehsils. (Fig. 1).

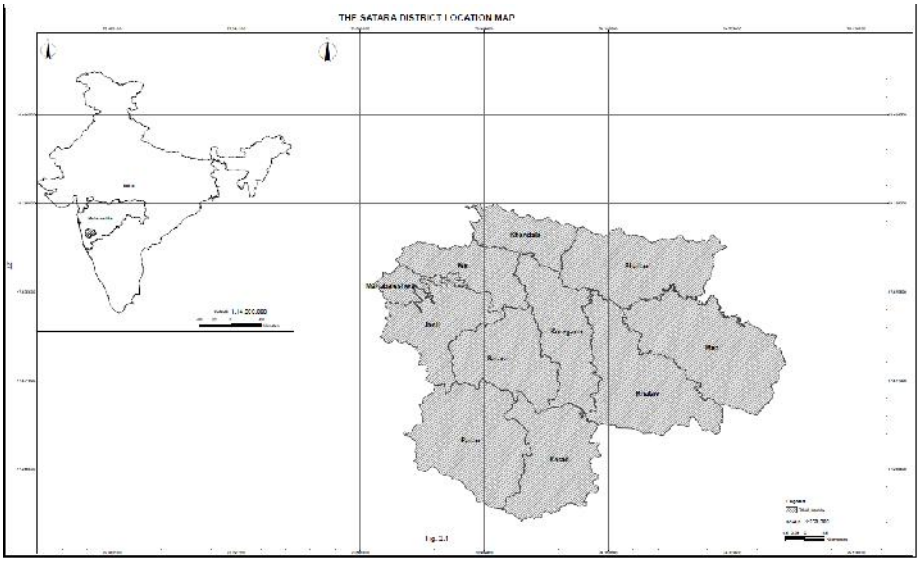

Fig. 1

3. OBJECTIVES

1. To study impact of drought in primary productivity of village wise agriculture area in Satara district.
2. To study spectral characteristics of drought by using satellite technology.

4. METHODOLOGY

The methodology consists of data collection and data basing required for drought Geo-Statistics analysis. Based on the agriculture analysis and agro-Statistics analysis, the instigated drought cause and impact to agriculture area is carried out.

4.1. USED SATELLITE DATA

1. Satellite data: IRS-ASTER (2004) and IRS-P6 LISS-III(2005)

4.2. USED HYDRO-METEOROLOGICAL DATA

Rainfall from 11 meteorological stations were used. Daily rainfall data of 13 rainfall gauging stations for the same period were obtained from the Indian Meteorology Department. Rainfall of Year 2004 for the Satara district was obtained from the Meteorological Department at Pune.

5. CAUSES OF DROUGHT IN STUDY AREA

Drought in Satara district is mainly due to the failure rainfall and dry regimes. In the study area there are responsible for both natural and anthropogenic activities. the main naturally causes are long time failure rainfall, short period of rainy-days, increasing the high temperature and evaporation, topography pattern, water imbalances and desiccating winds etc. Major human activities are deforestation, wrong performs in land use, more sand take on river beds, continuous same cropping pattern, farming on the river channel, huge range of construction etc. To the parallel natural as well as human accident earth climatic evidence to change the long period resulted Manganga and Yerala river basin decreasing rainfall pattern.

Satara district suffers in the four months monsoon climate, i.e. June to September. In the Satara district climatic phenomena particularly rainfall was very confusion. In the district

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

parallel situation occurred in both side in west heavy flooding and in east high drought. Studied over the last few decades, there have been many experiments in nature. Some of the other factors which have directly or indirectly contribution of occurrence of dry condition.

The fundamental of scarcity precipitation is the basis of the drought hazard. Very low rainfall in the catchment areas of Manganga and Yerala basin affected at Man, Khatav tehsils and dry region of Phaltan and Khandala tehsils also eastern part of Koregaon and Karad tehsils. Worried basin causes to regular insufficient of water to whole stream of Manganga and Yerarariver in study region. Scarcity rainfall, during the 2004, 2005 and 2012 for long period in continuation is the origin cause of drought. A dry river due to complete low rainfall and large scale temperature and evaporation is the essential condition for drought. That condition creates the basin of Manganga and Yerala from year 2004 and 2005.

High temperature and low rainfall affected by Khatav, Man, Phaltan, Khanda tehsils and eastern parts of Koregaon, Karad tehsils every annum. Gradual droughts are covers in almost all villages under the Man, Khatav, Phaltan and Khandala tehsils and some villages in eastern part of Karad and Koregaon tehsils. Table 1 shows per day rainfall for monsoon period between June to September 2004.

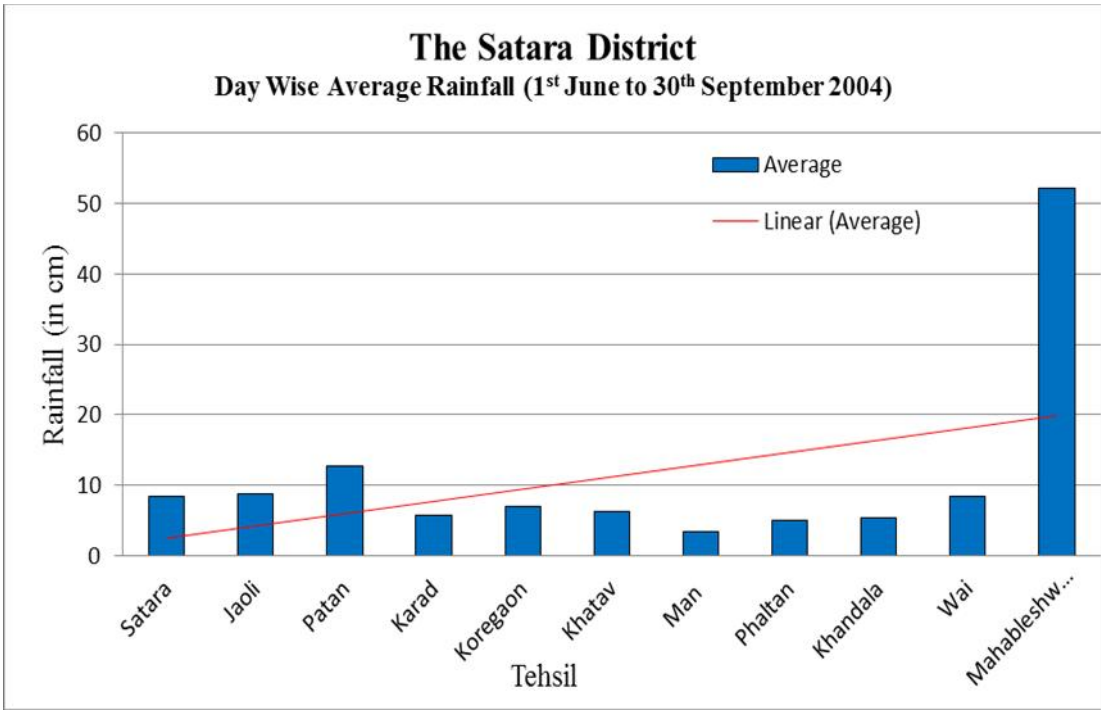

Fig. 2

The average of monthly rainfall in year 2004 and 2005 due to basic cause of the droughts for scarcity of water is created by high weakness of rainfall to compare of last 110 years. Year 2004 mean monthly rainfall of affected tehsils in the district is depicted in Table 2. In the year 2004 very low amount and variability of rainfall is recorded at Man, Khatav, Phaltan and Khandala tehsils.

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

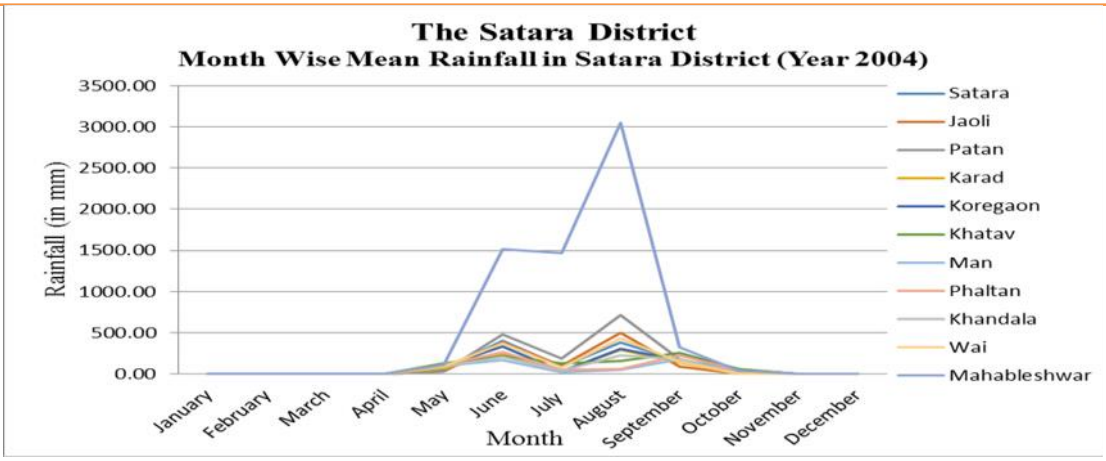

Fig. 3

5.1. IMPACT OF DROUGHT IN PRIMARY PRODUCTIVITY OF AGRICULTURE

The climate ambitious water scarcity and increases in the severity of droughts which is affected on crop production, small scale and marginal landholders and number of dependent on related to primary agricultural field. The climate calamities drought is the most common hazards.In the eastern part of study area in Man, Khatav, Phaltan, Khandala and east part of Karad and Koregon tehsils have a high affected the dryness and drought prone regions. The massive effected was agriculture, crop growing, live stokes, human health and drinking water etc. Given their involvement in the Satara district food system and the drought impacts that small scale holder farmers is doomed to failure.

The drought caused water shortages in study region for an impact on 8, 93,995 people and 1, 22,918 livestock totally collapsed drinking water supply scheme due to shortage of available water. Impact on numbers of villages the growing incidence of drought disasters is highly correlated to the increasing vulnerability of the local economy. Affected famous crops are Bajara, Jowar, some patches of Groundnuts, Maize, sugarcanes etc. whole crops was damaged in the drought. Monsoon whether gated the cloudy but no rainfall start in this region results availability for crop growing process stopped and the sun to reduces the humidity of atmosphere in this region.

In drought year 2004 -2005 in the district affected primary productivity agricultural land village wise is shown in Table 1. In the district more affected farmers in Man and Khatav tehsils. During the two years drought situation on agriculture land affected more than 50,000 farmers. The total agricultural land on the drought was the 1, 76,853.993 hectares. More than 90 per cent loss on the crops by drought and then occurred high hit on crop viral influences end of day result was the remaining crop only stay to chars. farmers not get the crop production in any kind of condition.

6. RESULTS AND CONCLUSIONS

In the Satara district eastern part having a drought impact in Man, Pathan, Khandala and Khatav tehsils included the eastern part of Karad and Koregon tehsils. In Manganga and Yerala river in the study region totally dry in the monsoon season. The field investigation of the randomly surveys (2013-2014), observation, mock interview and number of references to found drought high affected on the entire the family and number of farmers depending only

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

on the farms. Entire village's number of people goes to the nearest metropolitan's city likely Mumbai and Pune etc. Some people goes to the Sugarcane cutting in the Sugarcane farms regions. Drought impacts overall all villages which is located on the Manganga and Yerala river basins.

In year 2004 highly impact on the villages to high ratio of damages of agriculture field. In year 2004 drought affected villages name and its affected area in hectare are shown in Table 1 and Fig 4

Table 1
The Satara District
Tehsil Wise Drought Affected Villages and Affected Area (Year 2004-05)

Tehsil	Village	Area in Hectares	Tehsil	Village	Area in Hectares
Karad	Antvadi	621.727	Koregaon	Apshinge	946.999
	Babarmachi	236.159		Bhadale	1259.307
	Chikhali	528.042		Bhandarmachi	381.825
	Gholapwadi	475.487		Bhavenagar	836.295
	Gosavewadi	244.007		Borjaiwadi	351.791
	Hajarmachi	112.072		Chilewadi	304.059
	Kamathi	416.01		Ekambe	2010.211
	Karavadi	482.606		Hasewadi	460.227
	Karve	1126.226		Hivare	407.807
	Khodjaiwadi	265.065		Jaigaon	607.463
	Kival	1114.665		Jamb kh.	602.265
	Nigadi	501.93		Kanherkhed	547.039
	Pachund	202.982		Kawadewadi	380.023
	Rajmachi	386.979		Nagewadi	241.264
	Sayapur	129.039		Nalavadewadi	687.878
	Shamgaon	1200.144		Nigadi	366.331
	Surli	743.389		Pawarwadi	269.326
	Tembhu	442.123		Pimpri	887.89
	Vagheri	889.194		Ramoshiwadi	205.728
	Vanvasmachi	118.728		Shendurjane	450.556
	Virvade	192.089		Tadawale s. Wagholi	1193.057
	Wagheshwar	37.825		Velu	1043.516
	Total Area	10466.489		Wathar station	1007.512
Khandala	Ahire	981.035		Total Area	15448.369
	Ajnuj	586.823	Man	Andhali	312.48
	Ambarwadi	326.145		Bhandavali	572.98
	Bori	831.315		Bidal	1661.146
	Dhawadwadi	393.416		Bijavadi	994.366
	Ghatdare	233.12		Bodake	421.723
	Harali	325.969		Dahivadi	2641.842
	Khandala	974.151		Dhakani	482.523
	Khed Bk.	1587.259		Dhuldev	1452.385

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

Tehsil	Village	Area in Hectares	Tehsil	Village	Area in Hectares
	Koparde	1270.425		Dorgewadi (Naravane)	576.888
	Lonand	1669.36		Gangoti	656.239
	Mhavashi	440.504		Hingani	2156.498
	Nimbodi	748.535		Injabav	1063.961
	Padali	1208.464		Jadhavwadi	470.072
	Pargaon	337.897		Jashi	909.059
	Sukhed	667.315		Kalewadi (Naravane)	1137.353
	Wanyachiwadi	220.121		Kasarwadi (Andhali)	708.321
	Total Area	12801.853		Kiraksal	1091.387
Khatav	Amalewadi	83.485		Kukudwad	2510.85
	Anpatwadi	320		Lodhavade	779.112
	Anphale	607.465		Mahimangad	727.207
	Aundh	824.172		Malavadi	874.831
	Bhosare	538.456		Mankarnawadi	1639.286
	Bhurakvadi	381.942		Mardi	2346.102
	Bhushangad	190.629		Mogarale	1184.23
	Bombale	1053.04		Mohi	1493.539
	Budh	1113.668		Naravane	1260.197
	Chinchani	714.939		Pachvad	1504.116
	Chorade	1051.731		Palashi	1348.752
	Dambhewadi	742.928		Palavan	444.811
	Darajai	525.178		Palsavade	1235.546
	Daruj	614.84		Pangari	1095.642
	Datewadi	619.221		Parkhandi	503.232
	Enkul	1084.17		Paryanti	1471.903
	Fadtarwadi	577.242		Pingali Bk	1385.15
	Gadewadi	119.992		Rajavadi	1240.975
	Ganeshwadi	439.487		Ranand	1301.467
	Garalewadi	1281.145		Sambhukhed	806.440
	Garavadi	781.735		Satrewadi (malavadi)	469.885
	Garudi	768.982		Shindi Bk.	539.003
	Girijashankarwadi	274.183		Shindikh	1083.874
	Hingane	631.373		Shinganapur	1100.735
	Kaledhon	1916.669		Swarupkhanwadi (mahimangad)	309.103
	Kalewadi	199.455		Takewadi (Andhali)	1867.316
	Katarkhatav	1944.178		Ukirde	624
	Khabalwadi	269.627		Valai	1446.512

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

Tehsil	Village	Area in Hectares	Tehsil	Village	Area in Hectares
	Kharashinge	705.151		Varugad	835.795
	Kokarale	400.441		Wadjal	769.447
	Kumathe	1135.856		Total Area	51508.279
	Kurle	1273.242	Phaltan	Adarki Bk.	885.367
	Kuroli	974.776		AdarkiKh.	757.858
	Landewadi	213.574		Andrud	749.518
	Loni	303.52		Barad	1596.017
	Manjarwadi	665.159		BhadaliKh.	562.817
	Mayani	3059.269		Bodkewadi	759.539
	Mol (BK)	1.135		Dalvadi	702.346
	Mol(KH)	17.286		Dhaval	724.252
	Mol	504.411		Dhumalwadi	1515.694
	Mulikwadi	503.236		Dudhebavi	1472.994
	Nagnathawadi	654.877		Girvi	960.618
	Naikachiwadi	161.748		Hingangaon	1133.606
	Nandoshi	436.791		Jaoli	2060.482
	Nimsod	2148.203		Kapashi	547.929
	Pachwad	991.434		Khadaki	408.158
	Pimpari	567.433		Koparde	190.765
	Rahatani	649.696		Korhale	388.98
	Rameshwar	190.413		Kurvali Bk.	1599.554
	Ramoshiwadi	137.042		Malvadi	896.873
	Satewadi	622.231		Mandavkhadak	375.165
	Taraswadi	148.001		Manewadi	112.742
	Trimali	453.761		Mirdhe	1230.416
	Umbarmale	316.011		Mirewadi	319.945
	Vadi	302.808		Mirgaon	668.445
	Vaduj	2610.339		Nandal	1205.694
	Vanzoli	707.942		Nirugudi	331.62
	Varud	772.549		Pirachiwadi	514.615
	Wakalwadi	1572.473		Salpe	1206.805
	Wakeshwar	962.993		Saskal	479.416
	Yeliv	341.552		Sherechiwadi	259.674
	Yelmarwadi	442.444		Sherechiwadi	866.548
	Total Area	54924.538		Tambave	549.752
				Tardaf	760.866
				Tathavada	1318.647
				Vinchurni	602.44
				Waghoshi	323.78
				Wakhari	1003.789
				Wathar (Nimbalkar)	1503.767

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

Tehsil	Village	Area in Hectares	Tehsil	Village	Area in Hectares
Source: Agricultural Department, Satara District, 2005.				Zadakbaichiwadi	156.972
				Total Area	31704.465

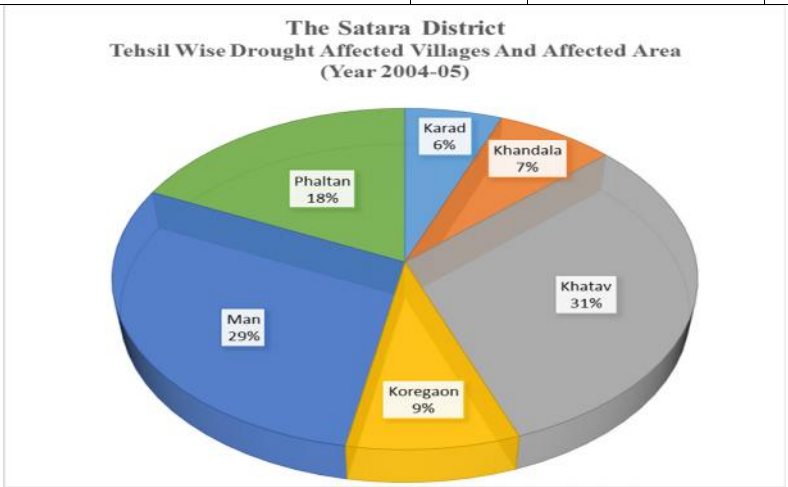

Fig. 5

REFERENCES

1. Brammer, H. (1990), Floods In Bangladesh I : Flood Mitigation And Environmental Aspects; The Geographical Journal, Vol. 156, No. 1, pp. 12- 22
2. Burman S. G. (1977), Floods and its Control, In Deshbandhu and E. Chauhan (eds), Trends In Indian Environment, New Delhi; Today and Tomorrows Printers And Publishers.
3. Cichocki, A., S. Amari, et al. (2004). ICALAB for Image Processing: Toolbox for ICA, BSS, BSE
4. Fiori, S. (2002). "Overview of Independent Component Analysis Technique with an Application to Synthetic Aperture Radar (SAR) Imagery Processing." Neural Networks: 'Neural Networks for Analysis of Complex Scientism Data: Astronomy, Geology and Geophysics'.
5. J.M.Gorriz, C.G.Puntonet, et al. (2004). Maximum Entropy Guide for BSS. AIP Conference.
6. Koperski, K.(1997).Spatial Data Mining *http://db.cs.sfu.ca/GeoMiner/survey/html/node1.html*
7. Lotsch, A., M. A.Friedl, et al. (2003). "Spatio-Temporal Deconvolution of NDVI Image sequences using Independent Component Analysis." IEEE Transactions on Geoscience and Remote sensing 41(12).
8. Mangat H. S. (1994), 'Patiala Floods : Where Lies The Solution' , Transaction, Institution Of India Geographers Vol. 16, No. 1 , pp. 29-33
9. Samual, J.C., Basu G.C., Bhan S. & Das D.C. (1981) Runoff-silt load prediction models for damodar watersheds. Indian Journal of Soil Conservation. 9 (1).
10. Seiler, R., Kogan, F. and Sullivan, J., (1998). AVHRR-based vegetation and temperature condition indices for drought detection in Argentina Remote Sensing: Inversion Problems and Natural Hazards Advances in Space Research 21(3): 481-484.
11. Sharma V.V.L.N, Murali Krishna G., Hemamalini B. and Rao K. N., (2001) LU/LC change detection through Remote Sensing and its climatic implications in the Godavari delta region- Journal of Indian Society of Remote Sensing. 29 (1&2).
12. Subrahmanayam, V. P (1988), ' Hazards of Floods and Droughts In India', in M. I .EL. Sabh and T. S. Murty (eds.) , Natural and Man- Mad Hazards, D. Reidel Publishing Co. , 337-356.
13. UNICEF.(2000).India: More than 100 Million at Risk *http://www.unicef.org/drought*