REVIEW OF RESEARCH
IMPACT FACTOR : 5.7631(UIF) UGC APPROVED JOURNAL NO. 48514 ISSN: 2249-894X
VOLUME - 8 | ISSUE - 4 | JANUARY - 2019

AN ASSESSMENT OF DROUGHT IN KOLAR DISTRICT IN KARNATAKA STATE

Nagendra M.[1] and Ashok D. Hanjagi[2]
[1]Research Scholar, Department of Geography & Geoinformatics, Bangalore University, Bangalore.
[2]Professor, Department of Geography & Geoinformatics , Bangalore University, Bangalore.

ABSTRACT :

Drought is a worst kind of natural disaster that comes slowly and causes huge loss. Drought has different dimensions and can be defined or viewed from different aspects. Drought prone district in the south eastern part of Karnataka such as Kolar is frequently affected due to deficient rainfall and absence of any perennial source of water. Kolar district is facing acute water problems since many decades. The district stands frontline in dairy farming live-stock rearing which leads to more dairy products. The district population is around 15 lakhs. Kolar district has been chosen for this research work to study the present status and suggest innovative solutions to control the drought and improve the socio-economical standards in the district. The main finding of this study is to promote productive dry land agriculture including restructuring of cropping pattern on the basis of soil-water and climate resource of the area. Soil moisture conservation including promotion of proper land-use practices is suggested. The present study is based on secondary data available from Government and private institutions and records with the Karnataka State Natural Disaster Management Centre (KSNDMC). The findings of the study and recommendations are highlighted in the paper.

KEYWORDS : *Drought, socio-economics, economic activities, water-resource.*

1. INTRODUCTION

Drought is a worst kind of natural disaster that happens slowly and causes huge loss to agriculture and live stock. It develops over a long period of time and cover a wide area. Drought has different dimensions and can be defined or viewed from different perspectives. The severity of drought is expressed in the form of biological degradation and socio-economic distress. Drought is usually understood as a period of dryness due to lack of rainfall. According to the water balance concept, drought is a physical condition in which the amount of water available from precipitation and soil moisture is insufficient to meet the demands of evapotranspiration. The drought-areas are characterized by excess of evaporation over actual rainfall. Kolar district is one of the biggest districts in Karnataka State and experiences recurrent drought conditions.

The three types of droughts that occur are -

1. Permanent drought: This type of drought is seen in areas which have the driest climates.
2. Seasonal drought: This is found in the climates which have well defined rainy and dry seasons.
3. Contingent drought: This occurs in climates which have rainfall of an irregular and variable type.

The Kolar district falls in rain shadow region of monsoon flow and is located far away from the coastal zone and type 3 drought is more prevalent there. Hence, precipitation occurrence is less. However the district also stands frontline in dairy farming live-stock rearing which leads to dairy products. Alternative solutions based on scientific assessment of land and water resources are essential to mitigate the losses from recurrent drought.

The research questions taken up for the present study are -

1. How frequent and severe drought has been affecting the district?
2. The damage caused by the drought and effect on drinking water?
3. What are the possible scientific solutions to control the adverse impacts of drought in the district?

2. STUDY AREA AND OBJECTIVES

The study area is the district of Kolar in southern part of Karnataka State in India as shown in Fig.1.

The detailed objectives of the study are –

a. promoting a more productive dry land agriculture including grestructuring of cropping pattern on the basis of soil-water climate resource of the area
b. Development and productive use of the water-resource of the area.
c. Soil and moisture conservation including promotion of proper land-use practices.

Study area –Kolar district, Karnataka, India

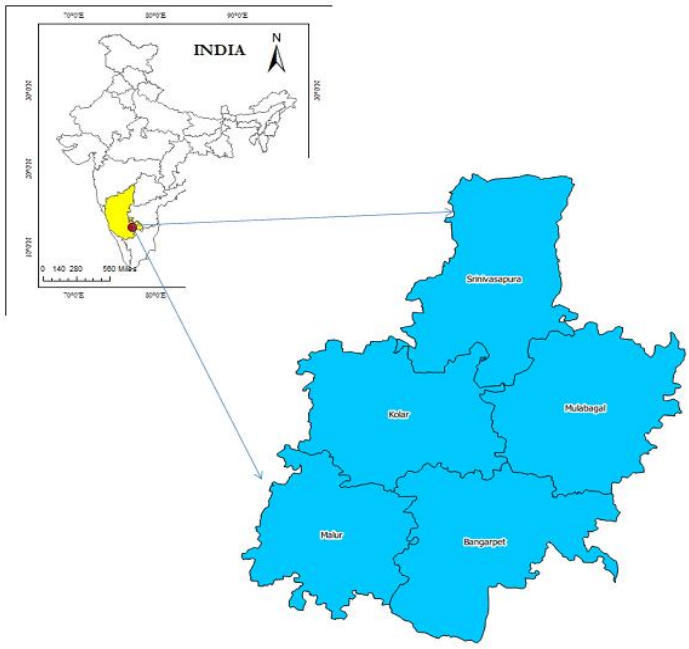


Fig.1: Study area of Kolar District, Karnataka State

3. DATA SOURCES &METHODOLOGY FOR THE STUDY

The present study completely depends on secondary data collected from Government and academic research publications and official records. Various data and maps related to the drought occurrence and its

impacts in Kolar district was collected and analysed to understand the spatial and temporal features of drought over a period of 2001 – 2015. The data was collected from India Meteorological department, Indian space Research Organisation, State Agriculture Department, Bureau of Economics & Statistics, Karnataka State Natural Disaster Management Centre and District and Taluk level data in Kolar. Further local specific data was collected through ground surveys and questionnaire in the district. The current satellite data from Indian remote sensing Satellite was also analysed to understand vegetation dynamics.

The methodology consisted of following steps:

1. Collection of primary and secondary data
2. Analysis of such data and preparation of geospatial maps
3. Analysis of spatial and temporal variations over a period of 2001 to 2015
4. Identify the patterns of drought occurrence in terms of frequency, affected areas and impact on agriculture production
5. Arrive at specific recommendations related to optimal management of water resources and crop selection.

4. RESULTS AND DISCUSSION

The following sections depict the results of the study. The meteorological setting of the district can be seen from Fig. 2 & 3 and Table 1.

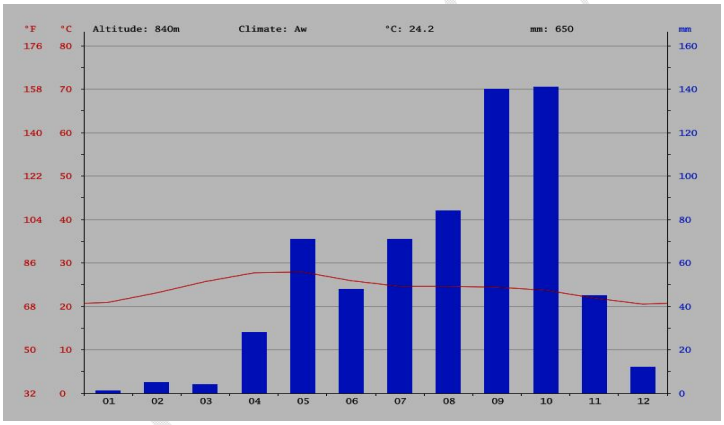


Fig. 2: Month wise Temperature distribution in Kolar district

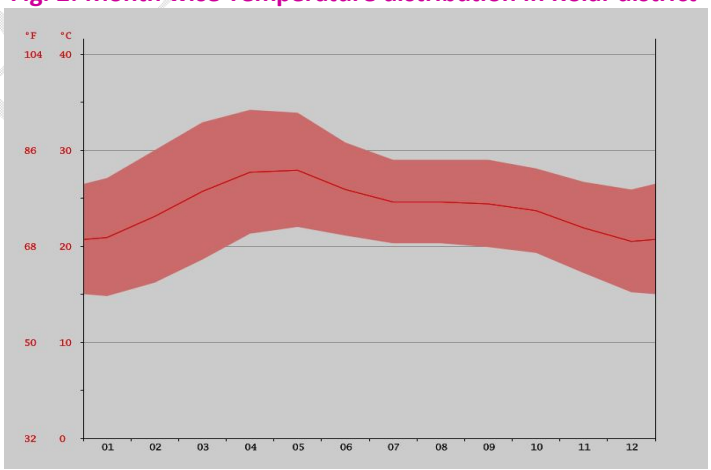


Fig. 3: Month wise temperature variation in Kolar district

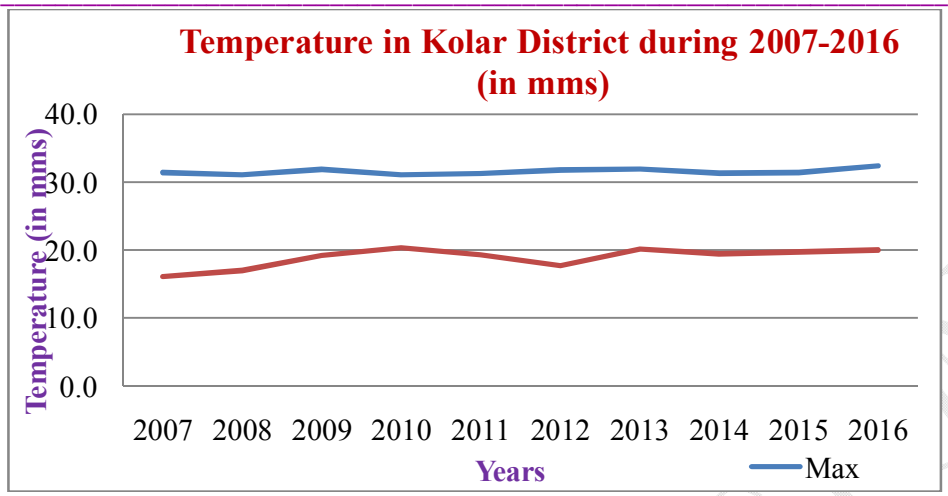


Fig. 4: Distribution of temperature maxima during 2007 to 2016

It may be seen that the temperature ranges from 40 to 45 ^{0} C and peaks in the summer and monsoon season. There is a year to year high variability in the temperatures. This leads to high level of evaporation loss. The annual rainfall distribution may be seen in Fig. 5 and 6.

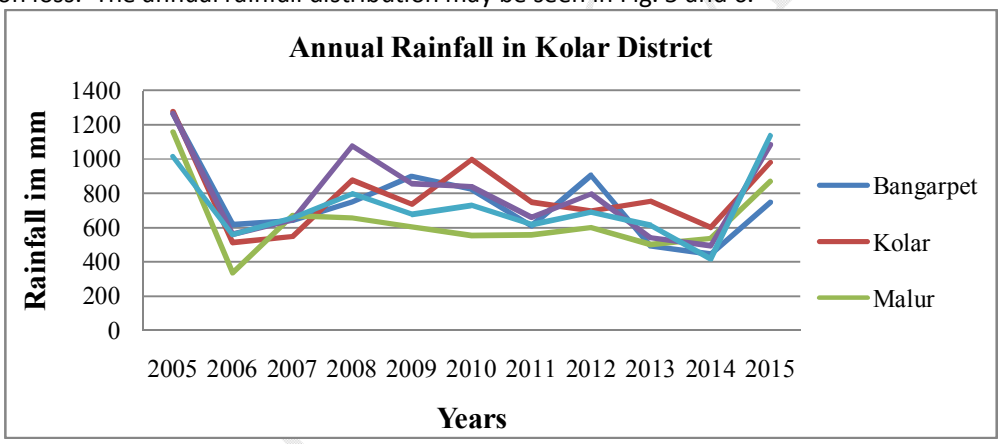


Fig. 5: Annual Rainfall taluk wise in Kolar District

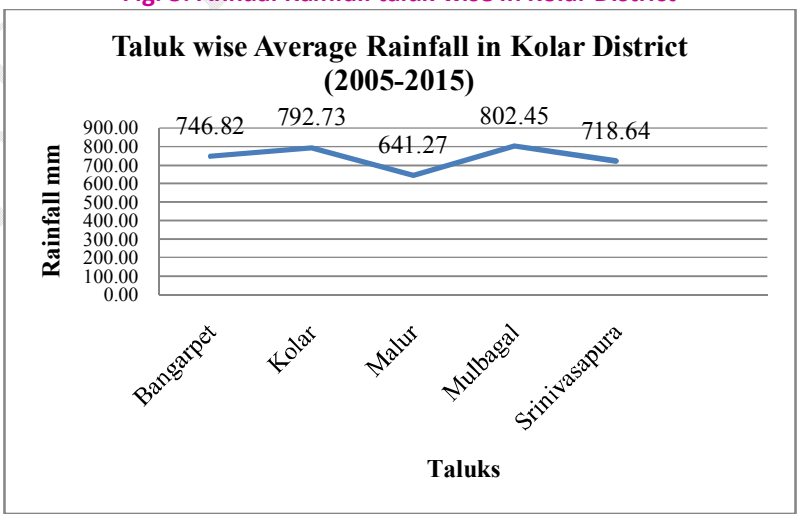


Fig. 6: Taluk wise average rainfall

Table - 1: Annual Rainfall in Kolar District (in mms)

S N	Taluks	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1	Bangarpet	1264	619	644	753	901	827	612	906	493	447	749
2	Kolar	1276	512	548	875	736	997	746	698	755	600	977
3	Malur	1158	338	672	656	605	554	559	602	504	537	869
4	Mulbagal	1267	562	645	1077	857	841	660	797	541	496	1084
5	Srinivasapura	1012	557	657	796	677	729	617	691	615	418	1136
District Total		5977	2588	3166	4157	3776	3948	3194	3694	2908	2498	4815
District Average		1195	518	633	831	755	790	639	739	582	500	963
Total Average		1992	863	1055	1386	1259	1316	1065	1231	969	833	1605

The year to year variation in rainfall may be seen in Table 1. The annual rainfall of Kolar district shows a decline from 2005 to 2015.The drastic change is seen in Bangarpet district i.e. 1264 mm to 749mm from 2005 to 2015 respectively. The highest amount of rainfall in 2005 was received by Kolar district i.e. 1276 mm of rainfall where a the lowest amount of rainfall was measured in Srinavasapura district i.e. 1012 mm of rainfall. In 2015 the maximum amount to rainfall was notated in Srinavasapura i.e. 1136 mm of rainfall whereas lowest rainfall was recorded in Bangarpet district i.e. 749 mm of rainfall. The total district shows a decline in rainfall till 2014. After 2015 we can see slight increase in the rainfall all most all the five districts.

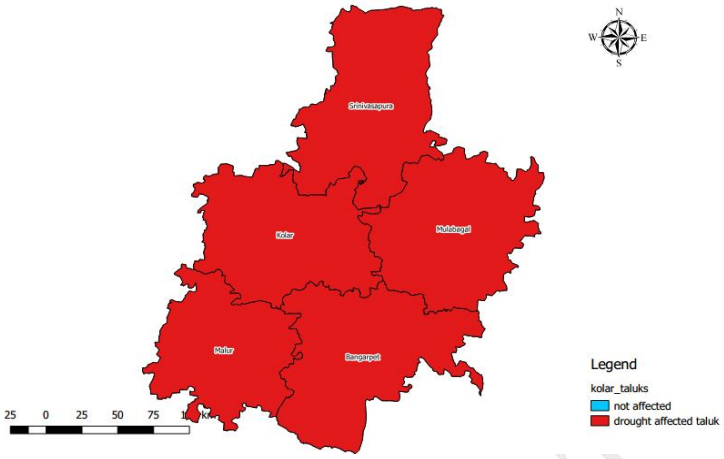
The occurrence and spatial distribution of drought may be seen from Table 2.

Table 2: Drought Affected Taluks from 2001 to 2015

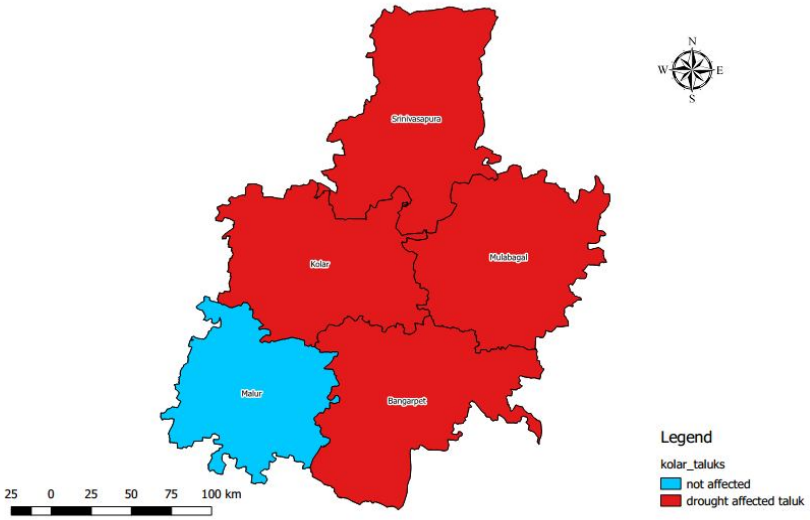
Sl No.	Taluks	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1	BANGARAPET		Yes	Yes			Yes			Yes		Yes	Yes	Yes	Yes	Yes
2	KOLAR		Yes	Yes			Yes			Yes		Yes	Yes	Yes	Yes	Yes
3	MALUR		Yes	Yes			Yes			Yes			Yes	Yes	Yes	Yes
4	MULABAGAL		Yes	Yes			Yes			Yes		Yes	Yes	Yes	Yes	Yes
5	SRINIVASAPURA		Yes	Yes			Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes
	Total	Nil	5	5	Nil	Nil	5	Nil	1	5	Nil	4	5	5	5	5

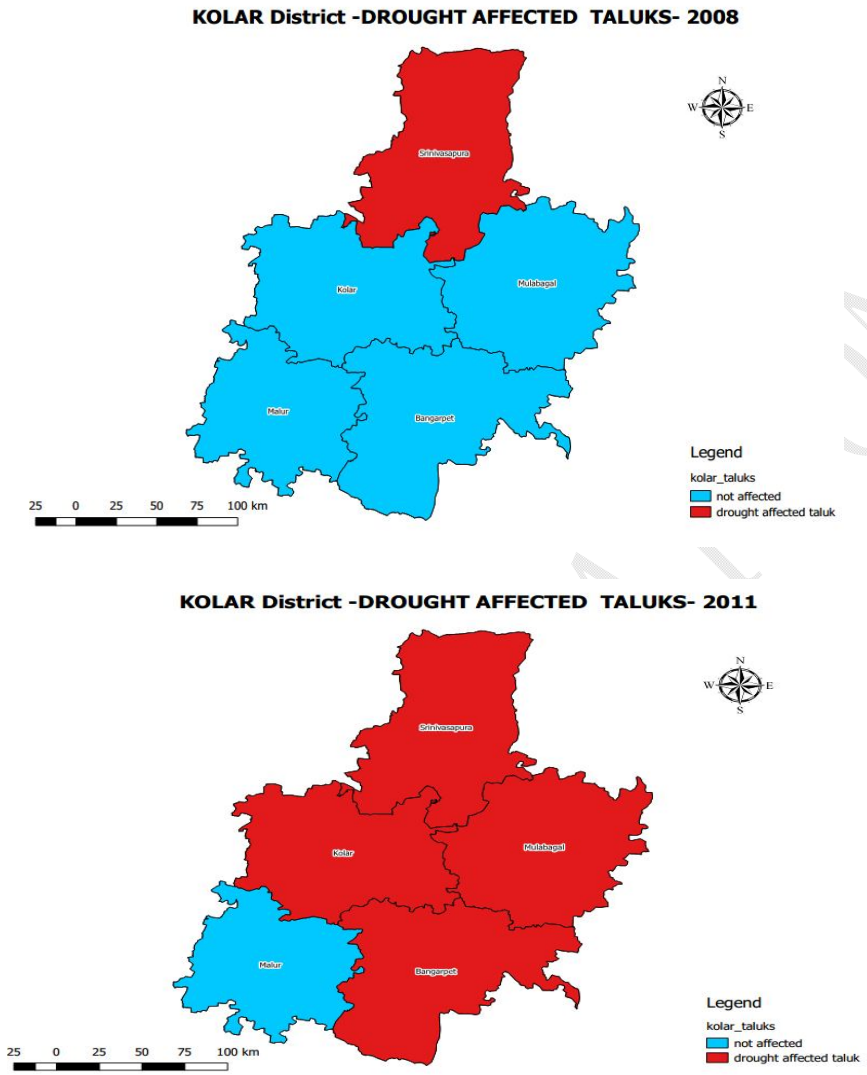
The spatial distribution of the drought occurrence is given in Fig. 7 (a) to(d)

KOLAR District -DROUGHT AFFECTED TALUKS
2002 ,2003 ,2006, 2009, 2012, 2013 ,2014 ,2015



KOLAR District -DROUGHT AFFECTED TALUKS- 2011





Figs. 7 (a) to (d): Drought occurrence and spatial distribution in Kolar District

The Figures 7 (a) to (d) shows the high level of incidence of drought in Kolar district. This is linked to the high variability of rainfall and high temperatures that occur.

Now let us review the impact of the drought conditions on the agriculture and income generation. Following Tables present the details.

Table 3: District Income and per capita Income

Sl. No.	Taluks	At Current Prizes (2010-11)		At Constant (2004-05) Prizes		Per capita NDDP	
		Gross District Domestic Product (GDDP) (Rs. In lakhs)	Net District Domestic Product (NDDP) (Rs. in lakhs)	Gross District Domestic Product (GDDP) (Rs. In lakhs	Net District Domestic Product (NDDP) (Rs. in lakhs)	At Current Prizes (2010-11)	At Constant (2004-05) Prizes
1	**Bangarpet**	406724	365289	38688	33402	14631	13441
2	**Kolar**	316109	284641	28952	263318	14763	13579
3	**Malur**	427520	388603	37386	347434	32520	28548
4	**Mulbagal**	236042	225137	20707	199927	16337	14660
5	**Srinivasapura**	99084	91763	8555	74363	7739	6931
	District Total	1485479	1355433	134288	1219066	85990	77259

Table 4: Production & Income generation Taluk wise in Kolar District

Sl. No.	Taluks	At Current Prizes (2010-11)		At Constant (2004-05) Prizes		Per capita NDDP	
		Gross District Domestic Product (GDDP) (Rs. In lakhs)	Net District Domestic Product (NDDP) (Rs. in lakhs)	Gross District Domestic Product (GDDP) (Rs. In lakhs	Net District Domestic Product (NDDP) (Rs. in lakhs)	At Current Prizes (2010-11)	At Constant (2004-05) Prizes
1	**Bangarpet**	27.4	26.9	28.8	2.7	17.0	17.4
2	**Kolar**	21.3	21.0	21.6	21.6	17.2	17.7
3	**Malur**	28.8	28.7	27.8	28.5	37.8	37.0
4	**Mulbagal**	15.9	16.6	15.4	16.4	19.0	19.0
5	**Srinivasapura**	6.7	6.8	6.4	6.1	9.0	9.0
	District Total	100.0	100.0	100.0	75.3	100.0	100.0

Table 5: Agricultural Production Statistics Kolar District Production 2014-15

Sl. No	Taluks	Paddy	maize	Ragi	Total cereals and minor millets
1	**Bangarpet**	5380	592	25370	31342
2	**Kolar**	2866	641	29638	33145
3	**Malur**	2690	117	17786	20593
4	**Mulbagal**	3124	801	27267	31192
5	**Srinivasapura**	1356	516	18494	20366
	Total	**15416**	**2667**	**118555**	**136638**

The main crops grown in Kolar district are Paddy, maiz and ragi other than these some cereals and minor millets are also grown in this district. The total production in 2014-15 for paddy is 15416, maiz is 2667, Ragi is 118555 and Total cereals and minor millets are 136638. Ragi needs less water during growing period therefore it is grown more in the dry district of Kolar.

5. RECOMMENDATIONS FOR DROUGHT PROOFING:

Considering the high level of incidence of drought in the Kolar district in Karnataka and the high impact on the agricultural production and economic conditions, it is necessary to make a long term plan to combat drought. Based on the meteorological settings in the district in terms of rainfall distribution, spatial variability, temperature variations, following are the recommendations emerging from the Study:

1. Detailed study of the agrometeorological condition taluk wise and identify most suitable crops
2. Develop check dams and ponds for harvesting rainfall
3. Develop horticulture crops with short duration and less water needs
4. Develop alternate skills such as handicrafts to generate additional income for the drought affected farmers

REFERENCES

1. Akhtari R., Morid S., Mahdian M. H. & Smakhtin V. (2009) Assessment of areal interpolation methods for spatial of SPI and EDI drought indices. Int. J. of Climatol.29, 135-145.
2. Byun H. R., Lee S. J., Morid S., Chio K. S., Lee, S. M. & Kim D.,W. (2008) Study on the periodicities of droughts in Korea. Asia-Pacific J. of Atmosph. Sci.44(4), 417-441.
3. Cuadrat, J.M., Saz, M.A. Vicente-Serrano, S.M. & González-Hidalgo, J.C. (2007) Water resources and precipitation trends in Aragon (Spain). Int. J. Water Resour. D.23(1), 107-124.
4. Demuth, S. (2009) Learning to live with drought in Europe. A World of Science, Quarterly newsletter of the Natural Sciences Sector of UNESCO 7(3), 18-20.
5. Fleig, A.K., Tallaksen, L.M. & Hisdal, H. (2006) Drought indices suitable to study the linkages to large-scale climate drivers in regions with seasonal frost influence. In: Climate Variability and Change – Hydrological Impacts (ed. by S. Demuth, A. Gustard, E. Planos, F. Scatena& E. Servat), IAHS Publ. no. 308, 169-174.
6. Hisdal, H. (2002) Regional aspects of drought. PhD Thesis, Faculty of Mathematics and Natural Sciences, University of Oslo, Unipub AS, Oslo, Norway.
7. Manoli, E., Katsiardi, P. & Assimacopoulos, D. (2005) Putting the WFD into practice: Strategy formulation for IWRM under scarcity conditions. In: Proceedings of the ARID Cluster Conference Coping with Drought and Water Deficiency: from research to policy making, Limassol, Cyprus, 47-56.
8. Morid, S., Smakhtin, V. & Moghaddasi, M. (2005) Comparison of seven meteorological indices for drought monitoring in Iran. Int. J. of Climatol.26, 971-985.
9. Lei Kang and Hongqi Zhang , A Comprehensive Study of Agricultural Drought Resistance and Background Drought Levels in Five Main Grain-Producing Regions of China, **Sustainability** 2016,8,346; doi:10.3390/ su8040346, www.mdpi.com/journal/sustainability

Nagendra M.
Research Scholar, Department of Geography & Geoinformatics, Bangalore University, Bangalore.