

SESSION-3 :

**DROUGHT ASSESSMENT,
MONITORING AND
MITIGATION, CASE
STUDIES**

ASSESSMENT OF DROUGHT SEVERITY IN KSHIPRA BASIN, INDIA

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ABSTRACT

The primary goal of the study was to investigate the past drought events, to analyze dry spells and to assess drought severity in the Kshipra basin including assessment of the supplemental irrigation water requirement to protect Kharif crops from prolonged dry spells and drought. The study includes probability distribution of annual and seasonal rainfall, seasonal/annual rainfall departure, determination of critical dry spell(CDS), estimation of supplemental irrigation water requirement for CDS, estimation of standardized precipitation index (SPI) to inspect the pattern of rainfall anomalies and estimation of streamflow drought duration and severity. Analysis of rainfall records for 8 stations revealed that the drought occur in different parts of basin with an average frequency of once in 5-years. The average length of monsoon for the basin is about 76 days. For safe Soyabean cultivation in the basin appropriate provision of supplemental irrigation may be feasible to cope up with intervening prolonged dry spells periods. A bad monsoon year in the basin usually incorporates two intervening critical dry spells and these dry spells often cause most crop loss and seasonal water scarcity conditions. The estimation of crop water requirement and effective rainfall for critical dry spell may provide useful information to the water managers for the planning of supplemental irrigation and agricultural water management in the basin. It was observed that the streamflow drought event follow the meteorological drought/CDS. The analysis also revealed that the streamflow drought events started during late monsoon or post monsoon period often continued till arrival of next monsoon. The groundwater table analysis indicated that the groundwater levels in the basin have significant lowering trends.

ASSESSMENT OF DROUGHT SCENARIO FOR WATER RESOURCES DEVELOPMENT IN PANNA DISTRICT OF BUNDELKHAND REGION

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ABSTRACT

The Bundelkhand region is reeling under severe recurrent droughts and famine conditions exist since the last few years resulting in loss of agricultural livelihood, food crisis, and depletion of surface and groundwater resources, decreased grain production, drinking water crisis which have made life miserable for the local population leading to large scale out-migration. Provision and preparation against droughts are the key elements for minimizing their impacts. Panna district in Bundelkhand famous for its diamond mines even though blessed with seven rivers draining the area and an average rainfall of 1099 mm, still reels under severe water scarcity due to the recurring drought scenario.

This paper is an attempt towards the critical assessment of drought scenario in the district so as to plan for mitigation measures. Analysis of annual and seasonal rainfall records for the period from 1964–2009 revealed that the study area had faced drought condition with an average frequency of one in every 3 years. The maximum rainfall deficiency recorded in the area was of the order of –81% in 2007. Ajaygarh block experienced the maximum of 6 severe droughts during the period under study out of which three consecutive severe droughts occurred during 2006, 2007, and 2008; whereas Panna and Pawai experienced 3 and 1 severe drought respectively. The probability analysis of the annual and seasonal rainfall indicated that 3 out of the 5 blocks namely Panna, Pawai and Ajaygarh are drought prone blocks since the probability of occurrence of 75% of the mean annual rainfall is less than 80%. The trend analysis was performed by the non-parametric Mann-Kendall Test to identify the possibility of existence of any decreasing trend in the monsoon, non-monsoon and annual rainfall series. However no significant trend has been observed in the seasonal as well as annual rainfall pattern. The dry spell analysis has been carried out all the five blocks in the district. The first critical dry spell for Panna district commences from 26th July for duration of 16 days, whereas the second critical dry spell commences from 21st August for duration of 17 days. It is therefore imperative that measures should be initiated for providing supplemental irrigation during these periods of dry spells to prevent the crop from wilting. The crop water requirement have also been assessed for the various blocks using the Penman-Monteith method and irrigation water requirement evaluated considering the

effective rainfall based on USDA Soil Conservation Service method. This would enable the administrators to plan for various water resources development programmes and activities directed towards drought mitigation in the various blocks of Panna district.

AGRO-HYDRO-METEOROLOGICAL DROUGHT ANALYSIS OF RAINFED CROPS IN ARID AND SEMI-ARID AREAS OF RAJASTHAN

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ABSTRACT

Water is most vital for realizing full potential of agricultural sector and country's economic development. Optimum development and efficient utilisation of water resources assumes great significance. Since, the economy is based mainly on agriculture, its prosperity depends mainly on its landuse and water resources management.

In the present paper, the agro-hydro-meteorological data of Jodhpur and Jobner regions for 20 years have been analysed for rainfed crops on weekly basis. It was found that the drought occurrences have been concentrated in first three to four weeks of the initial crop growth period and in last two to five weeks before the crop maturity. Hence, the timing of irrigation is important because at some stage of the crop growth, excessive stress is caused by temporal variations in rainfall, delayed irrigation or inadequate irrigation can adversely affect the crop yield both in quantity and quality.

DROUGHT RESISTANCE IN ARID STATE OF RAJASTHAN

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ABSTRACT

Rajasthan is known for drought and desert. "Drought mitigation" is a vital issue for survival & sustainable development of the arid State like Rajasthan, which attracts attention of geo-scientists for suggesting practicable remedial measures. Since long, policy planners are after drought mitigation spending millions of rupees for combating problems of drinking water (construction of new tube wells, water transportation by rail & roads), transportation of food & fodder, generating temporary employment etc. Droughts still continue to stay here as unwanted guest. It is high time that ad-hoc planning for "Drought Mitigation" should be replaced by "Drought Resistance", that is, availability of water at any point of time & space irrespective of quantum of rainfall during a particular time spell. This needs paradigm shift in Government's policies by making it groundwater centric. Owing to aridity in Rajasthan, surface water is a scarce commodity (low rains), less dependable (erratic monsoon) that too susceptible to high degree of evaporation losses along with greater vulnerability for all sorts of pollution hazards. Being visible source, its availability, transportation and management are difficult tasks because of conflicts & protest of masses/Governments (as is witnessed on several occasions), power failure for lifting, en-route leakages from pipelines & canals etc. On the contrary, storage of water beneath the ground by artificial recharge of aquifers has advantages of no evaporation losses, lesser pollution probability and greater dependability because of its readily availability at any location and time through wells/ tube wells without any conflict with the added advantage of improvement in quality in saline and fluoride affected belts occupying significant areas in the State. Dreams of drought resistance/ proofing in the arid State is therefore only feasible by major shifts in Government policies to make it groundwater oriented applying innovative approach of water conservation, regulation, protection and especially structural measures for augmentation of resources by artificial recharge. There is plenty of scope for recharge due to availability of permeable geo-formations and deep & declining water levels ensuring availability of water at required point of time & location, irrespective of magnitude & spread of rainfall. It has been estimated that 82,443 MCM (71,318MCM in western & 11,125MCM in eastern Rajasthan) of additional water can be recharged to ground water over the period of time utilizing various artificial recharge techniques, which is enough for drought resistance and sustainable development of agricultural activities. Rainwater and surplus canal water available in plenty in north western India particularly during monsoon period can be surface water sources for recharging of potential aquifers. Water needs to be declared "National Property" for transporting this natural resource from surplus basins for mega recharge to groundwater also. Financial incentives and assistance should be introduced in water sector particularly recharging of potential aquifers on large scale with integrated participatory approach.

STUDY OF DROUGHT IN TWO DISTRICT OF ANDHRA PRADESH

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ABSTRACT

Several districts in Andhra Pradesh, specifically in the rain shadow region receive low rainfall. The districts have low cropping intensity and less irrigation facility. These are often affected by drought. Drought prone districts in the state are Anantpur, Chittoor, Cuddapah, Hyderabad, Kurnool, Mahboobnagar, Nalgonda and Prakasham. Rainfall is most important factor for characterization of the drought. Over longer period of drought, water availability in reservoirs also dwindles worsening the drought situation. Suitable planning is required to combat the droughts in these areas. Drought characterization is important for water resources planning and drought mitigation. Several drought indices are used to characterize drought. SPI (Standardized Precipitation Index) is based on precipitation data alone and uses data of various scales e.g. monthly, quarterly, half yearly etc. Based on the index value, drought is classified as moderate or severe. Distribution of rainfall is important for crop growth. Deficit of rainfall in different stages of the crop growth affects crop yield. Thus, drought characterization using monthly or smaller scale may be useful for studying drought from agriculture perspective. For monthly scale, start and end of drought events and their magnitudes are studied for Anantapur and Kurnool districts in Andhra Pradesh. Recurrence interval of drought for given magnitude of SPI has been estimated. The results indicated that the study district face droughts with an average frequency of once in every 4 years.

WATER MANAGEMENT STRATEGIES DURING DROUGHT: A CASE STUDY OF DISTRICT NAGOUR, RAJASTHAN

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ABSTRACT

Droughts are widely perceived as hydro climatic hazards. In reality droughts are socio environmental phenomena, produced by admixtures of climatic, hydrological, environmental, socioeconomic, and cultural forces. Water supply is challenged by hydrologic droughts, which reduce availability and quality of water and can adversely affect human and environmental systems. This paper reports on a study of extent of drought and strategy of water supply for district Nagaur (Rajasthan). The study is based on secondary data published by various departments of State and Central Government, review of published research papers and books on the subject and personal interactions of the author with people in rural and urban areas.

Drought water management strategies, both structural and non-structural measures with a greater sensitivity planning is highly variable, with some local governments (Panchayats) and organizations provide to be more capable than others of taking responsibilities.

EFFECTS OF SCARCITY OF WATER ON WETLAND OF KEOLADEO NATIONAL PARK AT BHARATPUR (RAJASTHAN)

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ABSTRACT

Wetlands are very essential and fundamental tools to attract and growth of wildlife in Keoladeo National Park Bharatpur (KNP). Many efforts were taken to conserve these wetlands due to scanty rainfall in this area that lead to their degradation and loss. Economic and ecological balance of the unmeasured wealth of this wetland must be checked otherwise its leads to become forest and endangered to world heritage site given by UNESCO. Scanty rainfall in this area from last two decades became a main reason in deteriorating the wetlands. In last 60 year this wetland reduced to half. This paper is based on the secondary data available from various state and central department, review of published papers and books on the subject.

Policy makers continue to be ignorant the enhancement and flourish of wetlands. There is an urgent need for conservationists to clearly quantify and demonstrate the importance of wetlands to halt further degradation and restore them, which requires comprehensive policy decisions, management efforts and a strong political will.