

Speed Post

ನಿಲಯ ಮಿತಾಶ್,
ನಿವಾಸಿ ಆಯುಕ್ತರು

No.

Date

Secretary to Government
Disaster Management, Bhoomi, & UPOB



ದೂ: ೨೬೮೮೮೮೦೪ / ಫ್ಯಾಕ್ಸ್: ೨೬೮೮೮೮೦೫೦
ಇಮೇಲ್: rckarnatakaneuvelhi@gmail.com

ಕರ್ನಾಟಕ ಭವನ,
೧೦, ಕೌಟಿಲ್ಯ ಮಾರ್ಗ
ಚಾಣಕ್ಯಪುರಿ,
ನವದೆಹಲಿ ೧೧೦ ೦೨೧

ಸಂ: ಆರ್‌ಸಿಕೆ/ಡಿಆರ್‌ಸಿ(ಪಿಆರ್)/೨೦೧೮
ದಿನಾಂಕ: 13.06.2018

ಕೇಂದ್ರ ಸರ್ಕಾರದ ಬರ ಕೈಪಿಡಿಗೇ ಬದಲಾವಣೆಯ ಸಂಬಂಧ, ದಿನಾಂಕ ೨೦ನೇ
ಏಪ್ರಿಲ್ ೨೦೧೮ರ ಈ ಕಚೇರಿಯ ಪತ್ರದೊಡೆ ತಮ್ಮ ಆದ್ಯ ಗಮನವನ್ನು ಸೆಳೆದಿದೆ.

ರಾಜ್ಯ ಸರ್ಕಾರದ ಪ್ರಸ್ತಾವನೆಯಲ್ಲಿ ಕೋರಿರುವಂತೆ, ಬರ ಕೈಪಿಡಿಯಲ್ಲಿನ
ಬದಲಾವಣೆಗೆ ಕೇಂದ್ರ ಸರ್ಕಾರವು ಅನುಮತಿಸಿದ್ದು, ಈ ಹಿನ್ನೆಲೆಯಲ್ಲಿ ಕೃಷಿ ಮಂತ್ರಾಲಯವು
ಹೊರಡಿಸಲಾದ ತಿದ್ದುಪಡಿಯ ಪ್ರತಿಯನ್ನು ಇದರೊಂದಿಗೆ ಲಗತ್ತಿಸಿ, ತಮ್ಮ ಅವಗಾಹನೆಗೆ
ಸಲ್ಲಿಸಿದೆ.

ತಮ್ಮ ವಿಶ್ವಾಸಿ,

ಸಹಿ/-

ಶ್ರೀ ಡಿ ವಿ ಪ್ರಸಾದ್

ಅಪರ ಮುಖ್ಯ ಕಾರ್ಯದರ್ಶಿಗಳು

ಮತ್ತು ಅಭಿವೃದ್ಧಿ ಆಯುಕ್ತರು

ವಿಧಾನ ಸೌಧ

ಬೆಂಗಳೂರು 560 001

✓ ಪ್ರತಿಯನ್ನು ಶ್ರೀ ಗಂಗಾರಾಮ್ ಬಡೇರಿಯಾ, ಸರ್ಕಾರದ ಪ್ರಧಾನ ಕಾರ್ಯದರ್ಶಿಗಳು,
ಕಂದಾಯ ಇಲಾಖೆ (ವಿಪತ್ತು ನಿರ್ವಹಣೆ), ವಿಕಾಸ ಸೌಧ, ಬೆಂಗಳೂರು 560 001: ರವರ
ಆದ್ಯ ಗಮನಕ್ಕಾಗಿ ಮತ್ತು ಮುಂದಿನ ಸೂಕ್ತ ಕ್ರಮಕ್ಕಾಗಿ ಕಳುಹಿಸಲಾಗಿದೆ.

(ನಿಲಯ ಮಿತಾಶ್)

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No.03-01/2018-DM-I
Government of India
Ministry of Agriculture and Farmers Welfare
Department of Agriculture, Cooperation and Farmers Welfare
(Drought Management Division)

Krishi Bhawan, New Delhi

Dated : 29th May, 2018

To

Chief Secretaries of
all State Governments

Subject: Amendment in the Manual for Drought Management.

Sir/Madam,

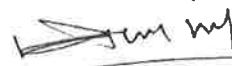
Please refer to the Manual for Drought Management, 2016(The Manual) which was forwarded to you vide this Department's letter No.9/1/2014-DM-I (pt.) dated 28.12.016.

2. Several state governments have represented that certain provisions of the Drought Manual are difficult to implement for declaration of drought. A one day workshop was organized with state governments, state agricultural universities, state space applications centres and Member of Expert Committee under the chairmanship of Additional Secretary & Central Drought Relief Commissioner on 12.03.2018 and the issues raised by the state governments in implementing the provisions of the Manual were deliberated extensively.

3. A decision has now been taken with the approval of the competent authority to introduce several amendments in the Manual as given in the Annexure.



Yours faithfully,



(Vijay Soni)

Under Secretary to the Government of India

Copy to:-

1. Home Secretary, North Block, New Delhi
2. Secretary, Department of Border Management, North Block, New Delhi
3. Secretary, DAHD&F, Krishi Bhawan, New Delhi
4. Secretary, Deptt. of Food & Public Distribution, Krishi Bhawan, New Delhi
5. Secretary, Ministry of DW&S, CGO Complex, Lodi Road, New Delhi
6. Secretary, Ministry of EF&CC, Indira Paryawaran Bhawan, Jor Bagh, New Delhi
7. Secretary, Department of Expenditure, North Block, New Delhi
8. Secretary, Department of Financial Services, Jeevan Deep Building, New Delhi
9. Secretary, Department of Health & Family Welfare, Nirman Bhawan, New Delhi
10. Secretary, Department of School Education & Literacy, Shastri Bhawan, New Delhi
11. Secretary, Ministry of Panchayati Raj, Krishi Bhawan, New Delhi
12. Secretary, Ministry of Power, Shram Shaktri Bhawan, New Delhi

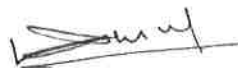
13. Secretary, Department of Rural Development, Krishi Bhawan, New Delhi
14. Secretary, Department of Land Resources, NBO Building, Nirman Bhawan, New Delhi
15. Secretary, Ministry of Water Resources, River Development & Ganga Rejuvenation, Shram Shakti Bhawan, New Delhi
16. Secretary, Ministry of Women & Child Development, Shastri Bhawan, New Delhi
17. Secretary, Department of Agricultural Research & Education, Krishi Bhawan, New Delhi
18. Secretary, Department of Space, Lok Nayak Bhawan, (III Floor), New Delhi
19. CEO, NITI Aayog, NITI Aayog Bhawan, New Delhi
20. Director General, IMD, Mausam Bhawan, Lodi Road, New Delhi.

Copy also to:

1. PPS to Secretary, DAC&FW.
2. PPS to Additional Secretary(DM), DAC & FW.

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30/5/18

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(Vijay Soni)

Under Secretary to the Government of India

Amendment to the Drought Manual

Sl. No.	Existing	Amended
1.	Page No. 16 of Manual 1.3 Impact of Drought Social impacts are manifest in widespread disruption in rural society on account of out-migration of the population from drought affected areas, rise in school dropout rates, greater immiseration and indebtedness, alienation of land and livestock assets, malnutrition, starvation and loss of social status among the most vulnerable sections. The situation of scarcity in some cases may exacerbate social tensions and lead to erosion of social capital.	1.3 Impact of Drought Social impacts are manifest in widespread disruption in rural society on account of out-migration of the population from drought affected areas, rise in school dropout rates, greater immiseration and indebtedness, alienation of land and livestock assets, malnutrition, starvation and loss of social status among the most vulnerable sections. The situation of scarcity in some cases may exacerbate social tensions and lead to erosion of social capital. <u>Besides, generation of hydroelectricity is adversely impacted by drought which indirectly accentuates the detrimental economic impacts of drought on both agriculture and industry.</u>
2.	Page No. 19 of Manual 2.1.1 Need The objectives behind an effective monitoring and early warning system are to: - provide accurate and timely information on rainfall, crop sown area, data on soil moisture (wherever possible), stream flow, groundwater, lake and reservoir storage at the relevant spatial scale at the State / district / sub-district levels. - detect drought conditions as early as possible in order to implement District Agriculture Contingency Plans and the Crisis Management Plan.	2.1.1 Need The objectives behind an effective monitoring and early warning system are to: - provide accurate and timely information on rainfall, crop sown area, data on soil moisture (wherever possible), stream flow, groundwater, lake and reservoir storage at the relevant spatial scale at the State / district / sub-district levels. - detect drought conditions as early as possible in order to implement District Agriculture Contingency Plans and the Crisis Management Plan. <u>declare drought based on Objective Criteria for drought declaration.</u>
3.	Page No.20 of Manual 2. Crop Weather Watch Group The Crop Weather Watch Group (CWWG), in the DAC&FW, can act as an Inter-Ministerial mechanism, which should meet at least once a week during June to September period to monitor drought situation in the country. The composition of the Group and the specific areas of responsibility are suggested in Table 2.1 below.	2. Crop Weather Watch Group <u>for Drought Management</u> The Crop Weather Watch Group <u>for Drought Management</u> (CWWGDM), in the DAC&FW, can act as an Inter-Ministerial mechanism, which should meet at least once a week during June to September period to monitor drought situation in the country. The composition of the Group and the specific areas of responsibility are suggested in Table 2.1

Table 2.1: Composition and Role of CWWG

Partners	Task
Additional Secretary, Department of Agriculture, Cooperation & Farmers Welfare & Central Drought Relief Commissioner	Chairperson of the Group: overall coordination
Economics & Statistical Advisor, DAC&FW	Report behavior of agro-climatic and market indicators
Agriculture Commissioner	Crop conditions : Availability of Inputs: Contingency Planning.
Animal Husbandry Commissioner	Livestock health; Fodder availability
India Meteorological Department	Rainfall forecast and monsoon conditions.
Central Water Commission & Central Ground Water Board	Monitoring data on important reservoirs / ground water
Ministry of Power	Availability of Power
Indian Council of Agricultural Research (Crop Specific Research Institutes, Central Research Institute for Dryland Agriculture, Central Arid Zone Research Institute, Indian Agricultural Research Institute etc.)	Technical input and contingency planning
National Centre for Medium Range Weather Forecasting	Provide medium-term forecasts
Remote Sensing Centers	Provide satellite based inputs
Mahalanobis National Crop Forecast Centre	Agricultural Drought Information
Indian Space Research Centre	Technical inputs on drought parameters

The CWWG will be responsible for the evaluation of multi-source information and data from scientific and technical bodies to determine the likely impact of meteorological and other environmental parameters on agriculture. The CWWG could

below.

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Partners	Task
Additional Secretary, Department of Agriculture, Cooperation & Farmers Welfare & Central Drought Relief Commissioner	Chairperson of the Group: overall coordination
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Central Water Commission & Central Ground Water Board	Monitoring data on important reservoirs / ground water / <u>Stream flow</u>
Ministry of Power	Availability of Power
Indian Council of Agricultural Research (Crop Specific Research Institutes, Central Research Institute for Dryland Agriculture, Central Arid Zone Research Institute, Indian Agricultural Research Institute etc.)	Technical input and contingency planning
Mahalanobis National Crop Forecast Centre	Agricultural Drought Information
Indian Space Research Centre	<u>Provide technical and satellite based</u> inputs on drought parameters

The CWWGDM will be responsible for the evaluation of multi-source information and data from scientific and technical bodies to determine the likely impact of meteorological and other environmental parameters on agriculture. The CWWGDM could also consider video conferences with State Governments every week, particularly, during the June-Sept period, to keep a close watch on the developments in the agricultural scenario and forge a common plan of action with all stakeholders,

	also consider video conferences with State Governments every week, particularly, during the June-Sept period, to keep a close watch on the developments in the agricultural scenario and forge a common plan of action with all stake-holders, should the need arise. The monitoring and information-management system of the CWWG is summarized in Table 2.2.	should the need arise. The monitoring and information-management system of the CWWG <u>DM</u> is summarized in Table 2.2.
4.	Page No.21 of Manual 1. State Drought Monitoring Centres : The State Governments to consider setting up of Drought Monitoring Centres (DMCs) staffed by a multi-disciplinary team of meteorologists, hydrologists and agriculture scientists to provide critical inputs to the State Executive Committee / State Disaster Management Departments / Other Institutional Structures established by the States. The DMCs will collect, collate and analyse information on drought parameters from National and State level agencies e.g., the IMD, NRSC/ SRSCs, MNCFC, CWC, CGWB, State agricultural department etc.	1. State Drought Monitoring Centres : The State Governments <u>Should set up State</u> Drought Monitoring Centres (SDMCs) staffed by a multi-disciplinary team of meteorologists, hydrologists and agriculture scientists to provide critical inputs to the State Executive Committee / State Disaster Management Departments / Other Institutional Structures established by the States. The SDMCs will collect, collate and analyse information on drought parameters from National and State level agencies e.g., the IMD, NRSC/ SRSCs, MNCFC, CWC, CGWB, State agricultural department, <u>state agricultural universities</u> etc. <u>The SDMCs should hold a CWWG meeting once a week.</u>
5.	Page No.23 of Manual	7. State Agricultural Universities State Agricultural Universities (SAUs) have the mandate for education, research and extension in agriculture and allied sectors with wide network of research stations, colleges and KVKs. Thus, SAUs can play a crucial role in compilation and analysis of data on rainfall, dry spells etc in their domain districts and have a specific role in studies on Moisture Adequacy Index (MAI) and Standardized Precipitation Index (SPI) at mesoscale and Plant Available Soil Moisture (PASM) at micro level, to undertake further research in drought management and in field level verification or ground truthing for drought assessment. SAUs also have the responsibility of guiding the state government on various indices for drought declaration, dissemination of agromet advisories; contingency crop planning and drought management, particularly in operationalizing the real-time contingency measures during delayed onset of monsoon and early/midseason/terminal drought situations; capacity building on indices like MAI, PASM and SPI. Some of the SAUs are also using the experimental extended range weather forecasts of IMD/IITM in advising the farmers towards early preparedness. Therefore, with knowhow and practice of the above tasks, roles and responsibilities, SAUs should be an important partner in State Drought Monitoring Cell.

	2.1.3 Key Variables for Monitoring Drought State Governments monitor drought by obtaining information from various sources on key variables of drought which include rainfall, reservoir / lake water levels, surface water / groundwater, soil moisture and sowing / crop conditions etc. • Meteorological Data – Rainfall and other parameters like Temperature, Wind speed and Relative Humidity (subject to availability) • Weather forecast - Short, medium, extended range • Soil Moisture (subject to availability)	2.1.3 Key Variables for Monitoring Drought State Governments monitor drought by obtaining information from various sources on key variables of drought which include rainfall, reservoir / lake water levels, surface water / groundwater, soil moisture and sowing / crop conditions etc. • Meteorological Data – Rainfall and other parameters like Temperature, Wind speed and Relative Humidity • Weather forecast - Short, medium, extended range • Soil Moisture
6.	Page No.27 of Manual Levels of Early Warning The early warning system should include the following: 1. Receipt of forecasts, early warning signals, and advisories from scientific institutions; 2. Monitor key drought indices at the National / State / District / Sub-district levels using composite index of various drought indicators; 3. Efficient dissemination of early warning so as to activate contingency measures. Capacity Development for Drought Monitoring The States are advised to undertake capacity building activities from time to time for all the stakeholders engaged in drought monitoring, response and mitigation with the support of relevant National and State Institutes.	Deleted
7.	Page No.28 of Manual Meteorological Data: Agencies: India Meteorological Department, National Centre for Medium Range Weather Forecasting, State Governments Indices to be Monitored: Daily, weekly, and monthly rainfall, snow fall / fog.	Meteorological Data: Agencies: India Meteorological Department, State Governments. Indices to be Monitored: Daily, weekly, and monthly rainfall, <u>temperature</u>, snow fall.
8.	Page No.33 of Manual B. Dry Spell: A dry spell is a short period, usually 4 weeks (upto 3 weeks in case of light	B. Dry Spell: A dry spell is a short period, usually 4 weeks (upto 3 weeks in case of light

	soils), of low rainfall or no rainfall. Thus, consecutive 3-4 weeks after the due date for the onset of monsoon with rainfall less than 50% of the normal in each of the weeks is defined as a Dry spell. This indicator is important in that it quantifies the extent of intra-season rainfall variations which is so critical for the health of crops and maintenance of soil and hydrological regime. In regions normally associated with high rainfall (south west monsoon rainfall >1400mm), the dry spell criteria may need to be recalibrated in synch with the agro-climatic conditions.	soils), of low rainfall or no rainfall. Thus, consecutive 3-4 weeks after the due date for the onset of monsoon with rainfall less than 50% of the normal in each of the weeks is defined as a Dry spell. This indicator is important in that it quantifies the extent of intra-season rainfall variations which is so critical for the health of crops and maintenance of soil and hydrological regime. In regions normally associated with high rainfall (south west monsoon rainfall >1400mm), the dry spell criteria may need to be recalibrated in synch with the agro-climatic conditions. <u>In Sandy soil of arid areas(less than 500mm rainfall), like Rajasthan, two consecutive weeks of Dry Spell also may be considered along with rainfall deviation.</u>
9.	Page No.33 of Manual B. Standardized Precipitation Index (SPI) expresses the actual rainfall as a standardized departure with respect to rainfall probability distribution function and hence, the index has gained importance in recent years as a potential drought indicator permitting comparisons across space and time. The computation of SPI requires long term data on precipitation to determine the probability distribution function (gamma distribution) which is then transformed to a normal distribution with zero as mean and standard deviation of one. The longer the reference period to calculate the distribution parameters, the greater the likelihood of obtaining more accurate results (e.g. 50 years data will be better than that for 30 years). Thus, the values of SPI are expressed in standard deviations, positive SPI indicating greater than median precipitation and negative values indicating less than median precipitation. SPI can be ideally calculated on the basis of a minimum of 30 years of historical data for a station. SPI should be computed only for the monthly time scale. Fitting appropriate statistical distribution to the time series rainfall data is critical for an accurate SPI computation and interpretation with the help of expert advice. However, sparse availability of long term Block/Taluk/Mandal level quality data in many States is a limitation in computation of SPI. The States are advised to refer to URL of IMD viz. imd pune.gov. in for SPI data and related information.	B. Standardized Precipitation Index (SPI) expresses the actual rainfall as a standardized departure with respect to rainfall probability distribution function and hence, the index has gained importance in recent years as a potential drought indicator permitting comparisons across space and time. The computation of SPI requires long term data on precipitation to determine the probability distribution function (gamma distribution) which is then transformed to a normal distribution with zero as mean and standard deviation of one. The longer the reference period to calculate the distribution parameters, the greater the likelihood of obtaining more accurate results (e.g. 50 years data will be better than that for 30 years). Thus, the values of SPI are expressed in standard deviations, positive SPI indicating greater than median precipitation and negative values indicating less than median precipitation. SPI can be ideally calculated on the basis of a minimum of 30 years of historical data for a station. SPI should be computed only for the monthly time scale. Fitting appropriate statistical distribution to the time series rainfall data is critical for an accurate SPI computation and interpretation with the help of expert advice. However, sparse availability of long term Block/Taluk/Mandal level quality data in many States is a limitation in computation of SPI. The States are advised to refer to URL of IMD viz. imd pune.gov. in for SPI data and related information. <u>The states, having block/taluka level rainfall data, can share the rainfall data of 30 years and administrative boundary with IMD to get</u>

Table 3.2 Standardized Precipitation Index (SPI) Categories

SPI Value	Category
< - 2	Extremely Dry
-1.99 to -1.5	Severely Dry
-1.49 to -1.0	Moderately Dry
-0.99 to 0	Mildly Dry
0 to 0.99	Mildly wet
1.0 to 1.49	Moderately wet
1.5 to 1.99	Severely wet
>2.0	Extremely Wet

I.a. The State Government could consider declaring a drought if the total rainfall received during the months of June and July is deficient by 50% or more as compared to the normal rain fall accompanied or otherwise with dry spell, and if there is an adverse impact on area under sowing, vegetation and soil moisture, or

I.b. The State Government could consider the declaration of drought if the total rainfall received during the months of October and November is deficient by 50% or more as compared to the normal rainfall accompanied or otherwise with dry spell, and if there is an adverse impact on the area sowing, vegetation and soil moisture, or

II. if the total rainfall for the entire duration of the rainy season of the State, from June to September (the South-West Monsoon) and / or from December to March (North-East Monsoon), is deficient as measured by either rainfall deviation (less than 75% of the average rainfall for the season) or SPI value less than - 1.0 with or without dry spells, and there is an adverse impact on area under sowing, vegetative health and soil moisture, as expressed through the vegetation soil moisture indices.

the SPI values.

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>2.0	Extremely Wet

10. Page No.34 of Manual

3.2.2 Remote Sensing based Vegetation Indices

Advancements in satellite remote sensing technology has enabled regular monitoring of crop conditions/vigour over large regions. Among the various spectral vegetation Indices commonly derived from remote sensing data, Normalized Difference Vegetation Index (NDVI) is most widely used for operational assessment

3.2.2 Remote Sensing based Vegetation Indices

Advancements in satellite remote sensing technology has enabled regular monitoring of crop conditions/vigour over large areas and hence is an important input for drought assessment. Satellite image derived Normalized Difference Vegetation Index (NDVI) and Normalized Difference Wetness Index(NDWI) are recommended for agricultural drought

of drought owing to the ease in calculation and interpretation and also its ability to partially compensate for the effects of atmosphere, illumination geometry etc. NDVI is derived using the formula $(\text{NIR} - \text{Red}) / (\text{NIR} + \text{Red})$, where NIR and Red are the reflectance in visible and near infrared channels. Water, clouds and snow have higher reflectance in the visible region and consequently NDVI assumes negative values for these features. Bare soil and rocks exhibit similar reflectance in both visible and near IR regions and the index values are near zero. The NDVI values for vegetation generally range from 0.2 to 0.6, the higher index values being associated with greater green leaf area and biomass.

Shortwave Infrared (SWIR) band is sensitive to moisture available in soil as well as in crop canopy. In the beginning of the cropping season, soil background is dominant hence SWIR is sensitive to soil moisture in the top 1-2 cm. As the crop growth progresses, SWIR becomes sensitive to leaf moisture content. SWIR band provides only surface wetness information. Normalized Difference Wetness Index (NDWI), computed using SWIR data, can complement NDVI for drought assessment particularly in the beginning of the cropping season. NDWI is derived as follows: $\text{NDWI} = (\text{NIR} - \text{SWIR}) / (\text{NIR} + \text{SWIR})$ where, NIR and SWIR are the reflected radiation in Near-Infrared and Shortwave Infrared channels. Higher values of NDWI signify more surface wetness.

Satellite based crop condition anomalies which point towards agricultural drought can be generated by computing Vegetation Condition Index (VCI) or NDVI/NDWI deviations from the normal years. Normal NDVI/NDWI is generated by averaging the NDVI/NDWI of at least 3 recent normal years. Such comparisons enable minimization of the effect on account of the differences in cropping pattern and crop calendar.

$$\text{NDVIddev} = \{(\text{NDVI}_i - \text{NDVI}_n) / \text{NDVI}_n\} * 100$$

$$\text{NDWIddev} = \{(\text{NDWI}_i - \text{NDWI}_n) / \text{NDWI}_n\} * 100$$

Where subscript 'n' refers to normal value and 'i' to current period.

The value so obtained for a given NDVI or NDWI ranges from -1 to +1. A negative number or a number close to zero is indicative of poor vegetation and a number close to >0.6—1.0 signifies healthy vegetation in the case of NDVI and absence of water stress in the case of NDWI.

NDVI/NDWI deviation of -20 to -30% represents moderate drought conditions and that of <-30% represents severe conditions. However, these values may be different for different agro-ecological regions and cropping patterns.

To combine the NDVI and NDWI deviation

assessment and monitoring and hence all the State are mandated to maintain these datasets, in consultation with respective State Remote Sensing Centre.

NDVI is derived using the formula $(\text{NIR} - \text{Red}) / (\text{NIR} + \text{Red})$, where NIR and Red are the reflectance in visible and near infrared channels in satellite image. NDVI is sensitive to the density and vigor of crops and hence its values range from 0.2 to 0.6 for green vegetation, higher index values are associated with greater green leaf area and biomass. Bare soil and rocks exhibit similar reflectance in both visible and near IR regions and the index values are near zero. Wet soils and water bodies shows negative NDVI values.

NDWI is derived using the formula $(\text{NIR} - \text{SWIR}) / (\text{NIR} + \text{SWIR})$ where, NIR and SWIR are the reflected in Near-Infrared and Shortwave Infrared channels in satellite image. Higher values of NDWI signify more surface wetness, either from crop surfaces or background soil surfaces. In the beginning of the cropping season, soil background is dominant and NDWI is a proven indicator of surface soil wetness. As the crop growth progresses, NDWI becomes sensitive to leaf moisture content. Generally, over crop lands, NDWI values range from 0.1 to 0.5 with higher values indicating higher wetness.

The NDVI and NDWI values for agricultural areas of the current and previous years at monthly/fortnightly intervals starting from June month for kharif season and November for Rabi season for different administrative units i.e. districts/sub-districts/talukas/tehsils/mandals shall be obtained from State Remote Sensing Centers/MNCFC/NRSC.

There are two derivatives from NDVI/NDWI to indicate the drought impact on crop lands namely, (1) deviation index in percentage (NDVIddev) and (2) vegetation condition index (VCI). State are advised to use one of the two derivatives on for a given vegetation index i.e., either deviation index from normal or VCI for drought assessment.

For computing NDVIddev, normal NDVI/NDWI is generated by averaging the NDVI/NDWI of at least 2-3 recent normal years. Use of recent past normal years NDVI, minimize the effect of the differences in cropping pattern and crop calendar on NDVI/NDWI anomalies.

$$\text{NDVIddev} = \{(\text{NDVI}_i - \text{NDVI}_n) / \text{NDVI}_n\} * 100$$

$$\text{NDWIddev} = \{(\text{NDWI}_i - \text{NDWI}_n) / \text{NDWI}_n\} * 100$$

Where subscript 'n' refers to normal value and 'i' to current period.

NDVI/NDWI deviation of -20 to -30% represents

category, the poorest among the two will be used, for example, if NDVI deviation is moderate and NDWI deviation is 'Severe', then overall category will be 'severe'.

The current period values of Vegetation and Wetness index values can be compared with longterm data (at least ten years) by computing Vegetation Condition Index (VCI). The VCI compares the observed NDVI and NDWI to the range of values observed for the same period in previous years. The VCI is expressed in %age and gives an idea where the current value is placed within the extreme values (minimum and maximum) in the historical datasets normalized to a scale of 0 – 100%. Lower and higher values indicate bad and good vegetation state conditions, respectively. VCI is computed as under:

$$VCI(NDVI) = \{NDVI_{curr} - NDVI_{min}\} / NDVI_{max} - NDVI_{min} \times 100$$

$$VCI(NDWI) = \{NDWI_{curr} - NDWI_{min}\} / NDWI_{max} - NDWI_{min} \times 100$$

Where the subscript 'curr' refers to Current Period Value, 'min' and 'max' refer to minimum and maximum values of VI in historical dataset for the same period and same location.

For using VCI in drought assessment following threshold values can be used as given in Table 3.3.

Table 3.3: Classification of Vegetation Condition based on VCI value

VCI Value(%)	Vegetation Condition
60-100	Good
40-60	Fair
0-40	Poor

While combining VCI of NDVI and NDWI, the minimum of the two values can be taken, i.e if at least one is in 'very poor' condition, the category will be considered as severe. If both are 'poor' or at least one is 'poor', then the category will be taken to be Normal.

VCI is a promising index in that it has the advantage of being comparable over space and time on account of the normalization of differences in cropping patterns, crop calendars, atmospheric parameters. The limitation arises from the requirement of long term time series

moderate drought conditions and that of <-30% represents severe conditions. However, these values may be different for different agro-ecological regions and cropping patterns. NDVIdev values representing different drought classes are shown in the table 3.3

Table 3.3 Drought classes based on NDVIdev

NDVIdev (%)	Category
>-20	Normal
-20 to -30	Moderate
<-30	Severe

To combine the NDVI and NDWI deviation category, the poorest among the two will be used, for example, if NDVI deviation is moderate and NDWI deviation is 'Severe', then overall category will be 'severe'.

The current period values of NDVI/NDWI can be compared with longterm data (at least ten years) by computing Vegetation Condition Index (VCI). The VCI compares the observed NDVI and NDWI to the range of values observed for the same period in previous years. The VCI is expressed in %age and gives an idea where the current value is placed within the extreme values (minimum and maximum) in the historical datasets normalized to a scale of 0 – 100%. Lower and higher values indicate bad and good vegetation state conditions, respectively. VCI is computed as under:

$$VCI(NDVI) = \{NDVI_{curr} - NDVI_{min}\} / NDVI_{max} - NDVI_{min} \times 100$$

$$VCI(NDWI) = \{NDWI_{curr} - NDWI_{min}\} / NDWI_{max} - NDWI_{min} \times 100$$

Where the subscript 'curr' refers to Current Period Value, 'min' and 'max' refer to minimum and maximum values of VI in historical dataset for the same period and same location.

VCI in values representing different drought classes are shown in Table 3.4.

Table 3.4: Classification of Vegetation Condition based on VCI value

VCI Value(%)	Vegetation Condition
60-100	Normal
40-60	Moderate
0-40	Severe

While combining VCI of NDVI and NDWI, the minimum of the two values can be taken, i.e if at least one is in 'severe' category, the category will

data for NDVI/NDWI (at least 10 years) and the risk of VCI values getting affected by the differences in cropping patterns, crop calendars and atmospheric parameters. The computation and interpretation of VCI is complex and require the services of experts (from SRSCs/NRSC/MNCFC).

The data for the current season and historical NDVI/NDWI may be sourced from State Remote Sensing Centres / MNCFC / NRSC / NDVI / NDWI data of moderate spatial resolution is recommended for agricultural drought assessment at sub-district level. The best possible spatial resolution should be preferred (Resourcesat AWiFS of 56m resolution, or MODIS with 250m / 500m resolution). Use of coarse resolution data of 1 km is not desirable for sub-district level assessments. VCI data needs to be interpreted with caution when the crops are in maximum vegetative phase. It may be borne in mind while using satellite based vegetation indices (e.g., NDVI) that these indices may provide good indication of crop condition and bio-mass, which may not always offer close proximation of the estimate of crop yield.

The National Agricultural Drought Assessment and Monitoring System (NADAMS), developed by the National Remote Sensing Centre (NRSC), and currently being implemented by the Mahalanobis National Crop Forecast Centre (MNCFC) issues fortnightly/ monthly drought assessment reports on detailed crop condition during the kharif season for 14 agriculturally important and vulnerable States such as Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Haryana, Jharkhand, Karnataka, Maharashtra, Madhya Pradesh, Odisha, Rajasthan, Telangana, Tamil Nadu and Uttar Pradesh at present. These reports provide values for Normalized Difference Vegetation Index (NDVI), Normalized Difference Wetness Index (NDWI), and Vegetation Condition Index (VCI).

be considered as severe. If at least one is 'moderate' then category will be taken as 'moderate.'

VCI is a promising Index in that it has the advantage of being comparable over space and time on account of the normalization of differences in cropping patterns, crop calendars, atmospheric parameters. The limitation arises from the requirement of long term time series data for NDVI/NDWI (at least 10 years) and the risk of VCI values getting affected by the differences in cropping patterns, crop calendars, temporal technological trend and atmospheric parameters. VCI data needs to be interpreted with caution when the crops are in maximum vegetative phase.

Either NDVI or NDWI or both shall be used to indicate the drought conditions. In case of early season drought declaration, i.e., in July or August, NDWI of the corresponding month may be preferred, since it is a surface wetness indicator. However, August month NDVI, can also be used, to indicate the impact of early season drought.

For drought declaration in Sept//Oct months, either NDVI or NDWI or both the indices corresponding to Sep. or October months can be used. If the crops are in maximum vegetative phase in September and senescing phase in October then it is desirable to use September NDVI/NDWI. If the crops are in maximum vegetation phase in October, then the NDVI/NDWI of the same month may be used. Based on the cropping pattern, crop calendar and prevailing drought conditions, NDVI/NDWI of either September or October months may be used.

Combined use of NDVI and NDWI deviation is also recommended. In such case, the poorest among the two will be used, for example, if NDVI deviation is moderate and NDWI deviation is 'Severe', then overall category will be 'severe'.

For the convenience of States, computation of NDVI deviation and VCI, using the dataset obtained from MNCFC website, showcased in Table.

Table Computation of NDVI deviations and VCI with a test dataset

Year	Sep. month NDVI	Details	Value
2006	0.388	Minimum NDVI	0.388
2007	0.52	Maximum NDVI	0.663
2008	0.544	Max-Min NDVI	0.275
2009	0.489	VCI for Sep 2017 NDVI	78.55
2010	0.566	(Sep 2017 NDVI - Min. NDVI)/(Max-Min NDVI)*100	

		2011	0.489	Normal NDVI = average of 2-3 recent past normal years' NDVI i.e., average of 2016 and 2014 NDVI	
		2012	0.529		0.578
		2013	0.663		
		2014	0.614	NDVI deviation from normal for Sep 2017 (Sep. 2017 NDVI-Normal NDVI/Normal NDVI)*100	4.50
		2015	0.533		
		2016	0.542		
		2017	0.604		

The National Agricultural Drought Assessment and Monitoring System (NADAMS), developed by the National Remote Sensing Centre (NRSC), and currently being implemented by the Mahalanobis National Crop Forecast Centre (MNCFC) publishes fortnightly/ monthly drought indicators (NDVI/NDWI/MAI) for the benefit of states on its website www.ncfc.gov.in.

NDVI / NDWI data of moderate spatial resolution is recommended for agricultural drought assessment at sub-district level. The best possible spatial resolution should be preferred (Resourcesat AWiFS of 56m resolution or MODIS with 250m / 500m resolution). Use of coarse resolution data of 1 km is not desirable for sub-district level assessments.

It may be noted that these indices may provide good indication of crop condition and bio-mass, which may not always be close approximation of the estimate of crop yield.

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3.2.3.1 Area Under Sowing

The extent of sowing is an important Indicator of the spread and severity of drought. Sowing operations are linked to rainfall and availability of water during initial growth stage. Farmers in rainfed regions commence sowing operations mostly with the onset of the monsoon. If sowing fails due to water stress, farmers tend to sow a second or even a third time. Therefore, the area under sowing provides reliable information on the availability of water for agricultural operations.

Drought conditions could be said to exist if the total sown area under kharif crops was less than 33.3% of the total normal sown area by the end

3.2.3.1 Area Under Sowing

The extent of sowing is an important indicator of the spread and severity of drought. Sowing operations are linked to rainfall and availability of water during initial growth stage. Farmers in rainfed regions commence sowing operations mostly with the onset of the monsoon. If sowing fails due to water stress, farmers tend to sow a second or even a third time. Therefore, the area under sowing provides reliable information on the availability of water for agricultural operations.

Drought conditions could be said to exist if the total sown area under kharif crops is less than 85% of the total normal sown area by

of July/August, depending upon the schedule for sowing in individual States due to failure of rains or very late arrival of monsoon. In such situations, even if rainfall revives in the subsequent months, there is little possibility of full recovery and the agricultural production is likely to take a substantial hit. However, the conditions will indicate portents for drought of a 'severe' nature will appear strong, if the area under crops falls to 50% of the normal by the end of July / August. State Governments should, therefore, consider the status of coverage by the end of July/August to see if the shortfall in sown area is significantly short of the total normal sown area.

In the case of Rabi crops, coverage of sowing of less than 50% of the total normal sown area during October-November is a strong indicator of a drought like development. State Agriculture Departments collect data on crop-wise progress for sowing for District/Taluks/Tehsils/Blocks.

However, data on sown area under crops may not shed any light either on the health of the crop or subsequent damage to the sown crop due to moisture stress.

the end of July/August, depending upon the schedule for sowing in individual States due to failure of rains or very late arrival of monsoon. In such situations, even if rainfall revives in the subsequent months, there is little possibility of full recovery and the agricultural production is likely to take a substantial hit. However, the conditions will indicate portents for drought of a 'severe' nature, if the area under crops falls to 75% of the normal by the end of July / August. State Governments should, therefore, consider the status of coverage by the end of July/August to see if the shortfall in sown area is significantly short of the total normal sown area.

In the case of Rabi crops, coverage of sowing of less than 85% of the total normal sown area during October - November is a strong indicator of a drought like development. However, the conditions will indicate portents for drought of a 'severe' nature, if the area under crops falls to 75% of the normal during October- November State Agriculture Departments collect data on crop-wise progress for sowing for District/Taluks/Tehsils/Blocks.

However, data on sown area under crops may not shed any light either on the health of the crop or subsequent damage to the sown crop due to moisture stress.

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Table 3.4 Classification of Agricultural Drought based on PASM(%)

PASM(%)	Agriculture Drought Class
76-100	No drought
51-75	Mild drought
26-50	Moderate drought
0-25	Severe drought

Table 3.5 Classification of Agricultural Drought based on MAI(%)

MAI(%)	Agriculture Drought Class
76-100	No drought
51-75	Mild drought
26-50	Moderate drought
0-25	Severe drought

Table 3.4 Classification of Agricultural Drought based on PASM(%)

PASM(%)	Agriculture Drought Class
76-100	No drought
51-75	Moderate drought
0-50	Severe drought

Table 3.5 Classification of Agricultural Drought based on MAI(%)

MAI(%)	Agriculture Drought Class
76-100	No drought
51-75	Moderate drought
0-50	Severe drought

The ranges and class may be suitably modified by the state depending upon the local dominant crop types, soil properties, etc. in consultation with experts.

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However, the CWC monitors storage data of selected major reservoirs only. Real / near real time

However, the CWC monitors storage data of selected major reservoirs only. Real / near real

	data from minor / medium storage reservoirs, if gathered by the State Governments, can be useful in making assessments of hydrological drought and the possible impact on irrigated crops. Similarly, developing rainfall-run off relationship models will help in prognostic assessment of surface water availability. States may consider installing stream gauging stations - one for every 100 sq km to help develop prognostic tools for understanding supply availability vis a vis demand.	time data from minor / medium storage reservoirs, <u>should be collected</u> by the State Governments <u>and should be used</u> in making assessments of hydrological drought and the possible impact on irrigated crops. States may consider installing stream gauging stations - one for every 100 sq km to help develop prognostic tools for understanding supply availability vis a vis demand.
14.	Page No.40 of Manual The limitation of this index is the non-availability of real-time periodic data (monthly scale) of ground water level observations. As of now, India-WRIS platform (http://www.india-wris.nrsc.gov.in/GWLevelApp.html?UType=R2VuZXJhbA==?UName=) provides ground water observations 4 times in a year. Care should be placed on prudent selection of GWD_{imax} data so as to avoid getting misleading projections that may arise from outlier values in the historical data-set.	The limitation of this index is the non-availability of real-time periodic data (monthly scale) of ground water level observations. As of now, India-WRIS platform (http://www.india-wris.nrsc.gov.in/GWLevelApp.html?UType=R2VuZXJhbA==?UName=) provides ground water observations 4 times in a year. Care should be placed on prudent selection of GWD_{imax} data so as to avoid getting misleading projections that may arise from outlier values in the historical data-set. <u>The Ground water level records monitored by state ground water departments should be utilized along with data available with the CGWB to estimate GWDI.</u>
15.	Page No.41 of Manual Stream flow records (Average 10- daily or monthly discharge data) are maintained by CWC which can be sourced by the States for assessment of drought. The SFDI is straightaway applicable for the river systems having perennial flow characteristics. In case of intermittent and ephemeral flow characteristics, joint probability distribution approach is required to be used for estimation of truncation level. The SFDI suffers from limitation arising from the non-availability of historical data (30 years or more) which may sometimes result in erroneous assessment of stream-flow drought characteristics, particularly with regard to non snowfed river systems.	Stream flow records (Average 10- daily or monthly discharge data) are maintained by CWC which can be sourced by the States for assessment of drought. The SFDI is straightaway applicable for the river systems having perennial flow characteristics. In case of intermittent and ephemeral flow characteristics, joint probability distribution approach is required to be used for estimation of truncation level. The SFDI suffers from limitation arising from the non-availability of historical data (30 years or more) which may sometimes result in erroneous assessment of stream-flow drought characteristics, particularly with regard to non snowfed river systems. <u>States may consider installing stream gauging station-one for every 100sq km to help develop prognostic tools for understanding supply availability vis a vis demand.</u>
16.	Page No. 42 of the Manual 3.2.6 Ground Truthing or verification It is acknowledged by experts that parameters identified for assessment of drought while useful, suffer from deficiencies on account of limitations of the available technology, unavailability of a wide	3.2.6 Ground Truthing or verification The Ground Truthing shall be carried out only in case of districts/sub-districts where prescribed indices show moderate/severe drought conditions. It has to be conducted well before harvesting and as soon as

	network of monitoring stations, paucity and unreliability of long term data. It is, therefore, essential for a realistic and credible determination of a complex phenomenon such as drought, that the matrix based analysis (as at Table 3.10) is supplemented in the event that values in the matrix indicate a 'Moderate' or 'Severe' drought, by a quick field level sample survey. The findings of the quick sample survey shall be conclusive in the determination, intensity and spatial extent of drought. The Ground Truthing (GT) needs to be conducted in each of the 10% of the drought affected villages, selected on a random basis. In each of the selected villages, representative locations (about 5 sites for each of the major crops), may be inspected for data collection. The GT shall preferably be conducted using a smart phone based App. The app shall record the GPS coordinates of the site and the photo of the state of crop, with the provision to upload these parameters on a computer server for archiving for post-facto analysis. Inspection of isolated and small fields (<1 acre) should be avoided to improve the quality of field data. The States may identify the relevant crop/field attribute data for the Mobile App. Appropriate inspection protocols may be developed for providing guidance in collection of data. An estimation of crop damage / loss of 33% or more on the basis of field verification will qualify for the declaration of drought. However, for the drought to qualify as one of a 'severe' nature, the estimation of damage / loss to crops should be more than 50%. Form-11 at Annexure-1 has been suggested for the compilation of village wise data on damage to sown crops. It is desirable that declaration of drought by the State Governments is supported by the matrix based analysis and field level verification / GT.	the trigger 2 is set off. The Ground Truthing (GT) must be conducted in each of the 10% of the drought affected villages, selected on a random basis. In each of the selected villages, representative locations (about 5 sites for each of the major crops), may be inspected for data collection. The GT shall preferably be conducted using a smart phone based App. The app shall record the GPS coordinates of the site and the photo of the state of crop, with the provision to upload these parameters on a computer server for archiving for postfacto analysis. Inspection of isolated and small fields (<1 acre) should be avoided to improve the quality of field data. The States may identify the relevant crop/field attribute data for the Mobile App. Appropriate inspection protocols may be developed for providing guidance in collection of data. An estimation of crop damage / loss of 33% or more on the basis of field verification will qualify for the declaration of drought. However, for the drought to qualify as one of a 'severe' nature, the estimation of damage / loss to crops should be more than 50%. Form-11 at Annexure-1 has been suggested for the compilation of village wise data on damage to sown crops. It may be noted that this system of GT collection is objective based on technology and only for the purpose of declaration of drought. GT should not be confused with the traditional system of girdawari/paisewari/annewari etc., which are basically done for assessing the impact of drought and will be used for selection of beneficiaries.
17.	Page No.44 of the Manual Explanation : The intensity of the drought will be contingent upon the values of at least three out of four Impact Indicators viz, Agriculture, Remote Sensing, Soil Moisture and Hydrology in the following manner: - Severe drought: if all the selected 3 impact indicators are in Severe category - Moderate drought: if two of the selected 3 impact indicators are in 'Moderate' or 'Severe' class. - Normal: for all other cases. - Trigger 2 will be set off in the event of a finding of 'severe' or 'moderate' drought. <i>The State has an option to reduce the drought category by one rank (i.e. Severe to Moderate) if the irrigation percentage of the</i>	Explanation : The severity of the drought will be contingent upon the values of at least three out of four Impact Indicators viz, Agriculture, Remote Sensing, Soil Moisture and Hydrology in the following manner: Severe drought: if at least two of the selected 3 impact indicators are in 'Severe' category and one is in 'Moderate' category. Moderate drought: if at least two of the selected 3 impact indicators are in 'Moderate' category. - Normal: for all other cases. - Trigger 2 will be set off in the event of a finding of 'severe' or 'moderate' drought.

	<i>administrative region (District/Taluk/Block/Mandal), for which drought is being declared is more than 75%. However, in such a situation of reduction of drought intensity from 'Moderate' to 'Normal', the State Government will still be required to conduct field verification as prescribed in Step 3 below.</i> Step 3: In the event that trigger 2 is set off, States will conduct sample survey for ground truthing as described at 3.2.6 above and in order to make a final determination of drought. The finding of field verification exercise will be the final basis for judging the intensity of drought as 'severe' or 'moderate'.	<i>The State has an option to reduce the drought category by one rank (i.e. Severe to Moderate) if the irrigation percentage of the administrative region (District/ Taluk/ Block/ Mandal), for which drought is being declared is more than 75%. However, in such a situation of reduction of drought intensity from 'Moderate' to 'Normal', the State Government will still be required to conduct field verification as prescribed in Step 3 below.</i> Step 3: In the event that trigger 2 is set off (severe or moderate), States will conduct sample survey for ground truthing as described at 3.2.6 above. The finding of field verification exercise (GT) will be final for judging the intensity of drought as 'severe' or 'moderate' depending on the crop loss. In case, 80% of GT reveals crop loss of more than 50%, states have option to upgrade the intensity of drought from Moderate to Severe category. The criteria for declaration will be same in case of consecutive drought.
18.	Page No.45 of the Manual 3.3 DECLARATION OF DROUGHT The State Governments will declare drought through a notification specifying clearly the geographical extent and administrative units such as Gram Panchayats, Blocks, Mandals, Taluks, Sub-division, Districts. Such notification will also indicate the level of severity of the drought (moderate or severe). The validity of such notification will not be for more than 6 months unless de-notified earlier. The declaration of Kharif drought should not be done later than 30 October and the Rabi drought by 31 March. The State Governments will declare the calamity as "drought " and not by any other nomenclature, if the conditions referred to in 3.3.1 are fulfilled (see Annexure-3). Drought declaration in the early season Drought declaration during August month may be carried-out, if the seasonal conditions signify drought like situation. Deficit rainfall in June and July with prolonged dry spells leading to significant reduction in crop sown area can trigger the declaration of early drought.	3.4 DECLARATION OF DROUGHT The State Governments will declare drought through a notification specifying clearly the geographical extent and administrative units such as Gram Panchayats, Blocks, Mandals, Taluks, Sub-division, Districts. Such notification will also indicate the level of severity of the drought (moderate or severe). The validity of such notification will not be for more than 6 months unless de-notified earlier. The declaration of Kharif drought should not be done later than 31 October and the Rabi drought by 31 March. The State Governments will declare the calamity as "drought " and not by any other nomenclature, if the conditions referred to in 3.3.1 are fulfilled (see Annexure-3). <u>In case of delayed sowing/transplanting, states can ask for extension of drought declaration date (31th October/31st March). This extension cannot be more than 3 weeks in any case. The sates may provide documentary evidence along with extension request.</u> Drought declaration in the early season Drought declaration during August month may be carried-out, if the seasonal conditions signify drought like situation. Deficit rainfall in June and July with prolonged dry spells leading to significant reduction in crop sown area can trigger the

	Indicators for early season drought declaration Rainfall deficiency based on rainfall deviation or SPI and the dry spell as shown in Table 3.9 continue to be mandatory for declaration. Among the impact indicators, reduction in crop sown area or failed sowing, MAI, Ground water or Reservoir water index are important. NDVI is less effective when the canopy coverage is low. In such situation NDWI, a surface wetness indicator is preferred to NDVI.	declaration of early drought. Rainfall deficiency based on rainfall deviation or SPI and the dry spell as shown in Table 3.9 continue to be mandatory for declaration. Among the impact indicators, reduction in crop sown area or failed sowing, MAI, Ground water or Reservoir water index are important. NDVI is less effective when the canopy coverage is low. In such situation NDWI, a surface wetness indicator is preferred to NDVI.
19.	Page No.45 of the Manual 3.5.1 Submission of Memorandum for Financial assistance under NDRF A Memorandum for assistance under the National Disaster Response Fund (NDRF) will be submitted within a week of the declaration of drought only if the calamity is of a severe nature. Only those items should be included in the Memorandum that are admissible as per extant guidelines of the Ministry of Home Affairs. The Memorandum for assistance will mandatorily contain a copy of the State Government notification on drought, details of assessment of drought as per Table 3.10 and details of village-wise field verification data (para 3.2.6). The State Governments will consider the overall socio-economic scenario as reflected through distress migration, fodder shortage, food and drinking water scarcities, abnormal price rise in food commodities and fodder, malnutrition among vulnerable sections for providing relief.	3.5.1 Submission of Memorandum for Financial assistance under NDRF A Memorandum for assistance under the National Disaster Response Fund (NDRF) will be submitted within a week of the declaration of drought only if the calamity is of a severe nature. Only those items should be included in the Memorandum that are admissible as per extant guidelines of the Ministry of Home Affairs. The Memorandum for assistance will mandatorily contain a copy of the State Government notification on drought, details of assessment of drought as per Table 3.10 and details of village-wise field verification data (para 3.2.6). The State Governments will consider the overall socio-economic scenario as reflected through distress migration, fodder shortage, food and drinking water scarcities, abnormal price rise in food commodities and fodder, malnutrition among vulnerable sections for providing relief. <u>If SDRF is not able to meet Drought relief, states may submit a memorandum for assistance under NDRF even if the drought is of moderate category.</u>