

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 : 23<sup>rd</sup> July, 2018

To

Chief Secretaries of  
all State Governments

**Subject: Amendment in the Manual for Drought Management.**

Sir/Madam,

I am directed to refer to this department's letter of even number dated 29.05.2018 forwarding therewith amendments made in the Manual for Drought Management, 2016 and to say that with the approval of the competent authority it has now been decided to add a separate chapter on **Rabi Drought Declaration** as Annexure to the Chapter-3 of the Manual of Drought Management (Copy enclosed).

**Encl: As above.**

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.



(Vijay Soni)

Under Secretary to the Government of India

**Copy also to:**

1. Dr. S. S. Ray, Director, MNCFC, DAC & FW, New Delhi.
2. Dr. C S Murthy, Head, Agriculture Sciences and Applications, National remote sensing Centre, ISRO, Hyderabad.
3. Dr. V. K Sehgal, Principal Scientist, ICAR-IARI, New Delhi.
4. Dr. G Ravindrachary, Project Coordinator, CRIDA, Hyderabad.
5. Dr. Anand Kumar Sharma, Scientist 'F', IMD, New Delhi.
6. PPS to Secretary, DAC&FW.
7. PPS to Joint Secretary(DM), DAC & FW.
8. Deputy Secretary (DM), DAC & FW.
9. Under Secretary (DM), DAC&FW.



**(Vijay Soni)**

**Under Secretary to the Government of India**

## **Annexure**

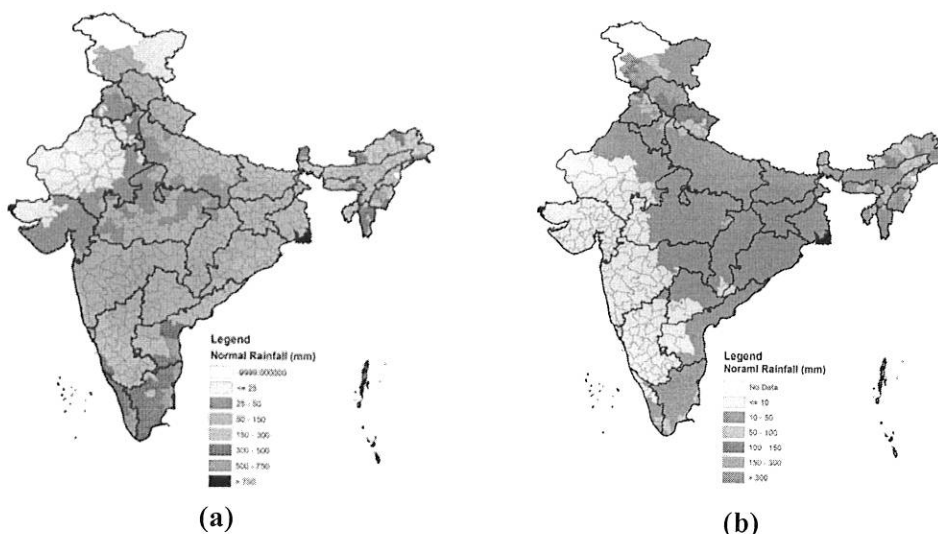
### **Drought Declaration in Rabi Season**

#### **1. Background**

*Rabi* season of India is predominantly an irrigated agro-ecosystem contributing to large proportion of food grain production. Irrigated conditions coupled with abundant availability of solar radiation due to clear sky conditions make the *rabi* crop season the most productive crop season of India. *Rabi* crop season refers to the crop growing period starting from September/October and extending to February/March. In this season, crops are cultivated mostly under four diverse agro-ecological situations, viz. (i) rainfed situation by exploiting residual moisture, ii) surface irrigated command areas, iii) ground water irrigated (outside the command areas) and iv) rainfed situation by depending on the North-east monsoon rainfall. In some parts of the country like north interior Karnataka, Madhya Maharashtra, *rabi* starts early i.e., in September itself. The normal *rabi* cropping area is about 63.8 M Ha which accounts to about 45% of total net sown area in the country. Major *rabi* season cropping states are Uttar Pradesh (around 20% of total *rabi* cropped area) Madhya Pradesh (16%) and Rajasthan (12%). Each of Andhra Pradesh, Bihar, Punjab, Haryana, Karnataka and Maharashtra states contributes about 5 - 10 % of total *rabi* crop area. Wheat crop alone accounts to 47.63% of total *rabi* area followed by pulses (22.03%), oil seeds (13.3%), coarse cereals (10.2%) and rice (6.83%).

Rainfall during North East Monsoon and winter seasons, play an important role in *rabi* season's crop production. Although the rainfall during these two seasons together represents less than 30% of the annual rainfall of the country, in the states like Tamil Nadu it represents larger proportion of total rainfall and determines the crop prospects. Spatial distribution of rainfall during these two seasons is depicted in Figs. 1 (a) and (b).

The major causes for drought during *rabi* could be deficit rainfall during South West and North East Monsoon seasons leading to (a) poor residual soil moisture, (b) reduced inflows in to reservoirs and water bodies, (c) poor/low groundwater recharge/levels in dug/open/bore wells. Drought occurrence during *rabi* season has been frequent in recent years due to lack of residual soil moisture, depletion of ground water, reduced reservoir storages etc. Due to over exploitation of ground water and vagaries of nature in climate change scenarios, irrigation is no more assured in the season. Thus it is often found that irrigation is not available for optimal number or during critical stages of the crops. The availability of water in the surface storages as well as ground water for *rabi* crop season is strongly linked to the performance of the monsoon that precedes the *rabi* season. Further, high temperature conditions, occurring quite often in recent years, also disrupt the water use of the irrigated command and cause drought. In many places particularly in the southern India, early *rabi* short durational crops are cultivated on the residual soil moisture, and these crops are very much exposed to water stress. The irrigation potential of the command area which depends on the storage water of the dam, ground water depth and quality, residue water in the soil profile determine the drought occurrence in *rabi* season. Thus the drought dynamics of *rabi* season is further more complex and high stake of the farmer is involved during this season.



\*Normal rainfall is based on the rainfall data from the year 1951 to 2000 (Data source: IMD)

Figure 1 (a) Normal Rainfall for the North East Monsoon season (Oct-Dec), (b) Normal Rainfall for the winter season (Jan-Feb)

Similar to kharif season drought, rabi season drought also leads to prevented/failed sowing or delay in sowing/transplanting and/or poor crop growth due to moisture stress resulting in crop losses. It also impacts the production and supply of fodder for the cattle in winter and following summer season. It has socio-economic impacts like shortage of drinking water, rising prices, lowering income of farmers, etc. and environmental impacts like over-exploitation of ground water.

## 2. BROAD INDICES AND FACTORS

The broad indices recommended here for drought assessment are related to rainfall, satellite based crop condition, soil moisture, crop sown area, surface water and ground water. Keeping in view the diversity in crop growing environments in rabi season, four categories of cropping situations have been identified as given in Table 1. For each of these four situations, Mandatory and Impact indicators are identified.

*Table 1: Categories of Rabi cropping Situations*

Situation	Name	Cropping season
Situation 1	Rainfed crops depending on residual moisture	September/October to January
Situation 2	Surface irrigated command areas	October to April
Situation 3	Ground water irrigated areas (Outside the command areas)	October to April
Situation 4	North-East monsoon dependent areas	October to February

**States shall identify the dominant cropping situation in the drought declaration unit i.e., Taluk, block etc and adopt the suitable set of indicators and decision rules.**

However, as an indication, generally the regions, which can be considered under above 4 cropping situations, are as follows,

- Situation 1 (Rainfed crops depending on residual moisture): Malwa region of MP, northern Karnataka, Madhya Maharashtra, parts of Andhra Pradesh, Telangana, Odisha, Chhattisgarh,

etc.

- Situation 2 (Surface irrigated command areas): Parts of Indo Gangetic Plains, Canal Command Areas of Tamil Nadu, AP, Telangana, Rajasthan, Gujarat, Karnataka, etc.
- Situation 3 (Ground water irrigated areas: Outside the command areas) Groundwater: Parts of Telangana, AP, Maharashtra, Karnataka, Bihar, West Bengal, Odisha, UP, etc.
- Situation 4 (North-East monsoon dependent areas): Major Parts of Tamil Nadu and Southern AP

The above list is only indicative and the states need to identify cropping situation of the district/tehsil/block for which the drought assessment is being made.

Due to heterogeneity in the crop growing environments, State Governments are advised to develop monitoring mechanism at the smallest possible administrative units (e.g. Hobli/ sub-division/ Tehsil/ Taluk/ Block/Mandal/ Gram Panchayat etc.), so as to enable generation of observation data / drought indicators for more realistic assessment of drought conditions. For definition and ranges of the indices given below, chapter 3 of the Drought Manual may be followed.

### **2.1: Rainfall Related Indices**

- Rainfall Deviation:
- Standardized Precipitation Index (SPI)
- Dry Spell

### **2.2 Remote Sensing based Vegetation Indices**

- Deviation percentage (%) Satellite derived Normalized Difference Vegetation Index (NDVI) and Normalized Difference Wetness Index (NDWI),
- Vegetation condition index (VCI)

### **2.3 Crop Situation Related Indices**

- Area under Sowing

### **2.4 Soil Moisture Based Indices**

- Percent Available Soil Moisture (PASM)
- Moisture Adequacy Index (MAI)

### **2.5 Hydrological Indices**

- Reservoir Storage Index (RSI)
- Ground Water Drought Index

### **2.6 Other Factors**

The State Governments may further monitor socio-economic indicators, as defined in section 3.2.5 of the Drought Manual.

### **2.7 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. The procedures defined in section 3.2.6 of



the Drought Manual need to be followed.

### 3. PROCESS FOR THE DETERMINATION OF DROUGHT DURING RABI SEASON

The Drought Monitoring Cells (DMCs) in the States will monitor data regularly on various critical parameters referred to earlier in this chapter and apprise the SEC/Disaster Management Department in the State Government on the spread and severity of an emerging drought like situation. As referred to earlier, the complexity of drought cannot be captured with the aid of a single indicator, but require a more comprehensive understanding of data on several parameters read in conjunction with rainfall, the most important and mandatory parameter in any determination of drought and bolstered by a field verification. Table 2 and 3 provide the Mandatory and Impact Indicators for different crop growing situations in rabi season. **States shall identify the dominant cropping situation in the drought declaration unit i.e., Taluk, block etc and adopt the suitable set of indicators and decision rules furnished in the following sections and tables.**

*Table 2 Mandatory Indicators for Drought monitoring/declaration in different cropping situations*

Situation	Cropping Situations	Mandatory Indicators
1	Rainfed crops depending on residual moisture	Rainfall during September to December (Rainfall deviation/SPI & Dry Spell)
2	Surface irrigated command areas	Reservoir Storage Index (RSI) at the end of September/October
3	Ground water irrigated areas (Outside the command areas)	Standardized Ground Water Level Index/ Ground Water Level Index (Post Monsoon)
4	North-East monsoon dependent areas	Rainfall during N-E Monsoon (October to December), Rainfall deviation/SPI & Dry Spell

*Table 3 Impact Indicators for Drought monitoring/declaration in different cropping situations*

Situation	Cropping Situations	Impact Indicators
1	Rainfed crops depending on residual moisture	<ul style="list-style-type: none"> <li>• Crop sown area.</li> <li>• Soil Moisture based (PASM/MAI)</li> <li>• Remote Sensing based NDVI/NDWI or VCI</li> </ul>
2	Surface irrigated command areas	<ul style="list-style-type: none"> <li>• Crop sown area</li> <li>• Remote Sensing based NDVI/NDWI or VCI</li> <li>• GWDI</li> </ul>
3	Ground water irrigated areas (Outside the command areas)	<ul style="list-style-type: none"> <li>• Crop sown area</li> <li>• Remote Sensing based(NDVI/NDWI)</li> </ul>
4	North-East monsoon dependent areas	<ul style="list-style-type: none"> <li>• Crop sown area</li> <li>• Soil Moisture based (PASM/MAI)</li> <li>• Remote Sensing based NDVI/NDWI or VCI</li> <li>• Hydrological based(RSI/GWDI)</li> </ul>

### 3.1 Steps in the Determination of Drought

Following steps are suggested for the determination of drought:

**Step 1:** Mandatory Indicators viz. RF deviation or SPI or Dry Spell will be considered as per matrix at Table 4 to assess if the first drought trigger is set off.

**Table 4:** Matrix for Mandatory Indicators (Trigger-1)

Rabi cropping Situation	Mandatory Indicator	Conditions	Drought trigger
<b>Situation 1:</b> Rainfed crops depending on residual moisture	Rainfall during September to December (Rainfall deviation/SPI & Dry Spell)	Deficit or scanty RF or SPI<-1 with Dry spell	Yes
		Deficit or scanty RF or SPI<-1 without Dry spell	Yes, if rainfall is scanty or SP<-1.5, else No
		Normal RF or SPI>-1 with Dry spell	Yes
		Normal RF or SPI>-1 without Dry spell	No
<b>Situation 2:</b> Surface irrigated command areas	Reservoir Storage Index (RSI) at the end of September/October	Percentage deficit in live storage volume of reservoir w.r.t. average storage of last 10 years is 30% and above.	Yes
<b>Situation 3:</b> Ground water irrigated areas (Outside the command areas)	Ground Water Drought Index (GWDI) (Post Monsoon)	GWDI <-0.30	Yes
<b>Situation 4:</b> North-East monsoon dependent areas	Rainfall during N-E Monsoon (October to December) (Rainfall deviation/SPI & Dry Spell)	Deficit or scanty RF or SPI<-1 with Dry spell	Yes
		Deficit or scanty RF or SPI<-1 without Dry spell	Yes, if rainfall is scanty or SP<-1.5, else No
		Normal RF or SPI>-1 with Dry spell	Yes
		Normal RF or SPI>-1 without Dry spell	No

**Step 2:** In the event that the first drought trigger is set off in Step 1, the Impact Indicators applicable in the particular rabi cropping situation as given in Table 5 will be considered.

**Table 5:** Impact indicators applicable in different rabi cropping situation for Trigger-2

Rabi cropping situations	Agriculture (Crop Sown Area)	Remote Sensing (VCI or NDVI/ NDWI Deviations)	Soil Moisture (PASM/ MAI)	Hydrology
<b>Situation 1:</b> Rainfed crops depending on residual moisture	applicable	applicable	applicable	Not-applicable

<b>Situation 2:</b> Surface irrigated command areas	applicable	applicable	Not-applicable	Only GWDI
<b>Situation 3:</b> Ground water irrigated areas (Outside the command areas)	applicable	applicable	Not-applicable	Not-applicable
<b>Situation 4:</b> North-East monsoon dependent areas	applicable	applicable	applicable	Only RSI/GWDI

### Drought Condition

For situation 1, 2 or 4, Drought will be considered as **Severe**: if any two indicators are in *Severe* category; and **Moderate**: (a) If one indicator in *Severe* category and one in *Moderate* category or (b) If any two indicators in *Moderate* category

For situation 3, Drought will be considered as **Severe**: if any one indicator is in *Severe* category; and **Moderate**: If both the indicators are in *Moderate* category.

**Step 3:** In the event that trigger 2 is set off (severe/moderate drought), States shall conduct sample survey for ground truthing as described at 3.2.6 in the Drought Manual and in order to make a final determination of severity of drought. The finding of field verification exercise will be the mandatory for judging the severity of drought as 'severe' or 'moderate'.

The criteria for drought declaration will be same in case of consecutive droughts.

### 3.2 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, Subdivision, 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 Rabi season drought should not be done later than 31<sup>st</sup> March.

#### Drought declaration in the early season

Drought declaration during November/December month as per the rabi cropping situation (as indicated in table 2) may be carried-out, if the seasonal conditions signify drought like situation. Deficit rainfall/Reservoir Storage level/Ground Water Levels in October/November leading to significant reduction in crop sown area can trigger the declaration of early drought. Mandatory Indicators as per the Cropping situation as shown in Table 4 continue to be mandatory for early declaration of drought.

### 3.3 Memorandum for Financial Assistance

The procedure defined in section 3.5 in the Drought Manual will be followed.



### **3.4 Timelines**

States will notify Rabi drought by 31<sup>st</sup> March. The further process will be followed as per the timelines given in Kharif season drought declaration.

All other aspects of Kharif season drought (as defined in the Drought Manual), such as DBT, should also be followed for Rabi season drought.

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