

# **Drought & Characterization**

**Water stress** occurs when the demand for water exceeds the available amount during a certain period causing deterioration of fresh water resources in terms of quantity (aquifer over-exploitation, dry rivers, etc.) and quality (eutrophication, organic matter pollution, saline intrusion, etc.).

**Water scarcity** is the lack of available water resources to meet water needs within a region.

**Drought** is a period of below-average precipitation in a given region, resulting in prolonged shortages of water supply, whether atmospheric, surface or ground water.

**Famine** is a widespread scarcity of food, caused by crop failure, population imbalance, or government policies. It is usually accompanied by regional malnutrition, starvation, epidemic, and increased mortality.

## Drought situations develop due to:

- Deficit precipitation that yield required volume of water
- Storage systems do not have sufficient water for supply
- Lesser crop area to meet food requirements
- Sale in distress conditions
- Crisis management approach is used in Drought management
- Resources & risk based capacity management practices
- Climate scenario along with depleted resources need
- Alternate sources of supply drain out on continuous tapping
- Need for inherent resource management based on vulnerability
- Exposure, sensitivity, adoptive capabilities



# Drought Perspective

Type	Reason	Observations
Meteorology	Deficit in rainfall	Mapping of water bearing clouds from Meteorological satellite
	High temperature & evaporation	Measurement of rainfall /snow fall Based on formation of monsoon at the sea and migration of cloud formation Local air mass circulation dissipate water-bearing clouds
Hydrology	River flow	Contribution from catchment run-off + springs + uniform rainfall pattern
	Reservoir storage	Legal & Illegal lifting of water; diversion of flow etc.  Catchment run-off, storage loss due to evaporation; seepage (embankments & side ways); infiltration
	Groundwater level	Decrease in groundwater level, non-potable drinking water
Agriculture	Non-availability of water for crops during growth period	No water for watering during critical growth period of crops  Plant growth deficiency and reduction in crop yield Decline in grain production & fodder
Economic	Fluctuation in commerce	Short supply of food / items Unstable commodity prices

## **Significant Factors that influence drought vulnerability in agricultural systems:**

- Biophysical factors (climate and soil)
- Technological (irrigation)
- Socio-economics (land use)

## **Drought vulnerability mapping**

- Agro- climatological factors - probability of seasonal moisture deficiency
- Soil water-holding capacity
- Agricultural systems (rainfed, irrigated, rangeland and livestock)

## **Output**

Vulnerability map with low vulnerability, low to moderate, moderate, and high vulnerability.

## **Managing agricultural risks**

- Land & Water Management
- Reduced tillage (including non-tillage)
- Water harvesting
- Supplementary irrigation

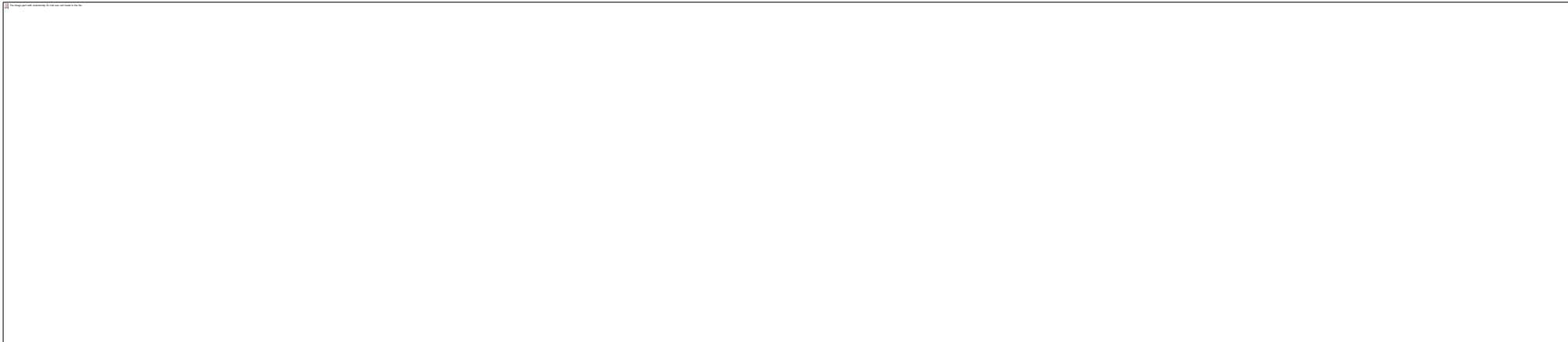
# Drought vulnerability and adaptive capacity of villages

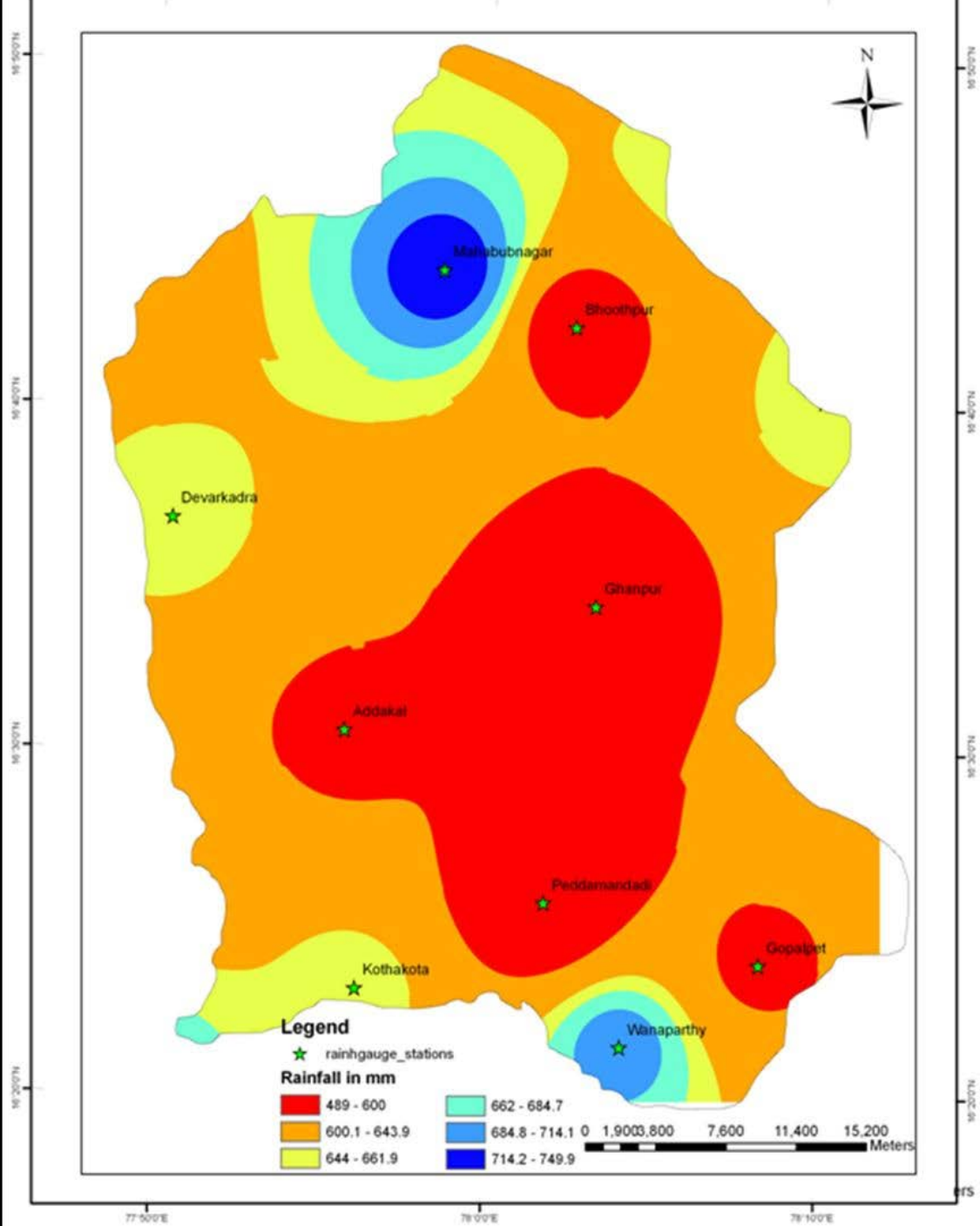
**Exposure** infers about the condition of a spatial unit depending on the extent, duration, magnitude and frequency of droughts.

Exposure index (EI)=( DF+DI+AR+SR+MR+WR+DS+TV+VC+CA+CCA+DC+WCA+PD+WS+RAI+SPI)/17

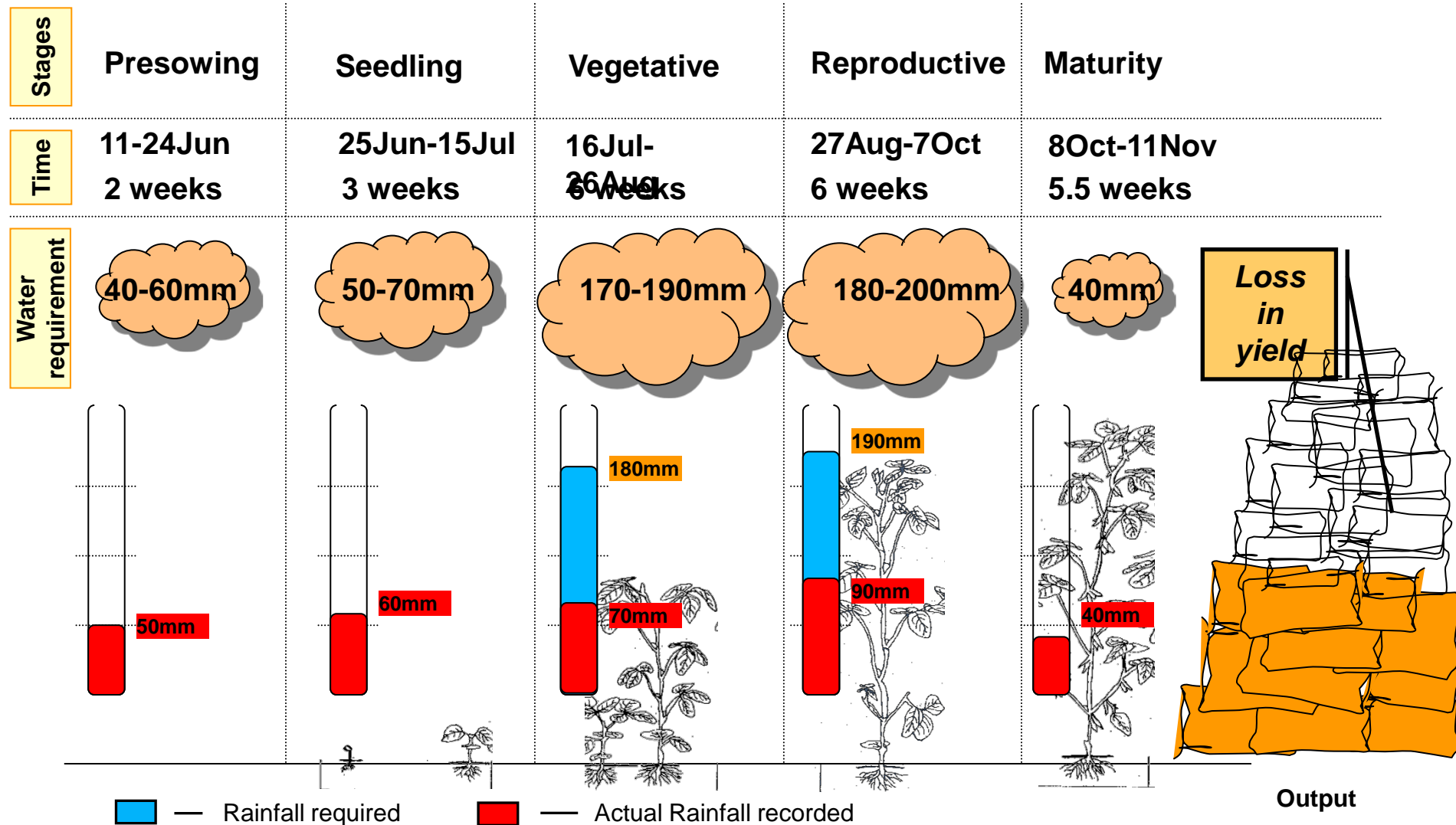
**Sensitivity** refers to the degree to which agriculture and agricultural laborers' response to drought or water stress. It is being assessed based on the farmer's decision to cultivate a crop or not due to delay of monsoon or improper distribution of rainfall.

Sensitivity index (SI)=(IA+AL+SL+CP)/4



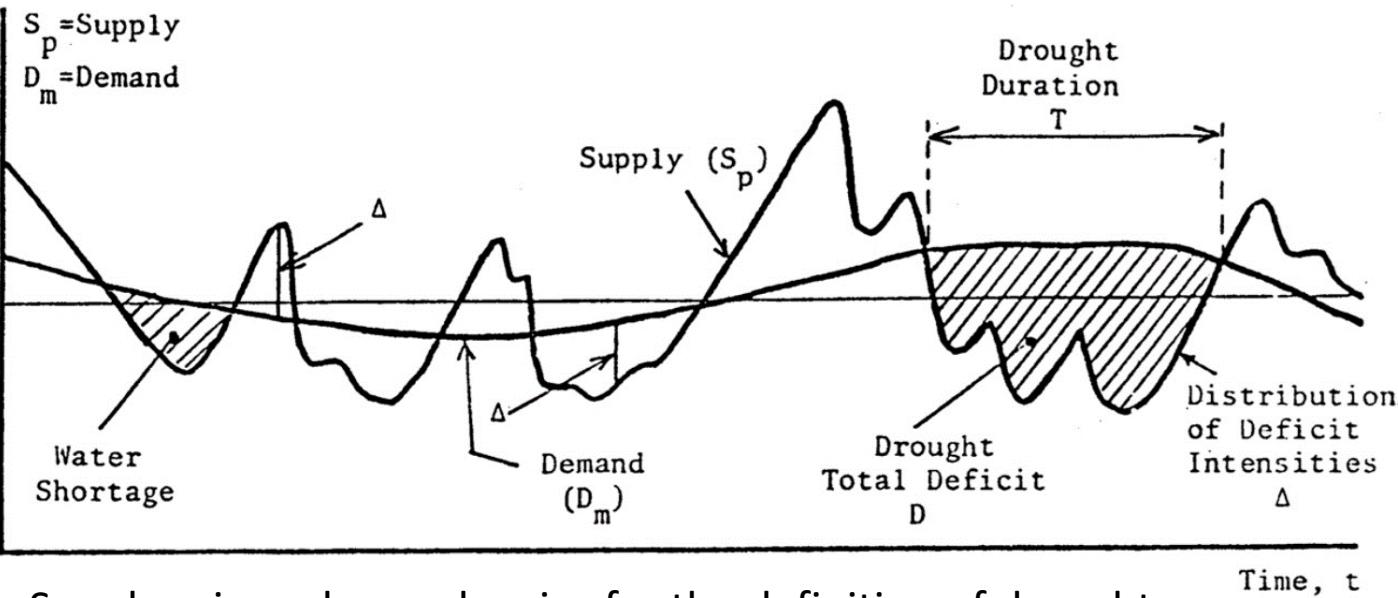


# Deviation in Rainfall and Impact on Yield





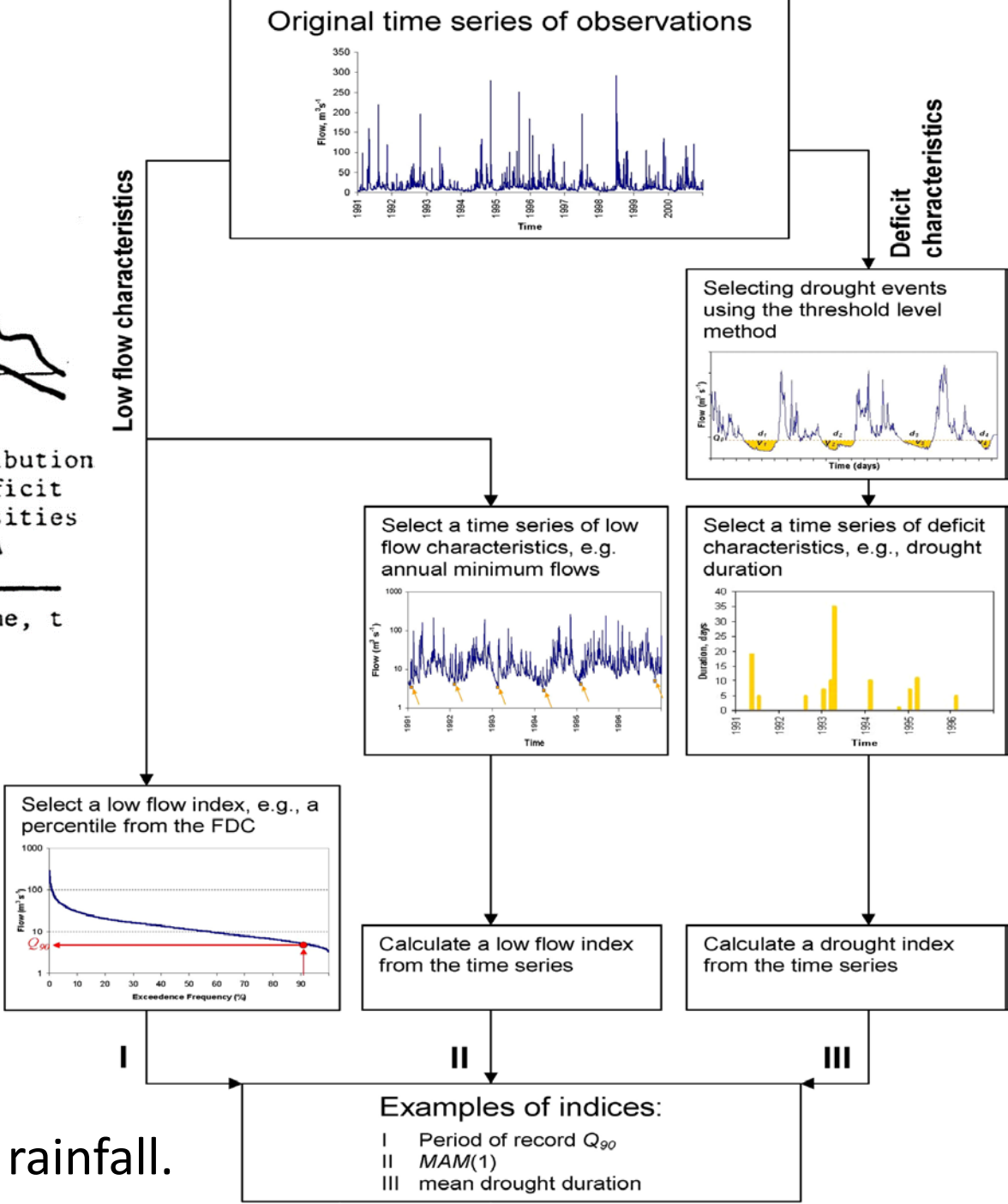
# Hydrological drought characteristics (Hisdal et al., 2004).

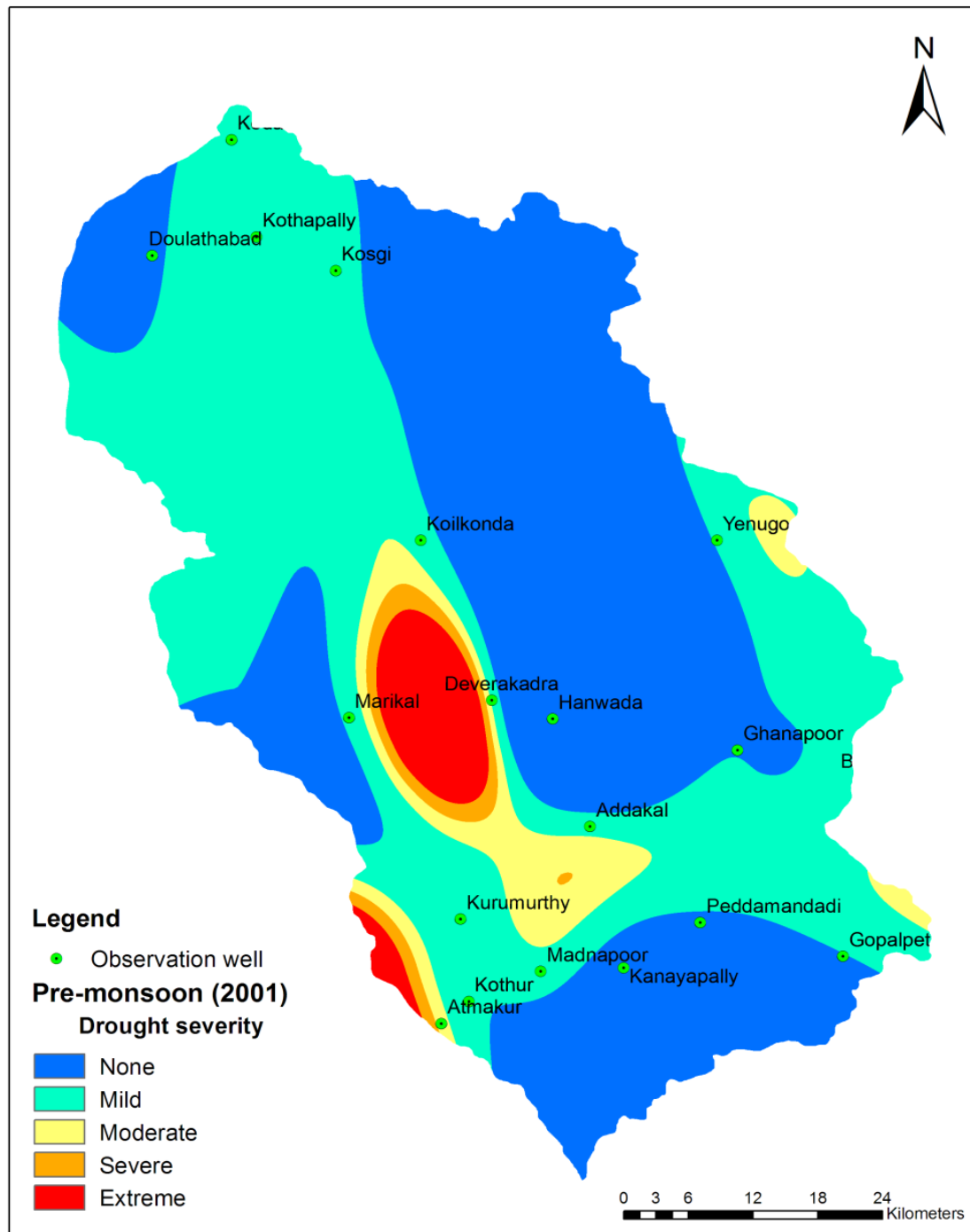


Supply-minus-demand series for the definition of droughts (Yevjevich, 1983).

## Stream flow :-

- **perennial**, in a channel which never dries up
- **intermittent**
- **ephemeral**, in a channel which flows only after rainfall.





## Standardised Water Level Index (SWI)

It gives inferences about groundwater levels fluctuations based on aquifer recharge, as an indirect reference to drought.

$$SWI = \frac{(W_{ij} - W_{im})}{\sigma}$$

$W_{ij}$  represents seasonal water level in  $i$ th well  $j$ th observation,

$W_{im}$  is the seasonal mean,

$\sigma$  is standard deviation.

Positive index values correspond to **drought** and negative values to **no drought**



**Thank You**