



RESEARCH PROGRAM ON  
Climate Change,  
Agriculture and  
Food Security



Research  
Program on  
Water, Land and  
Ecosystems

**IWMI**  
International Water  
Management Institute



# Utilization of Water Risk Knowledge Products for Agriculture Risk Management

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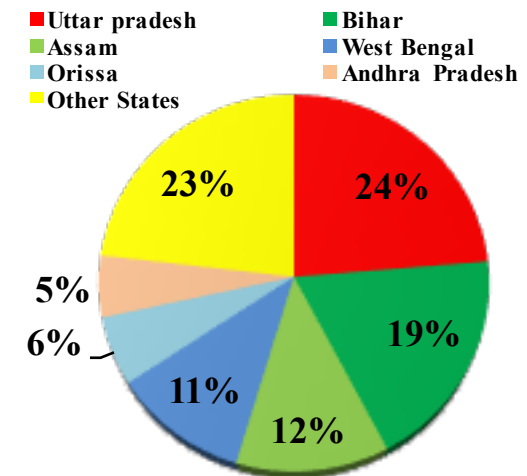
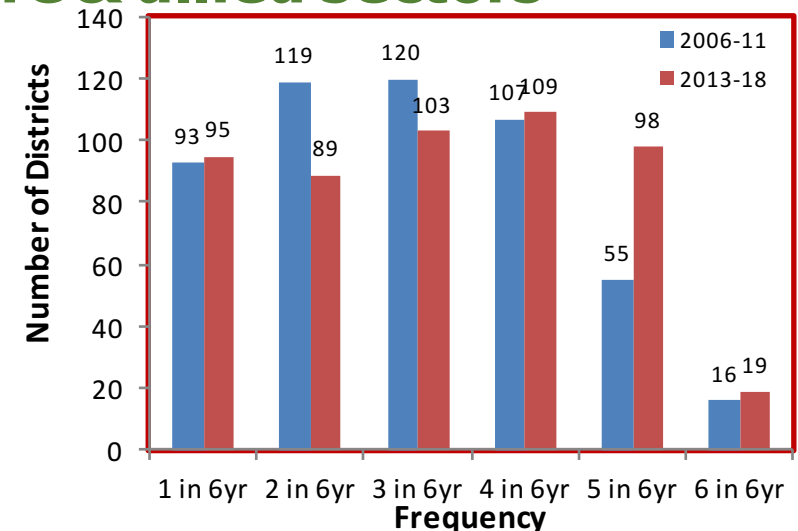


## Water related risks affecting Agriculture & allied sectors

- Monsoon dependent Indian agriculture suffers from recurring droughts and floods
- Drought occurs in all agro-climatic regions, with more severe impacts in arid and semi-arid regions and rainfed areas
- Increased frequency and intensity over the last two decades

### Flood Prone Areas in India

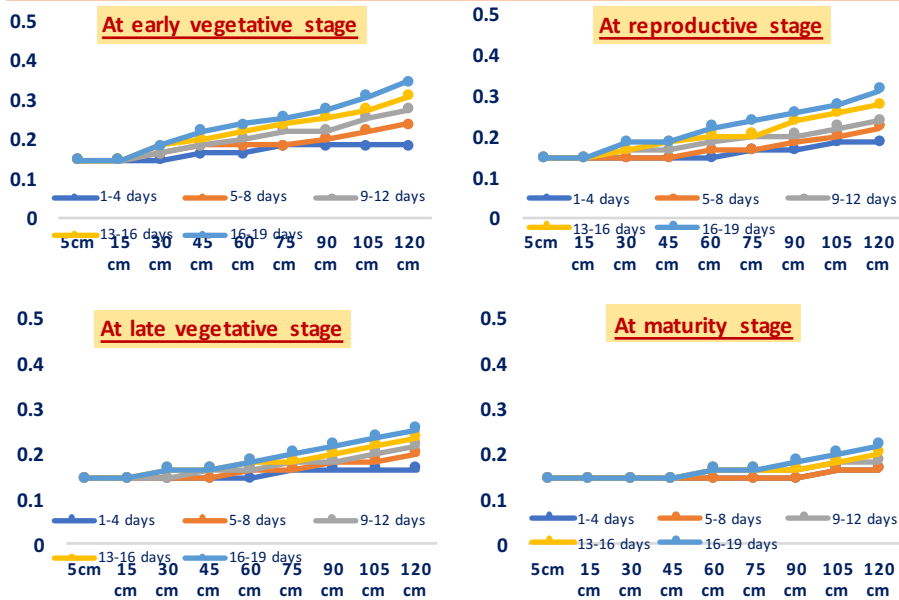
- ✓ National Flood Commission (1980): 40 M ha
- ✓ The Working Group on Flood Control Programme: 45.64 M ha
- ✓ Annual average area and population affected due to flood: 7.2 M ha and 3.19 million respectively.
- ✓ Brahmaputra-Meghna, Ganga and Indus most affected basins
- ✓ 39 districts chronically flood prone
- ✓ Uttar Pradesh and Bihar have significant flood prone area
- ✓ Need multi-pronged approach to address the diverse nature of floods



## Yield Loss Curves of Rice Developed for Strengthening Index Based Flood Insurance

- ✓ Evaluated yield loss response: rice varieties (Swarna sub-1, Durga and Tulasi).
- ✓ Swarna sub-1: better resilience under flash flood submergence condition.
- ✓ Yield loss of rice crop was maximum at early vegetative stage followed by reproductive stage, late vegetative stage and maturity stage irrespective of variety.

### Stage wise yield loss factors of rice (Var: Swarna Sub-1) with reference to potential yield (5.5 t ha<sup>-1</sup>) at different depth and duration of submergence



## Index-based Flood Insurance (IBFI) -Bihar

- ✓ About 363 farmers of flood affected villages of Gaihat and Katra blocks of Muzaffarpur district of Bihar under IBFI project were paid index-based flood insurance ranging from Rs.3,500 to Rs.20,000 per ha during 2018-2020
- ✓ About 150 farmers were paid index-based flood insurance during 2019-2020 by Hon'ble Union Minister of Animal Husbandry, Dairying & Fisheries Shri Giriraj Singh at ICAR-RCER, Patna, Bihar on 22nd February 2020.





## Post-flood Crop Management (PFM) Interventions for Enhancing Agricultural Resilience

### Crop specific post flood management (PFM) interventions identified for Rice, Maize, Potato

Based on the historical time, trend of flood events in Bihar and Odisha, the following scenarios are required for providing post-flood management:

#### A. Time of occurrence of flood event

- Early phase (July 1st week to August 1st week)
- Mid phase (August 2nd week to September 2nd week)
- Late phase (September 3rd week onwards)

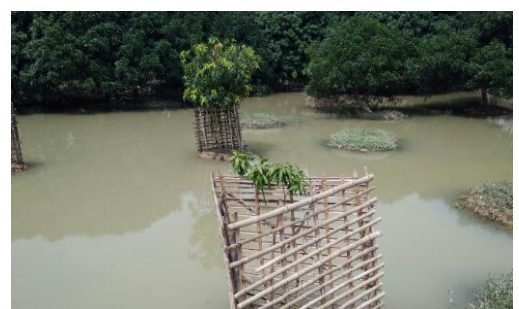
#### B. Duration and depth of flood water submergence

S.No	Duration (days)	Depth (m)
1	<=7	0.25-0.5
2		0.5-1.0
3	8-14	0.25-0.5
4		0.5-1.0

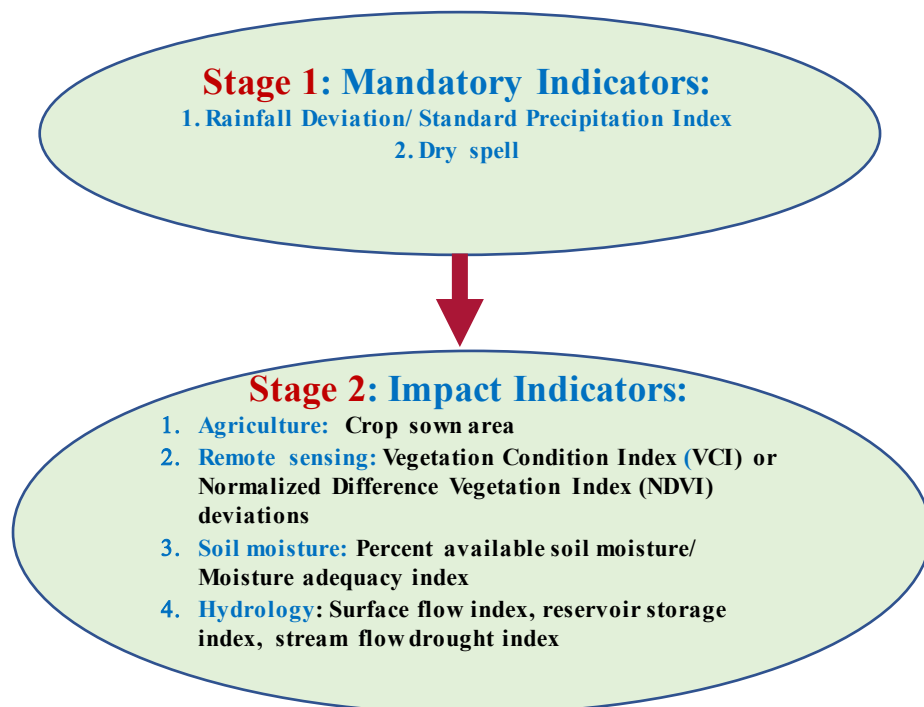
#### Interventions include

- **Alternate varieties and crops**
- **Promotion of short duration crops**
- **Agronomic and water management methods**

PFM interventions in farmers fields resulted in additional net economic returns of Rs 29,800 per ha in Muzaffarpur district and Rs 25,200 per ha in Puri district



The present drought monitoring mechanisms include (as per Drought Manual 2016)



**ICAR-IWMI Collaboration on  
Drought Monitoring and Management  
SADMS-South Asia Drought Monitoring System by IWMI**

- **Integrated Drought Severity Index (IDSI)**, a component of SADMS, is implemented across the country
- **IDSI integrates parameters of precipitation, temperature and vegetation condition and an index is generated**
- **Compared to traditional approach of VCI which considers NDVI, having a lag period of response to rainfall and temperature, IDSI is better equipped to reflect actual scenario**
- **Development of soil moisture related products**

**Data availability on different parameters and their periodicity is important for drought management**

**No single parameter would be sufficient to address complex issues of drought  
Combination of weather parameters and their derivatives, RS based  
parameters (IDSI) are used to assess drought conditions in India**

## Drought Management- Realtime

### 1. Pre season

- Seasonal forecast
- Interface meeting- Federal initiative
- Inputs supply arrangement
- Mobilisation of farming communities.

### 2. During season

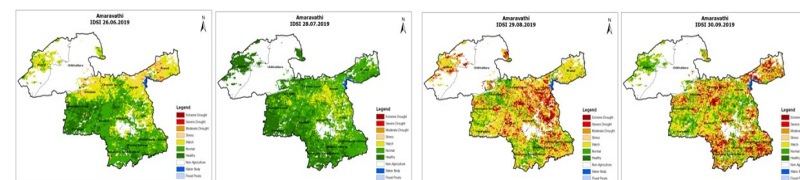
- Rainfall monitoring- Sub divisional, District, sub district level etc
- Crop sown status monitoring
- Dry spells, Deficient rainfall
- Remote sensing based indicators, IDSI (Integrated Drought Severity Index)
- Advisories to Dept and farming community

### 3. Post rainy season

- Groundwater recharge prospects
- Crop choices identification
- Need based water management interventions

## ICAR- NICRA ( National Innovations in Climate Resilient Agriculture)

- Implementation in 151 clusters covering 446 villages across country
- Technologies related to flood, drought etc are demonstrated in farmer fields



IDSI-Weekly Temporal Change- Amravati



Real time interventions were taken up based on rainfall deviation, dry spells and IDSI in selected KVKs (Farm Science Centres)



# Drought management

Collective efforts of ICAR and state agricultural universities

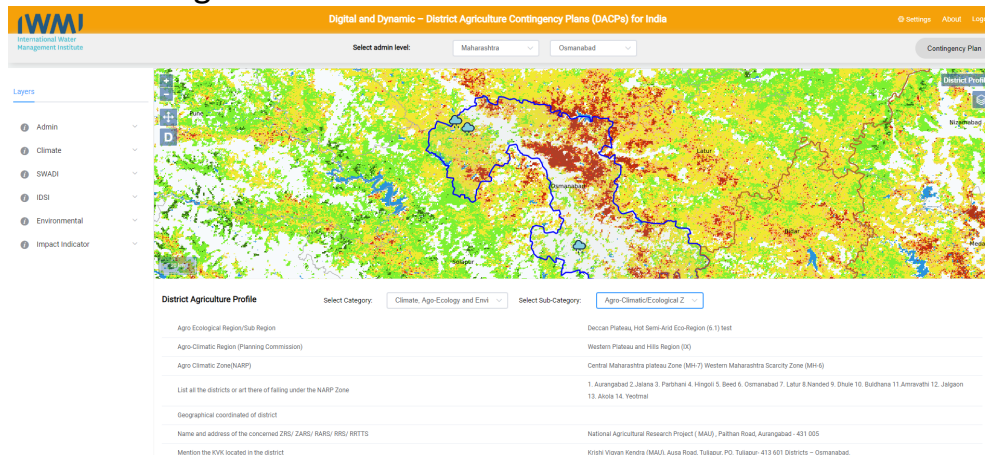
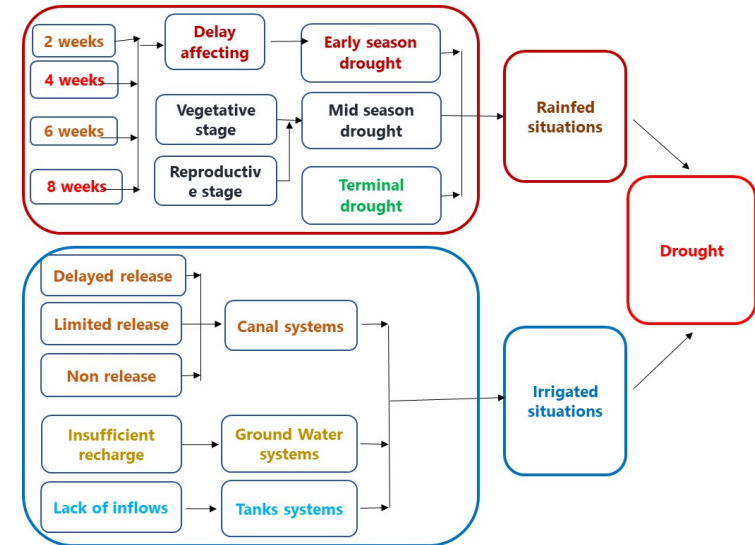
## The District Agricultural Contingency Plans

District- **Administrative unit for operationalization** of any action plan

650 district plans are developed & available on

<https://agricoop.gov.in/hi/agriculture-contingency-plan-listing> ,  
<http://www.icar-crida.res.in/>

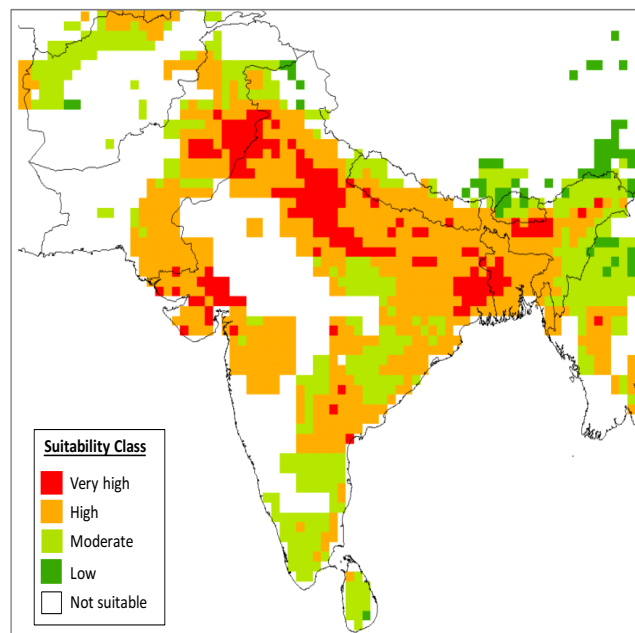
Interface meetings with state governments are organised before the monsoon season to enhance the preparedness to meet weather related contingences



India-Drought portal- In collaboration with IWMI

# Underground Taming of Floods for Irrigation (UTFI)

- UTFI - an appropriate solution for seasonal floods and droughts
- Estimated 137 million hectares of India's cropland has characteristics that are potentially well suited to UTFI
- ICAR-IWMI implemented and evaluated the concept of UTFI in Jiwai Jadid village in Milak block, Rampur district, Uttar Pradesh



Demonstration and scientific trial site in Uttar Pradesh



## Way forward

- **Development of post flood management strategies for flood affected districts utilising similar concepts**
- **Upscaling bundled solutions and Index based Flood Insurance in PPP mode**
- **Enhancing the utility of drought portal by national and state governments and relevant stakeholders through webinars and training programmes**
- **Digital and dynamic drought contingency advisories**
- **Updating the portal/ customisation with more data from state governments**
- **Improving dryland agriculture through conjunctive use of surface and groundwater**
- **Groundwater availability & use estimation through RS and other techniques**
- **Integrated agricultural risk monitoring, early warning and management**

**Thanks**