



International Water
Management Institute

Potential applications of S2S in early warning and agriculture risk management

Webinar “Future directions of Subseasonal to Seasonal Prediction over South Asia”

30 March 2021

Giriraj Amarnath

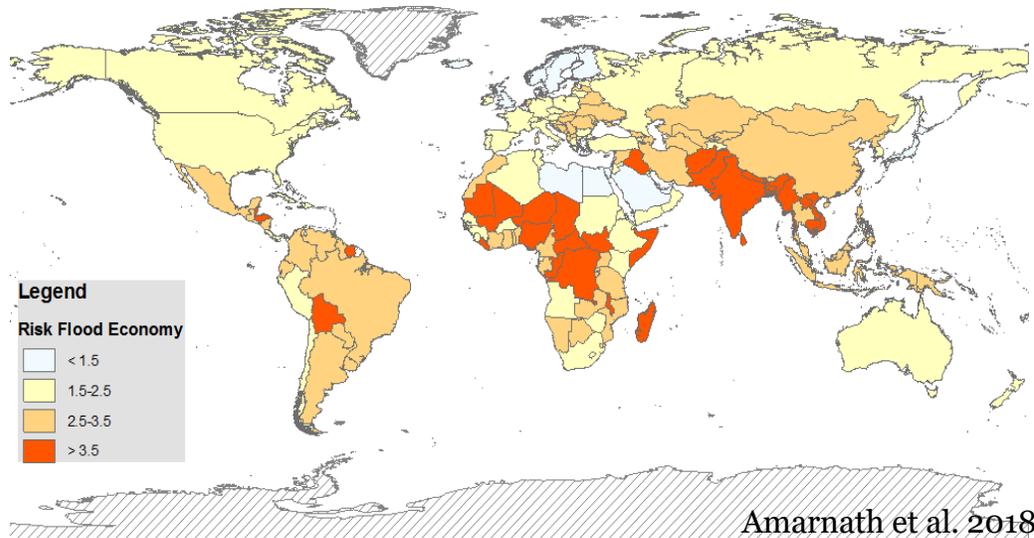
Research Group Leader: Water Risks to
Development and Resilience

Innovative water solutions for sustainable development

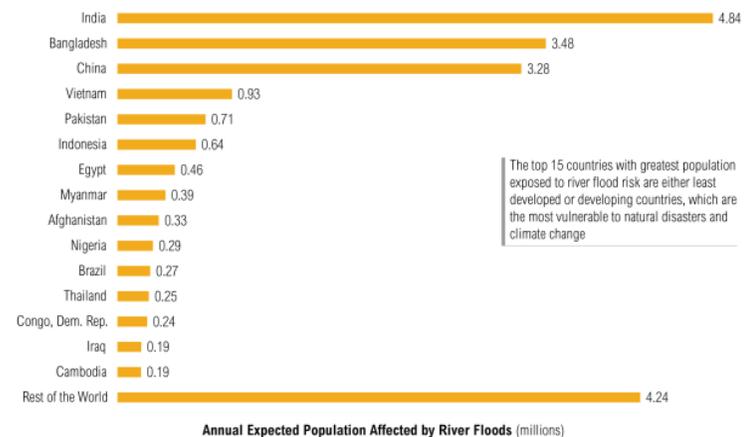
Food · Climate · Growth

Talking Points

- Great progress has been made in recent decades on development and applications of medium-range weather forecasts and seasonal climate predictions.
- Weather and climate information are critical inputs in system transformation and agrifood systems for climate risk management, reduce economic losses, resilient infrastructure and promote sustainable finance.
- S2S can bridge gaps in societal applications particularly in agriculture and food security, water, disaster risk reduction and health risks.



15 Countries Account for 80% of Population Exposed to River Flood Risk Worldwide



The top 15 countries with greatest population exposed to river flood risk are either least developed or developing countries, which are the most vulnerable to natural disasters and climate change

Annual Expected Population Affected by River Floods (millions)

NOTE: An average country-wide flood protection level was assigned for each country based on the country's income level. 2010 population data was used in the analysis.

wri.org/floods

Sources: World Resources Institute 2015; Whetton, H.C., et al., 2013; Ward, P.J., et al., 2013.

WORLD RESOURCES INSTITUTE



90% of all natural disasters are water-related

In 2020, 210 billion losses covering 416 events and fatalities over 15,000 and 100 million people affected

IWMI's framework on Water Risks and Disasters



GOVERNANCE, POLICY AND INSTITUTIONAL ARRANGEMENT



- HISTORICAL HAZARD DATA, ANALYSIS AND CHANGING HAZARD TRENDS
- EXPOSED ASSETS & VULNERABILITY
- RISK QUANTIFICATION



- PREPAREDNESS: EARLY WARNING SYSTEMS, EMERGENCY PLANNING AND RESPONSE CAPACITIES
- MITIGATION AND PREVENTION: MEDIUM TO LONG TERM SECTORAL PLANING (E.G. BUILDING RESILIENT INFRASTRUCTURE)



- CAT INSURANCE
- WEATHER RISK MANAGEMENT
- OTHER EMERGING PRODUCTS



RESEARCH AREAS

CLIMATE INFORMATION AND EARLY WARNING FOR RISK MANAGEMENT



CLIMATE INFORMATION AND ADVISORY SERVICES FOR FARMERS



CLIMATE SERVICES FOR FARMERS

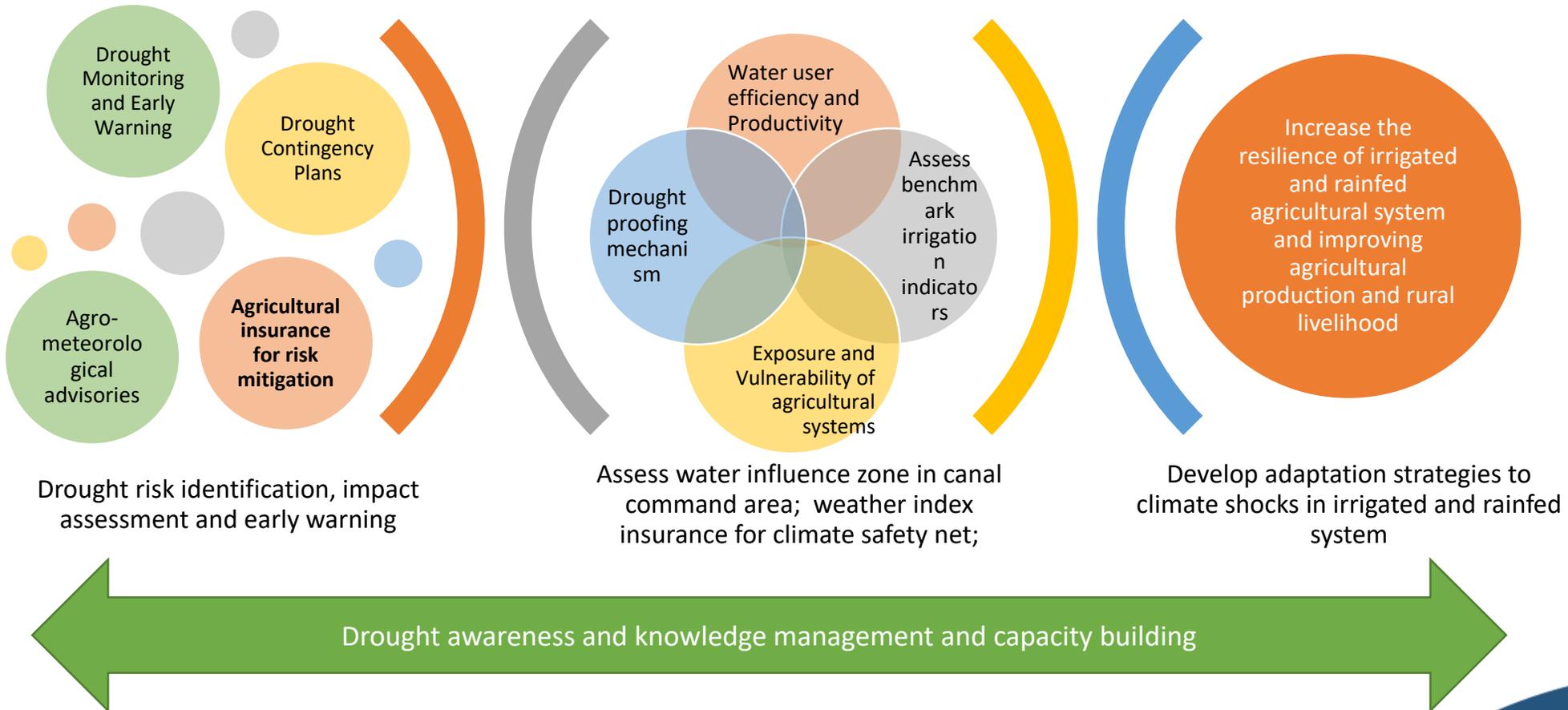
CLIMATE SERVICES INVESTMENT PLANNING AND POLICY



CAPACITY BUILDING & GENDER, YOUTH & INCLUSIVENESS

KNOWLEDGE PRODUCTS & ADVISORY SERVICES

Early Warning, Early Action and Early Finance (AWARE) : South Asia

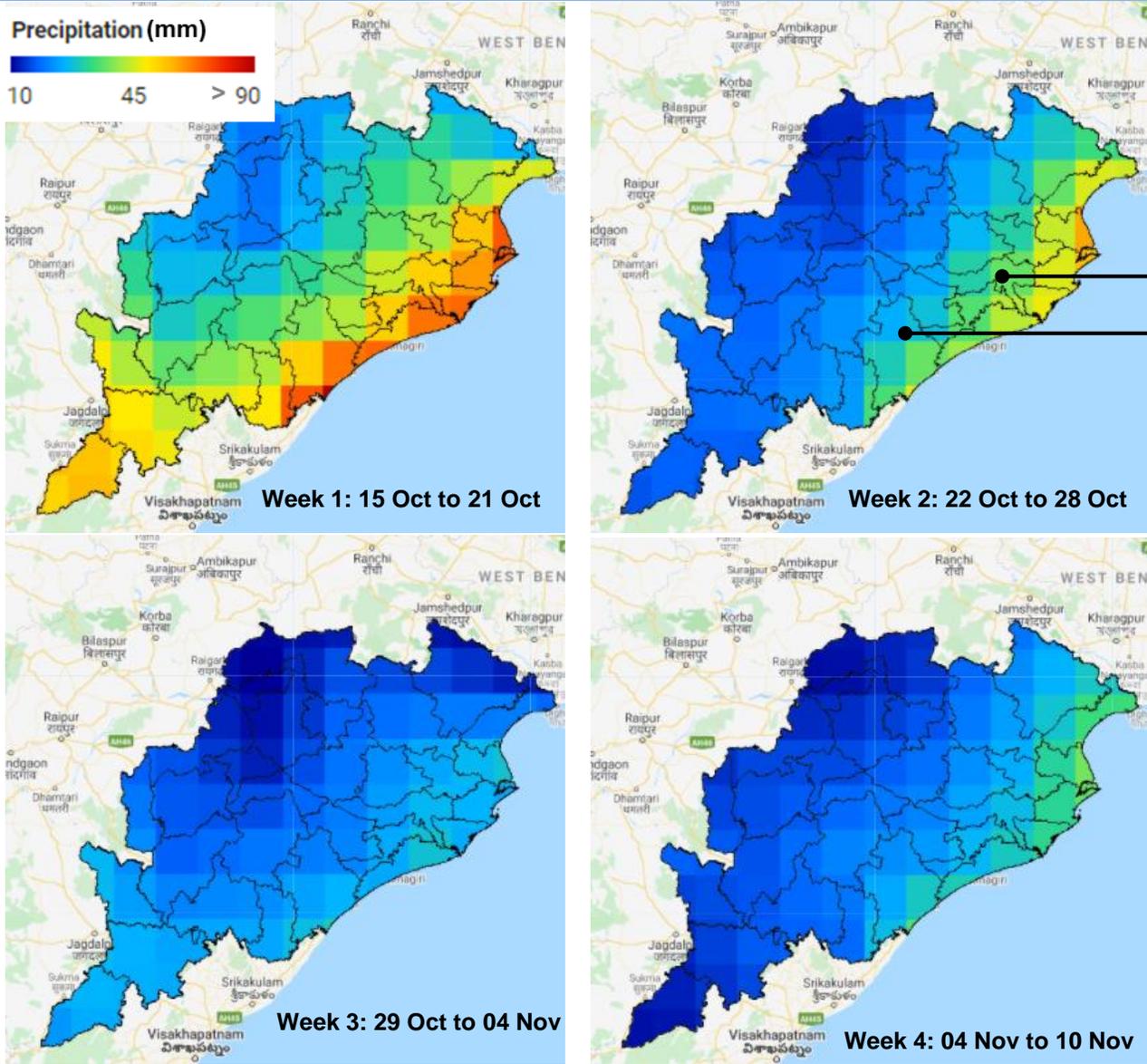


RESILIENCE: Building Climate Resilience of Indian Smallholders through Sustainable Intensification and Agroecological Farming Systems to Strengthen Food and Nutrition Security

- Agricultural productivity of smallholders in Odisha and Assam improved;
- Number of farmers practicing CSA technologies increased;
- Women's participation in farm level decision making enhanced;
- Farmers participation in local institutional activities strengthened; and
- CSA inputs from the project into state level climate action plans implemented

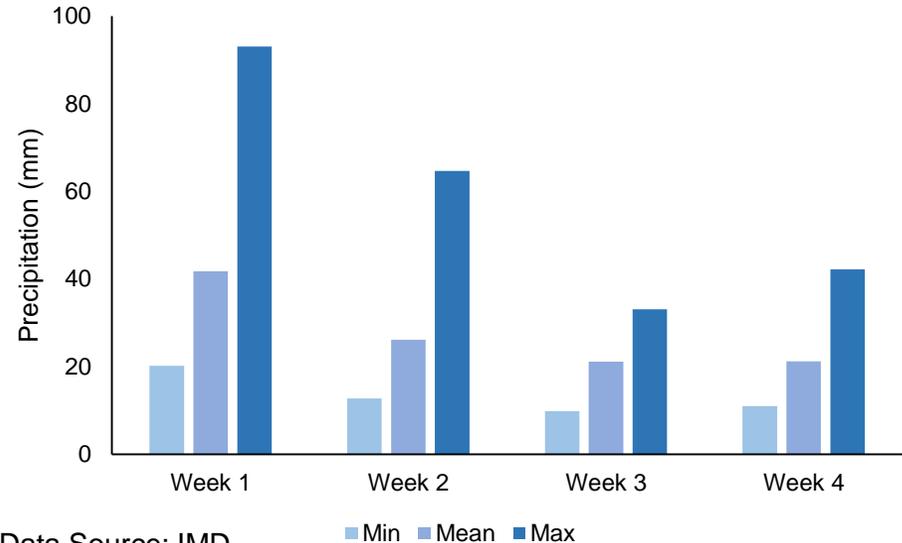
Subseasonal forecast for agriculture risk management

Weather forecast until 10 Nov 2020



Cuttack
Ganjam

- Heavy rainfall at isolated places over the Odisha is expected
- Week 2 onwards, rainfall is likely to be lower than Week 1 over the Odisha state.
- Coastal Odisha will receive lesser rainfall than other parts of the state .
- Both the districts, Cuttack and Ganjam are likely to be received similar rainfall.



Data Source: IMD

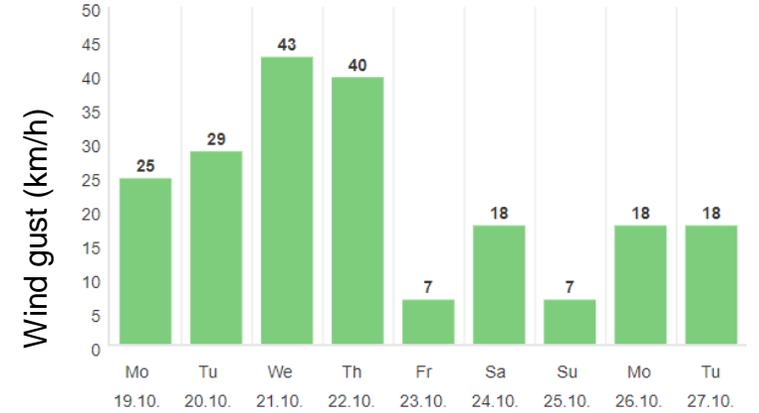
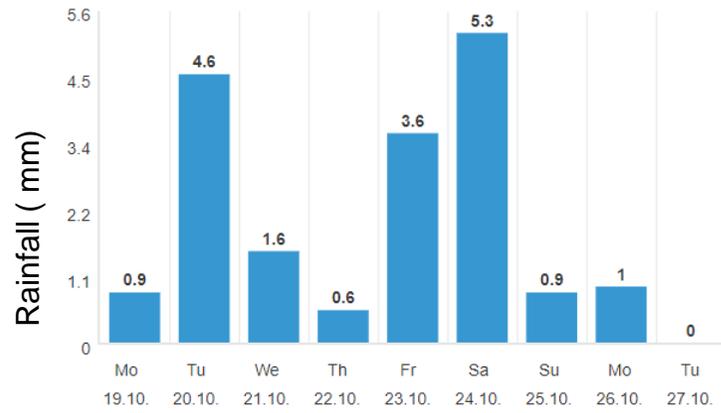
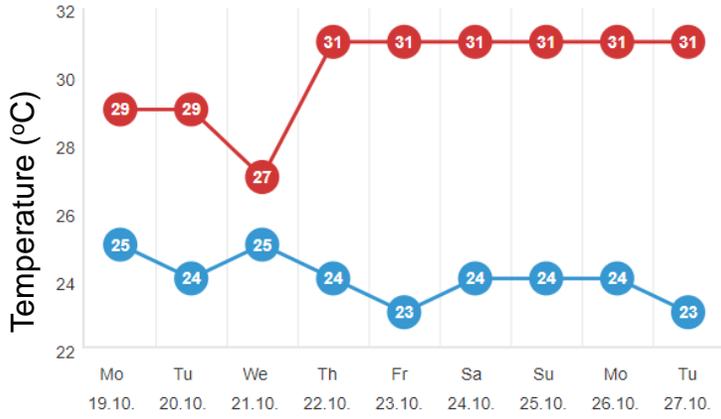
Data Source: IITM/ERPAS

Short-term forecast for climate smart agriculture

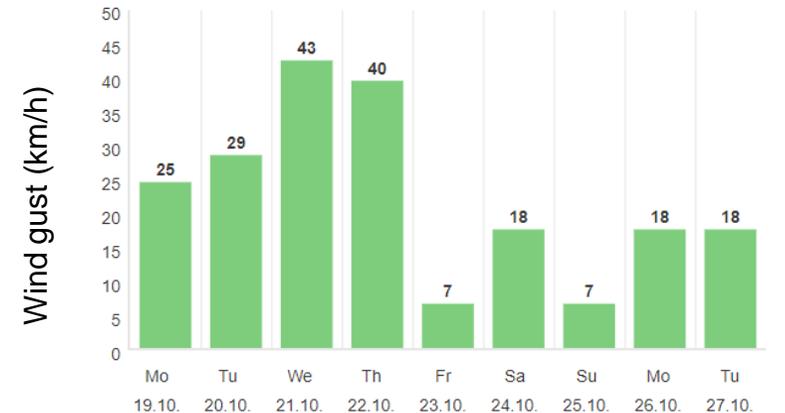
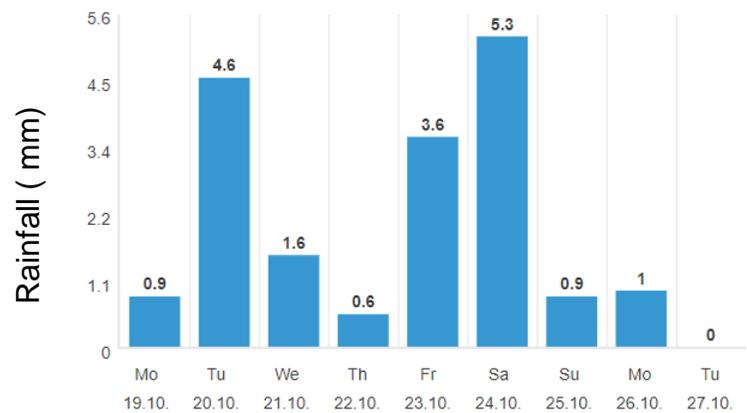
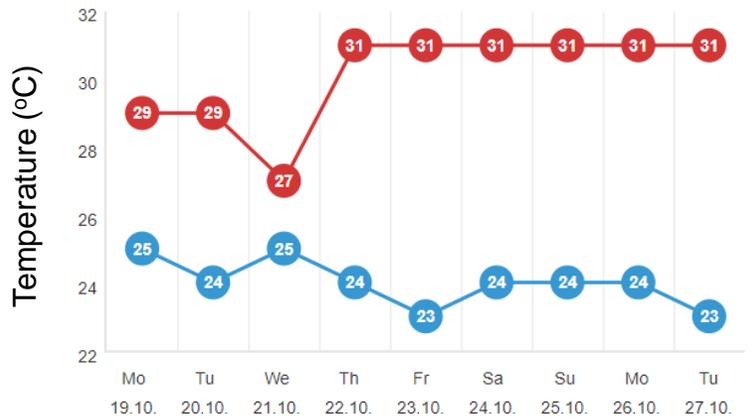


Weather forecast (Lead time 10 days) – Cuttack District

Badakusunpur, Tangi Tehsil

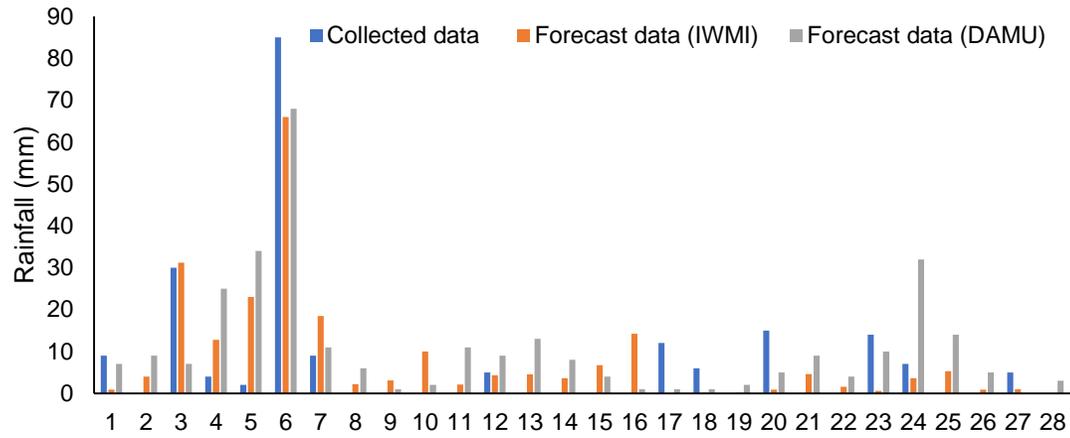


Abhayapur, Tangi Tehsil



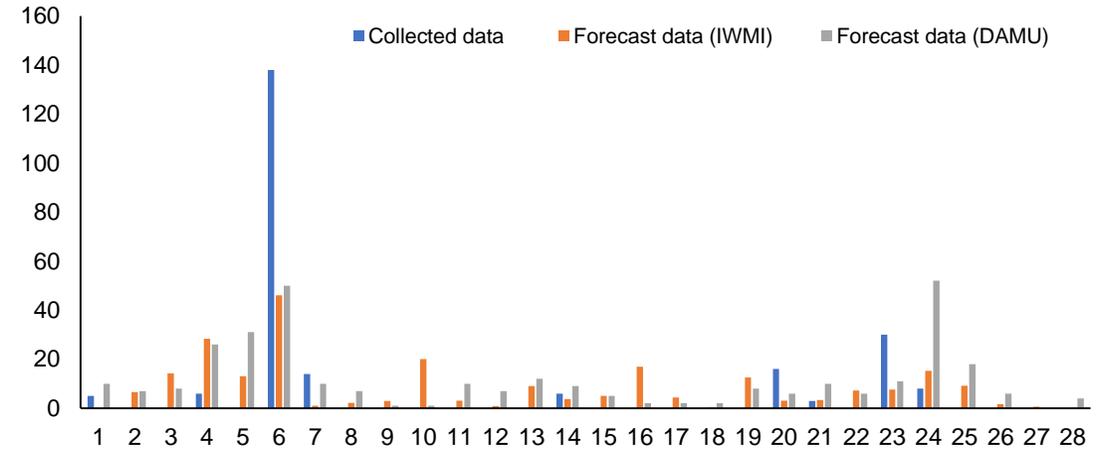
Note : Weather forecast data on rainfall, temperature and wind gust for the pilot villages. Optimal rainfall is predicted for the next 10 days.

Forecast Data Validation



Tangi

	Forecast data (IWM)	Observed data (DAMU)
RMSE(mm)	8.64	12.23



Niali

	Forecast data (IWM)	Observed data (DAMU)
RMSE(mm)	20.20	21.58

Advisory

Rain fall amount received(mm)	Advisory message
50 mm	Post pone irrigation
25 to 49 mm(continuously for two to three days)	Sowing can be taken up under dryland/Rainfed situation
12 to 15 mm	Fertilizer application under dry land can be done
10 to 12 mm	Hand weeding and hoeing can be done

Temperature (·c)	Advisory message
Seasonal temperature > 32·c/ day and continues for a week	Systemic insecticide application against sucking pest
Seasonal temperature < 20 ·c/ day and continued for a week	Systemic fungicides application against diseases

Wind Speed Km/hour(kmph)	Opt Farm Decision to be taken
< 5 kmph	Pesticide application and dusting can be done
> 30 kmph	Propping to sugarcane and banana must be done; irrigation interval gets reduced and hence demands more irrigation water

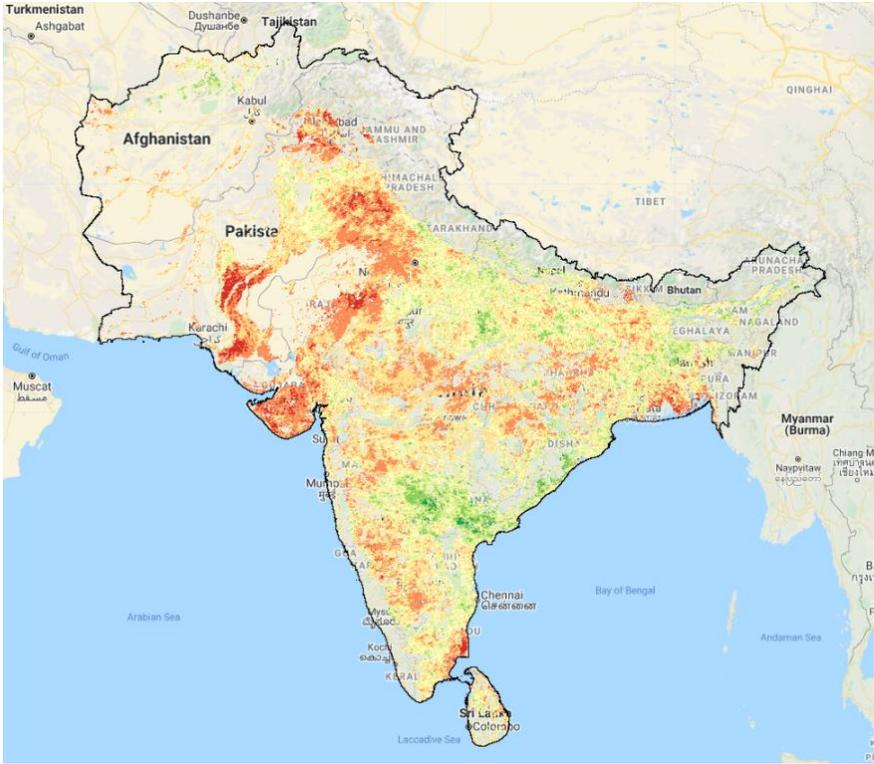
Drought Surveillance System for South Asia



Information and Action

Knowledge

Decisions



Agriculture Stress monitoring using satellite indices

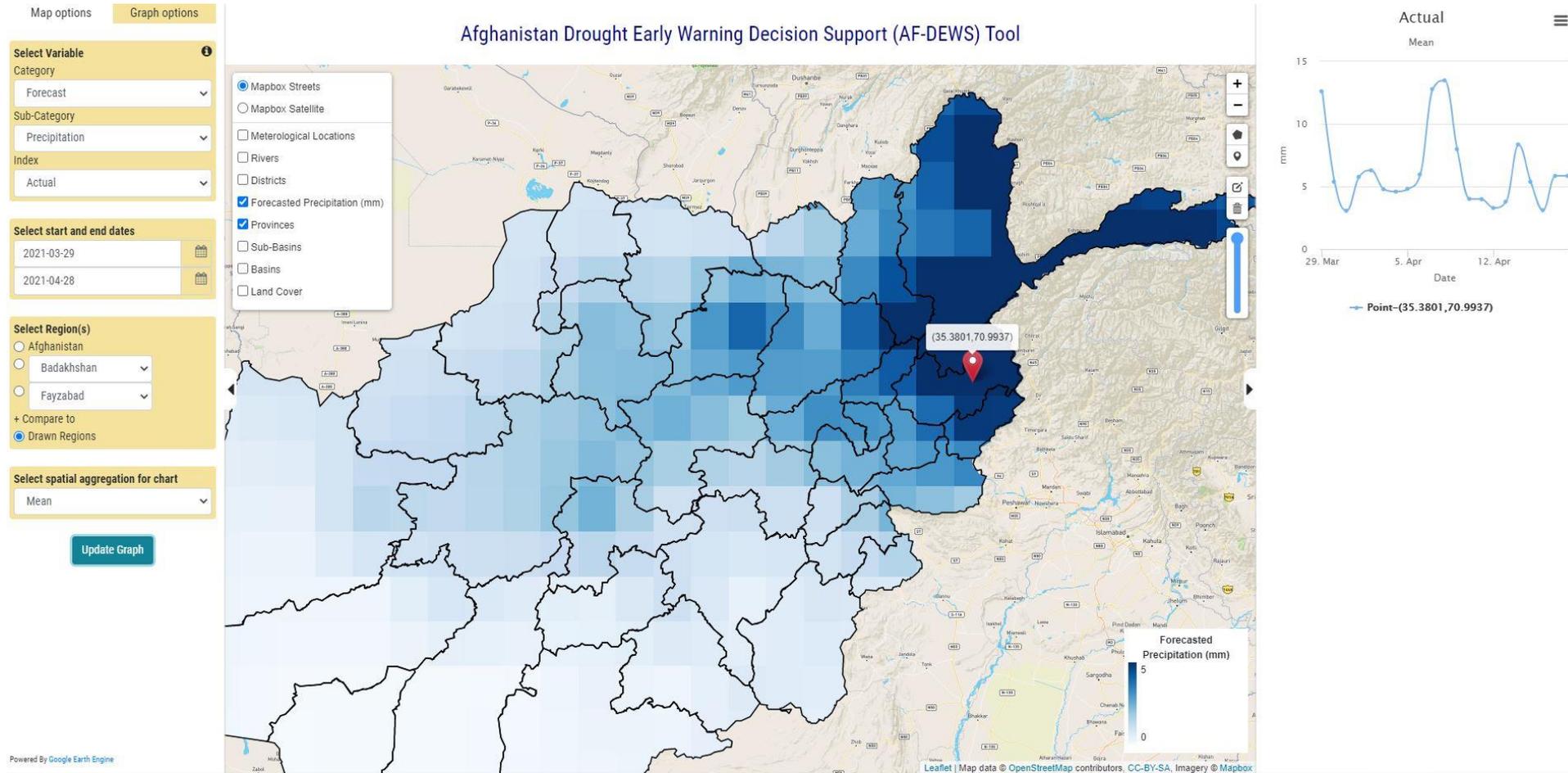


Consultation and awareness on the digital tools and actionable information

Contingency Measures and Strategy	Contingency
Choose Scenario: Drought <td>Contingency</td>	Contingency
Management Situation: At vegetative stage <td>At vegetative stage</td>	At vegetative stage
Management Sub-Situation:	
Shallow soils with assured rainfall	Interculture with furrow for weeding
Blackgram	Interculture for weeding and to create soil mulch
Soyabean	Protective irrigation possible through farm pond water
Peanut/rotet	Prepare shallow furrow while hoeing by tying ropes to strings, which will provide soil support to crop plant and conserve soil moisture
	Interculture with furrow for weeding and to create soil mulch
	Interculture with furrow for weeding and to create soil mulch
	Protective irrigation possible through farm pond water

Drought response strategies integration information and knowledge products for decision making process

Early warning and drought risk assessment in Afghanistan

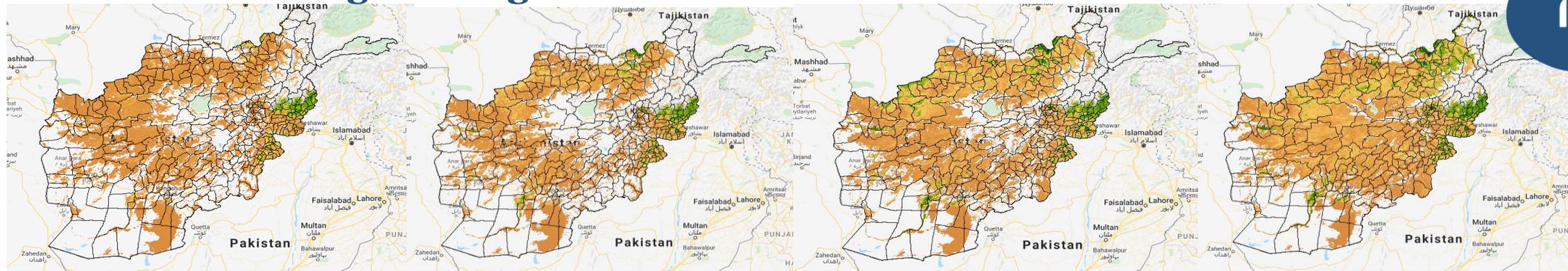


- Fully automated cloud-based system implemented using Google Earth Engine, will be used by GoIRA for drought declaration and response mechanism;
- Scalable from field-scale to national level for early warning, early action and early finance for drought mitigation efforts;

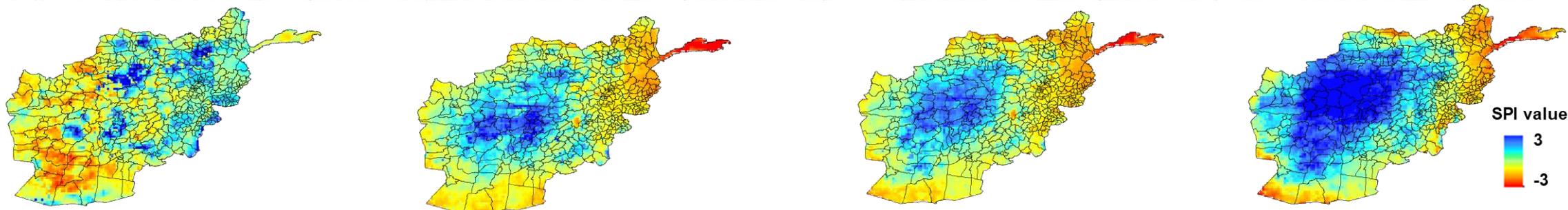
Case of 2018 Drought in Afghanistan



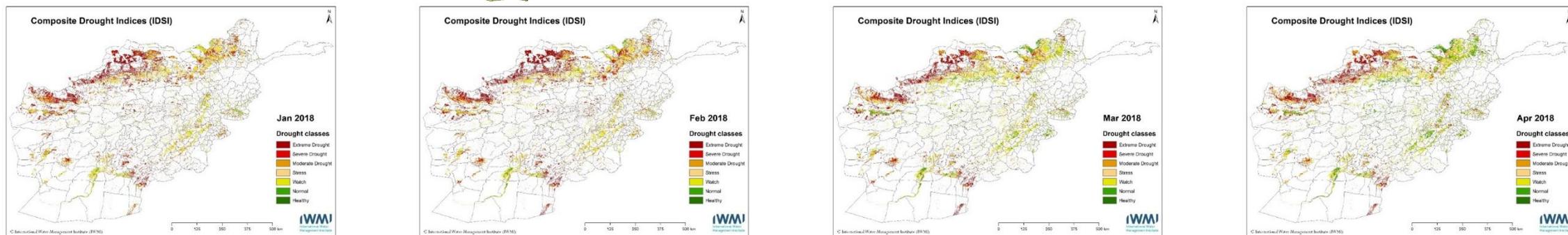
NDVI



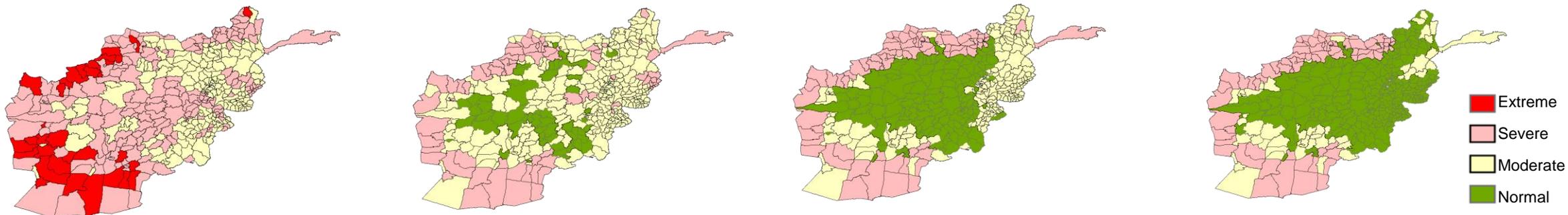
3 Month SPI



IDS

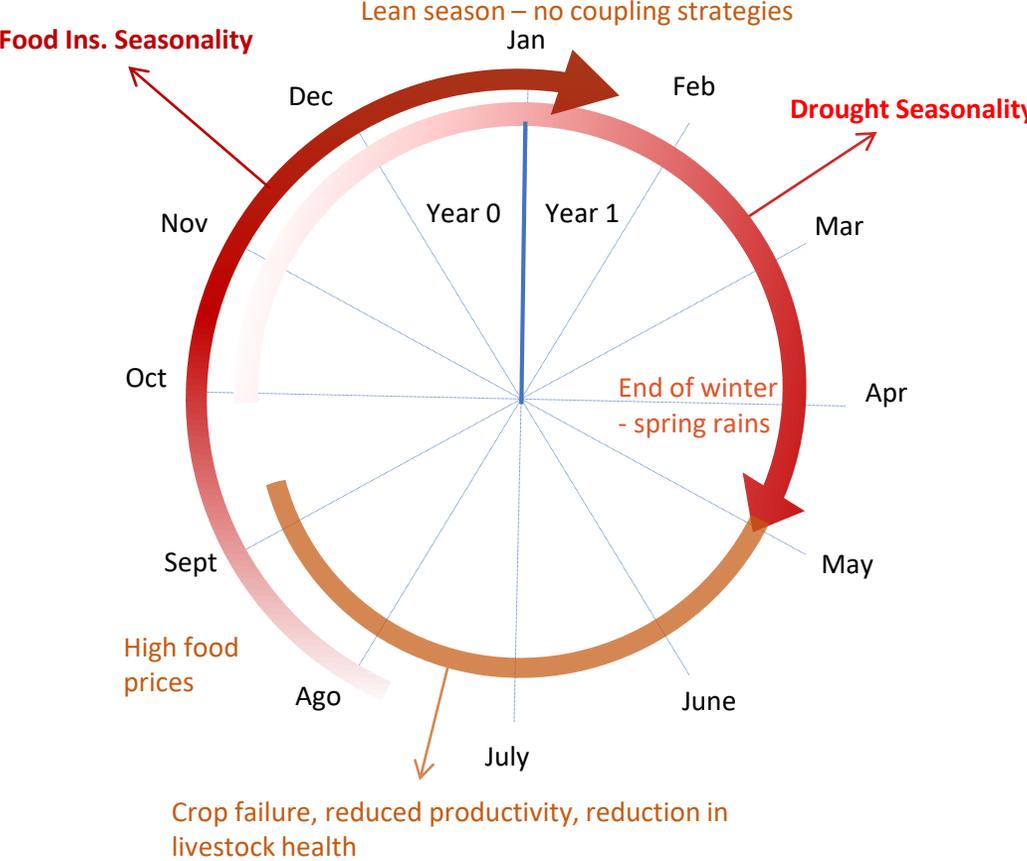


Rule-based Drought determination

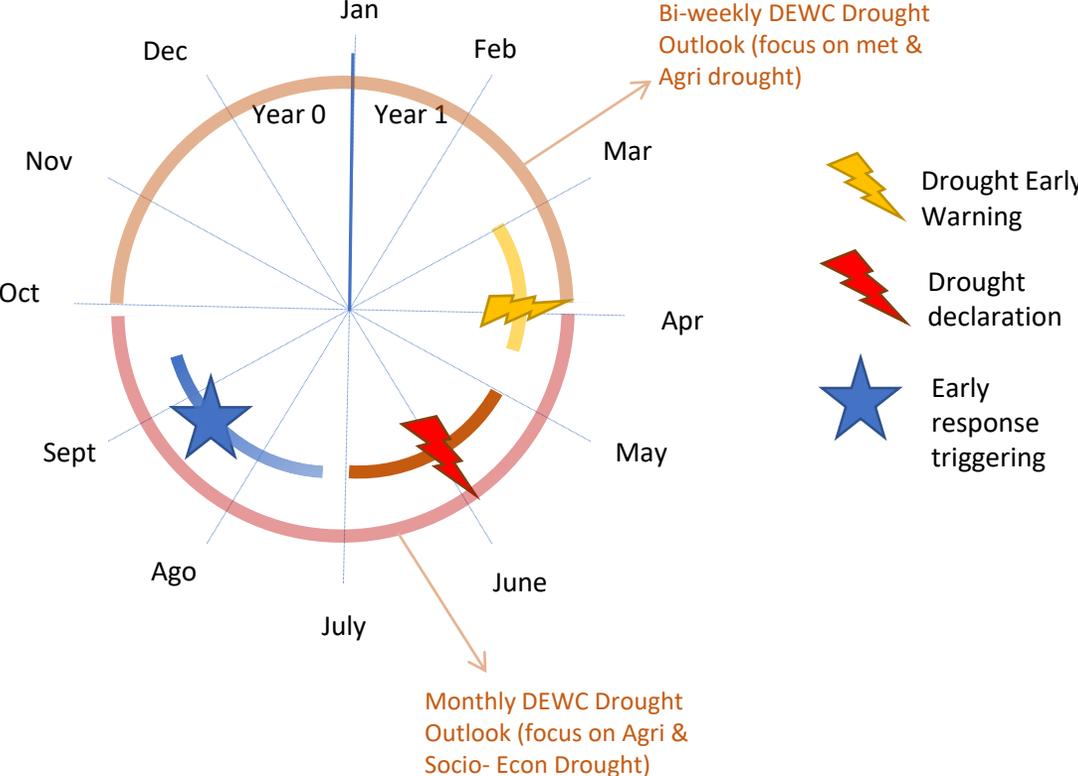


Update on the AF-DEWS: seasonality of drought and food insecurity vs monitoring and triggering

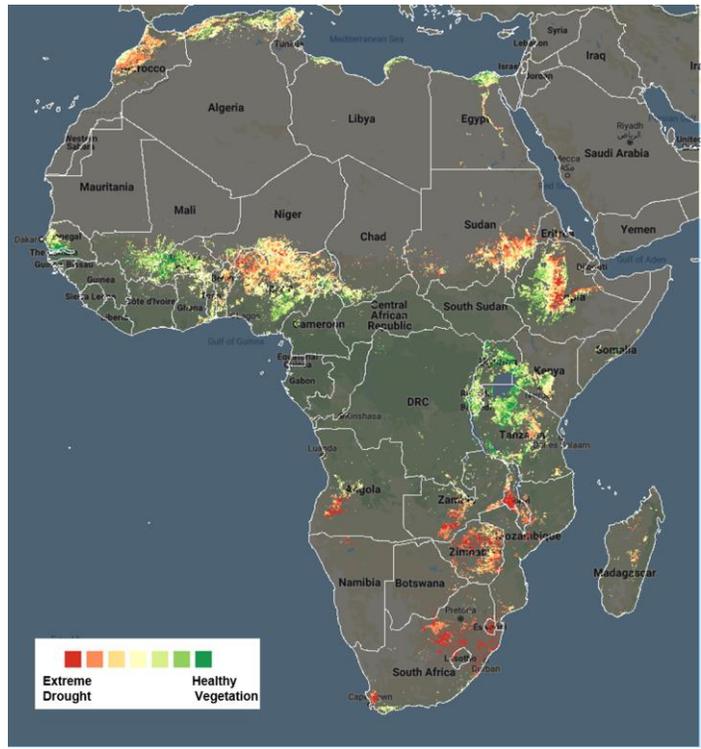
Drought and food insecurity seasonality



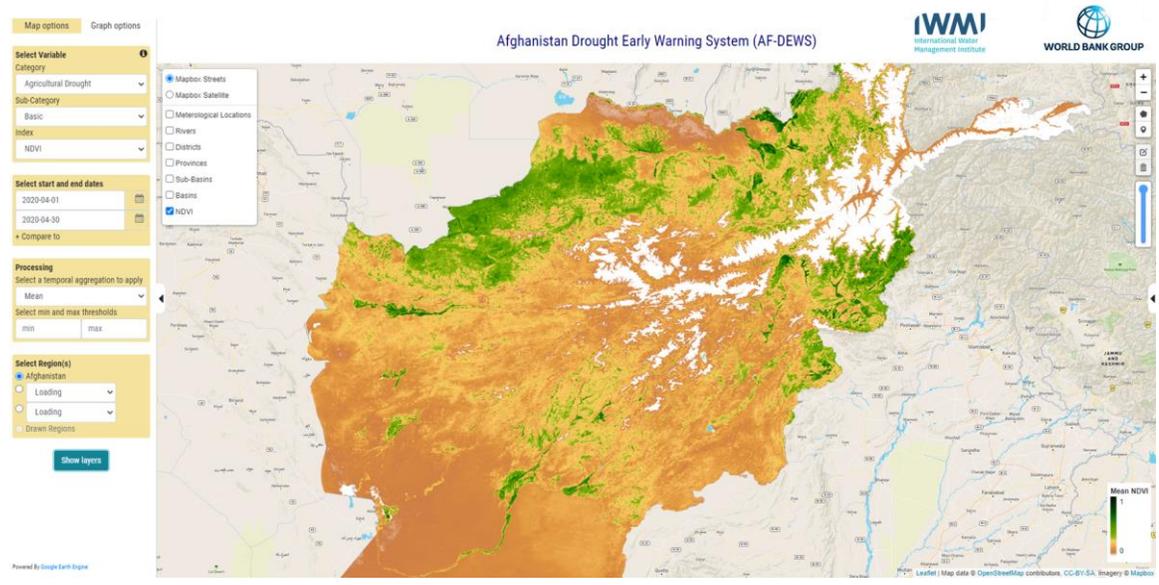
Monitoring, detection and triggering



Scaling SADMS Drought Resilience Initiatives in Africa and Asia



IWMI's Water-Secure Africa (WASA) Initiative and in collaboration with Digital Earth Africa Platform developing resilience application in managing floods and drought using open source data and tools for entire Africa



Afghanistan Drought Early Warning Support (AF-DEWS) tool

Next Generation Drought Index Project (NGDI)
Final Report and Documentation

Disaster Risk Financing & Insurance Program | IRI | Global Risk Financing Facility | European Union | World Bank Group | AIR | IWMI | ESA

June 30, 2020

Drought Resilience Profiles | Eswatini

COUNTRY OVERVIEW

The National Drought Risk Management Framework highlights the need for a national drought resilience strategy. The framework is based on the National Drought Resilience Strategy (NDRS) and the National Drought Resilience Strategy Implementation Plan (NDRS-IP). The framework is based on the National Drought Resilience Strategy (NDRS) and the National Drought Resilience Strategy Implementation Plan (NDRS-IP).

Logos: UN, World Bank Group, CIWA, Southern Africa, IWMI, UN Women.

SRI LANKA

Climate & Food Security Monitoring Bulletin
May-September 2020

Department of Meteorology, Department of Irrigation, Department of Agriculture, Disaster Management Center, Ministry of Health, National Disaster Relief Services Center, International Water Management Institute

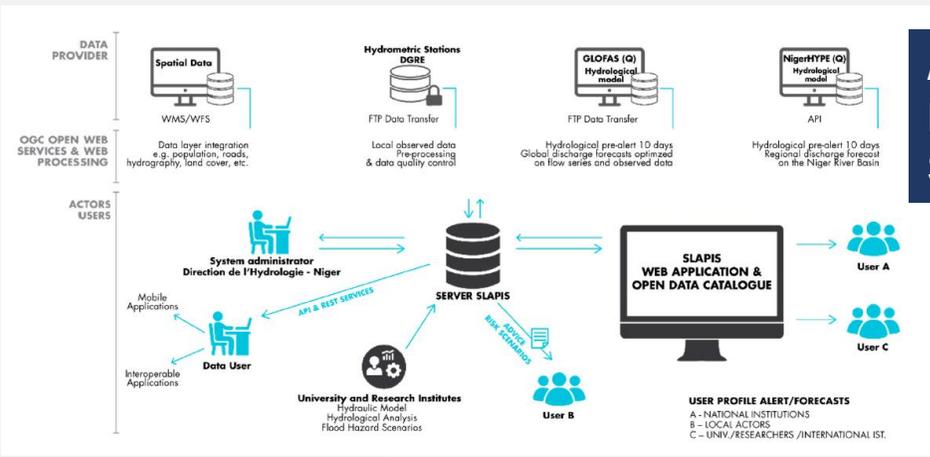
Guidance: State Ministry of Internal Security, Home Affairs and Disaster Management
Coordination and technical support: United Nations World Food Programme

Logos: UN, FAO, IFAD, WFP, UN Women, IWMI.

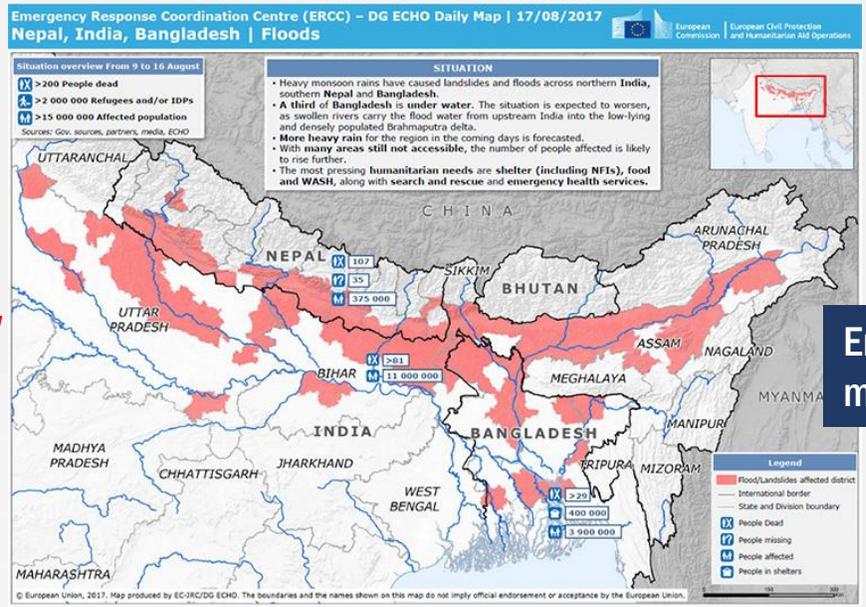
Published on 8th October 2020

Promoting knowledge products and tools for an integrated drought risk management in Southern Africa, Senegal and Sri Lanka

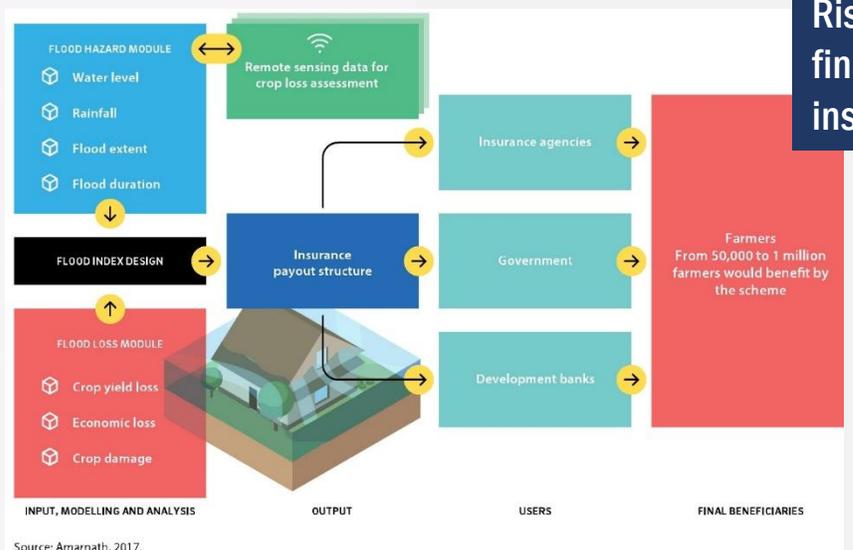
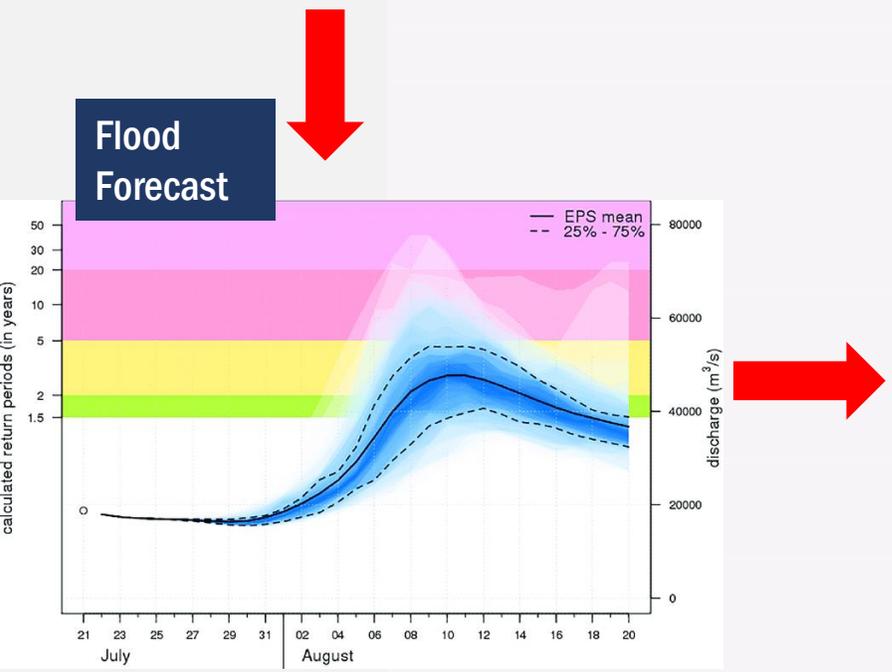
Role of S2S in the emerging flood risk technologies?



AI-based Prediction System



Emergency maps



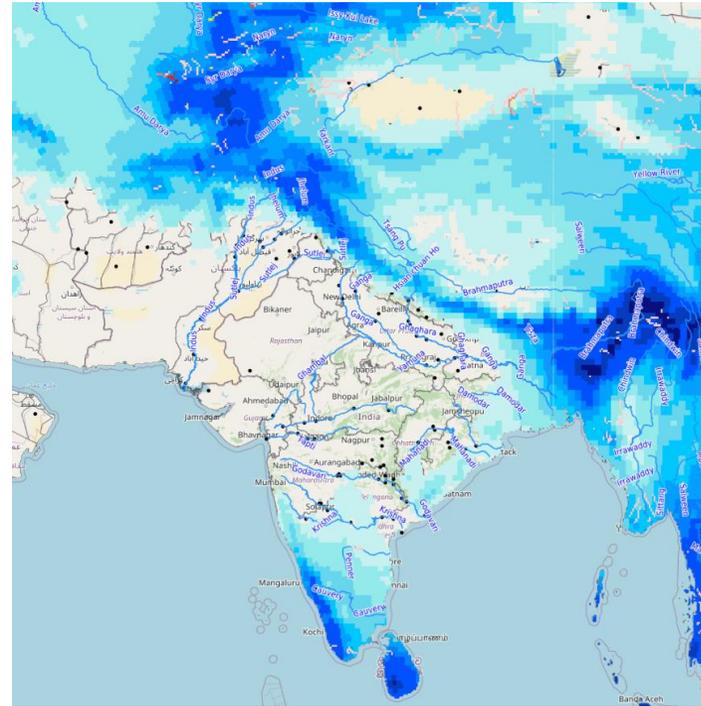
Source: IWM

Source: Amarnath, 2017.

Flood alerts for early warning to early action

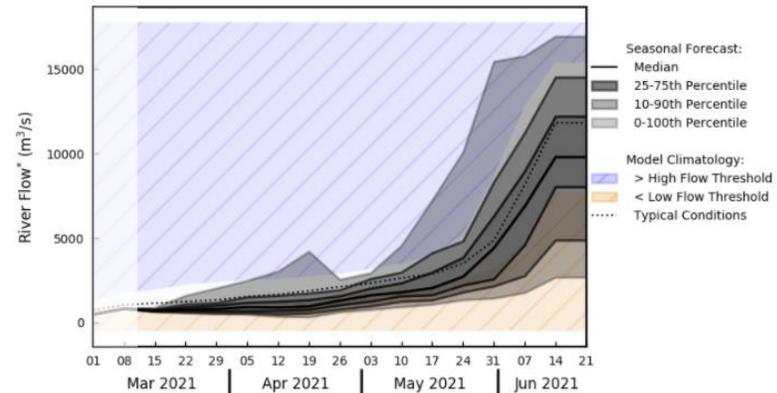


100-year Flood Return Map



Accumulated precipitation forecast

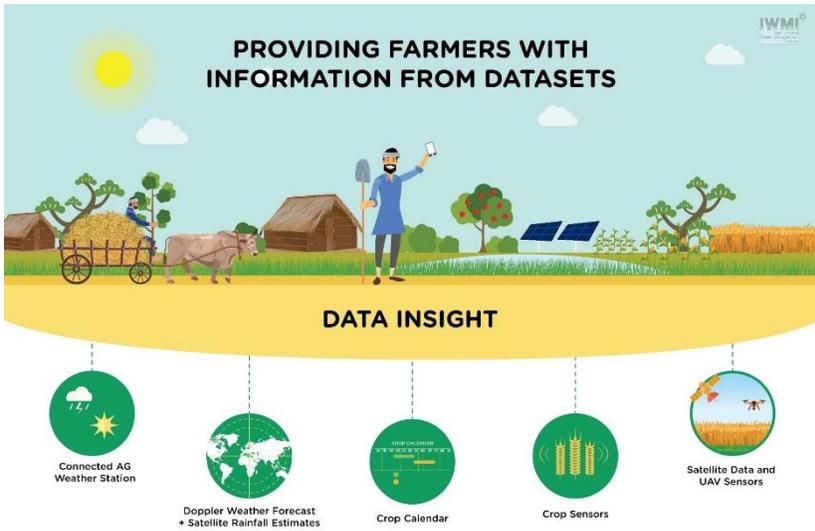
Hydrograph



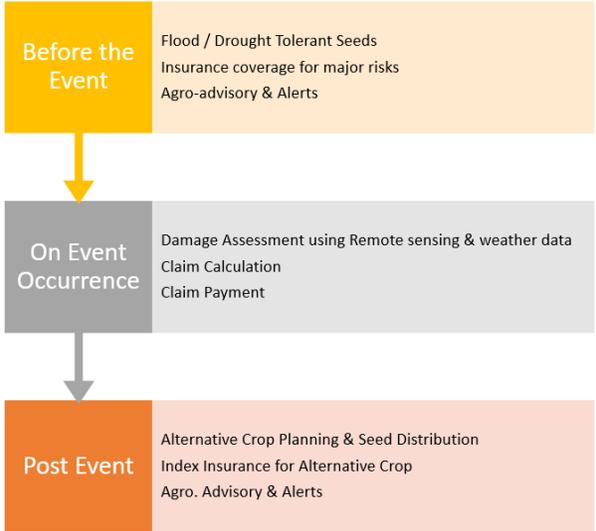
Seasonal flood forecast

*River flow is a weekly average, displayed at start of week (dates shown)
**High and low flow thresholds refer to the 80th and 20th percentiles of the model climatology

Bundled solutions (Seeds, Insurance and Climate Information Services)



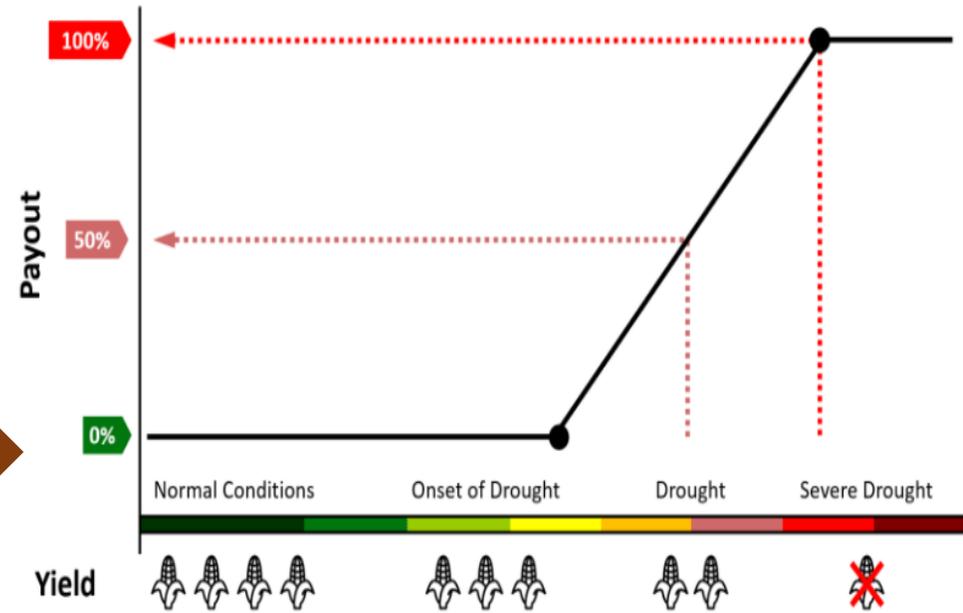
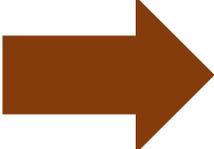
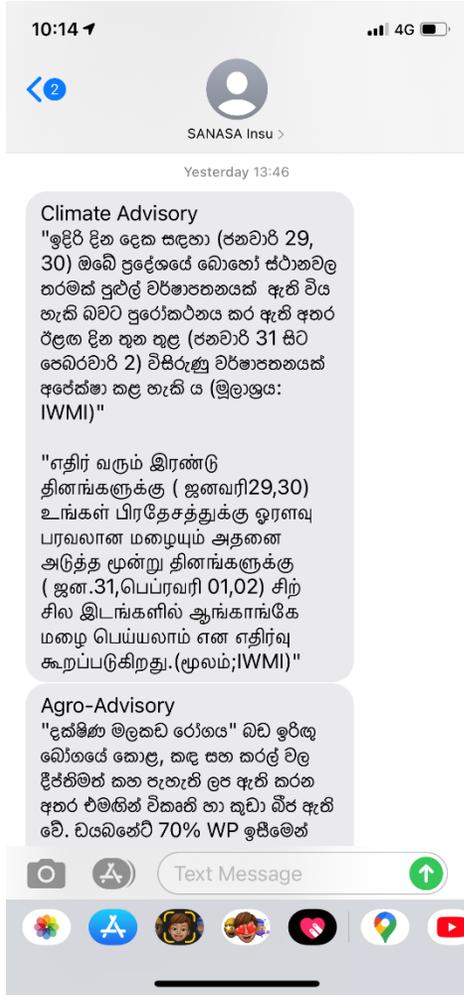
Bundling Concept (BICSA)



BICSA a well-designed financial products and services such as insurance, savings, seeds, agrometeorological advisories and digital banking all play a role in increasing smallholder farmers' resilience.

Climate Advisory Services

Weather Index Insurance trigger and Payout



Key messages

- **Subseasonal forecasting** has great potential for optimizing agricultural production, managing pests and diseases, and helping farmers to avoid the worst **impacts of weather shocks** such as floods and droughts.
- Advances in modelling make predictions more accurate, subseasonal forecasts may be employed for other uses, such as **managing water levels in dams and predicting outbreaks of human diseases**, including malaria and dengue-fever.
- **Promoting subseasonal forecasts at the local level** are critical for climate adaptation strategies to support authorities, ameliorating risk and reducing losses from extreme climate events.
- **Knowledge Management and Community of Practice** – to promote best practices through policy dialogue and capacity development including south-south learning.



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Thank You.

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Innovative water solutions for sustainable development

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