



International Water  
Management Institute



# Developing Data Science-based drought management plan to increase farming community preparedness to drought

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## **MENAdrought Project**

### PROJECT TEAM:

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Innovative water solutions for sustainable development  
Food · Climate · Growth

# Drought in Lebanon hits the agricultural sector

159 Views by Outlook



Yara Beaini  
Staff Writer

Last year, Lebanon faced one of its harshest droughts in the last 50 years. With a usual average of 812mm, precipitation levels hit an all-time low at 431mm, especially compared to the 905mm of the previous year. The increase in population and the rise of cities have increased the demand for water, and the drought has had a significant impact on the agricultural sector.



## 14. THE CONTRIBUTION OF HUMAN-INDUCED CLIMATE CHANGE TO THE DROUGHT OF 2014 IN THE SOUTHERN LEVANT REGION

K. BERGAOUI, D. MITCHELL, R. ZAABOUL, R. McDONNELL, F. OTTO, AND M. ALLEN

*A combined modeling and observational study suggests that the persistent rainfall deficit during the 2014 rainy season in southern Levant was made more likely due to anthropogenic climate change.*

## Economies Weakened by Pandemic

Egypt imports most of its wheat from Russia and Ukraine, and is looking for alternative suppliers. And Tunisia was struggling to pay for grain imports even before the conflict.



Baking bread in Saqqara, near Giza, Egypt. Shokry Hussien/Reuters



### Morocco allocates \$1 billion to mitigating drought



In Pictures

Gallery

### Jordan facing 'one of the most severe' droughts in its history

Experts say Jordan is now in the grip of one of the most severe droughts in its history, but many warn the worst is yet to come.

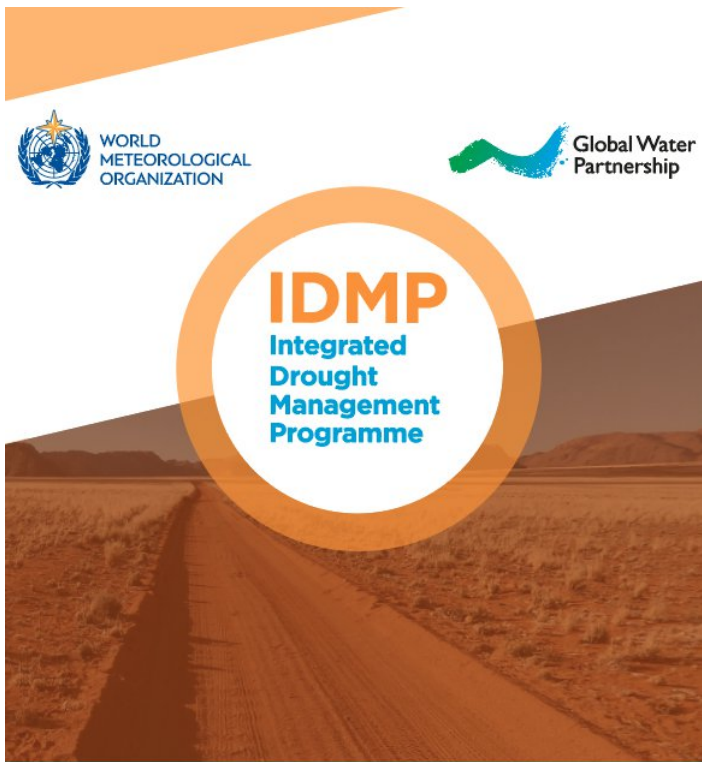


Rains were massively reduced, totalling just 60 percent of normal fall, an expert said [Khalil Mazraawi/AFP]





# MENA Drought – 3 pillars



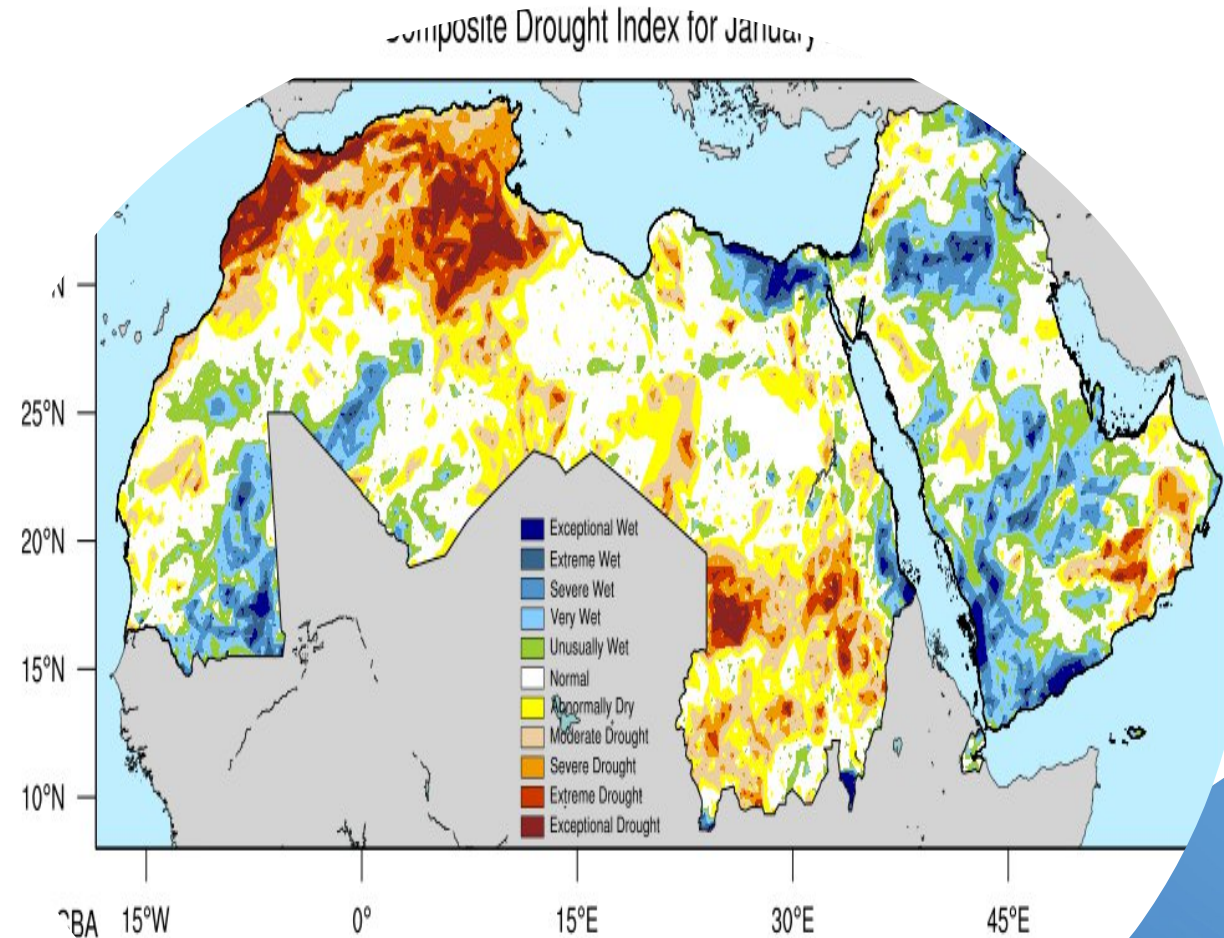
Adopted by 93 Nations

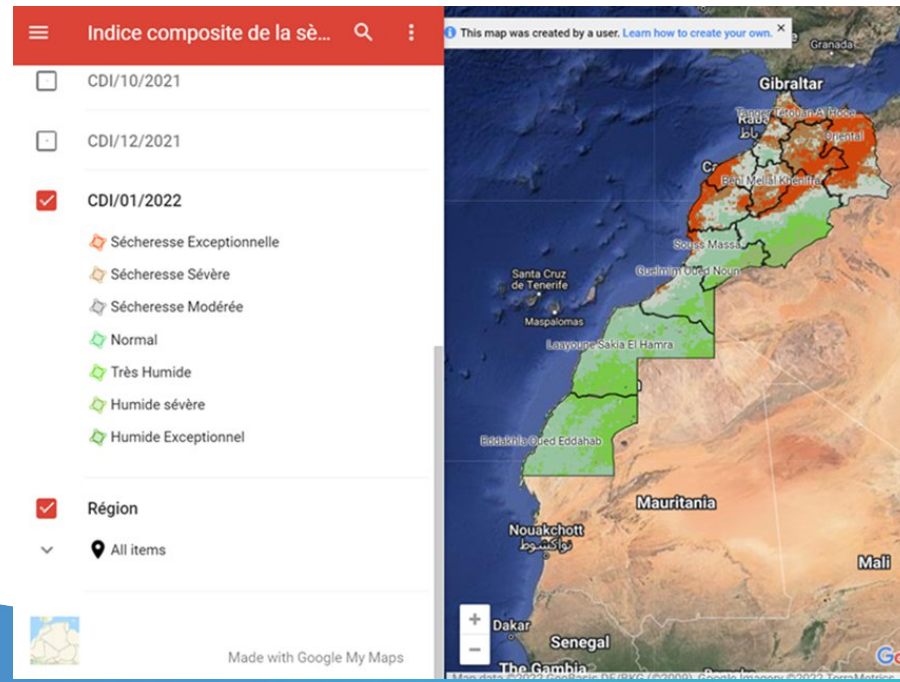
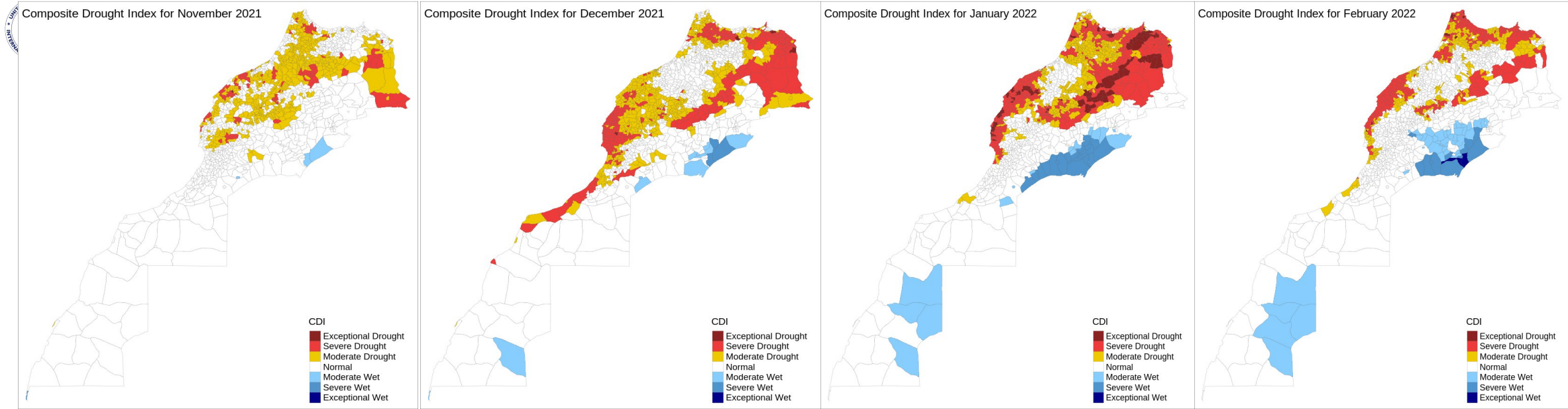


## Pillar 1: Where is drought and how bad is it?

We generate drought maps using 4 inputs from satellite and modelled – relative to *normal* conditions at that time of year

- rainfall
- temperature
- soil moisture
- stress of plants



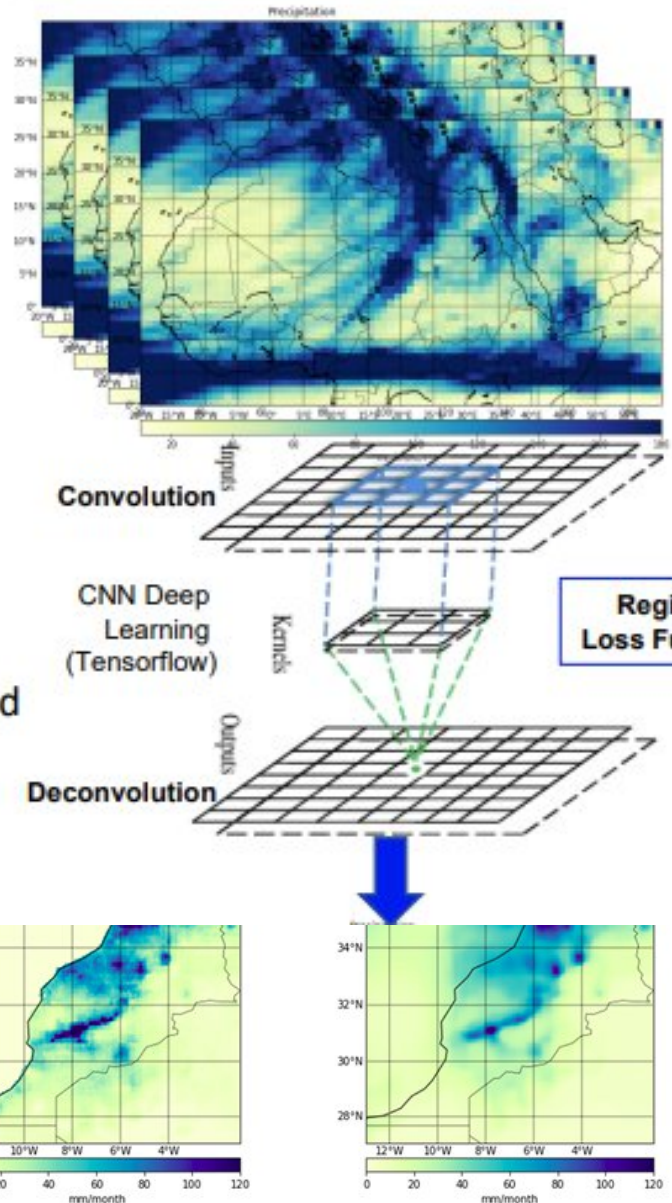


# Use of Convolution Neural Network

**4 NMME forecasts:**  
 (predictors)  
 GEOS5+CFS+NEMO+  
 CanCM4i  
 (monthly 100 km)

**1 Predictand: CHIRPS**  
 (monthly 5 km)

1981-2014 Training period  
 2015-2019 Test period

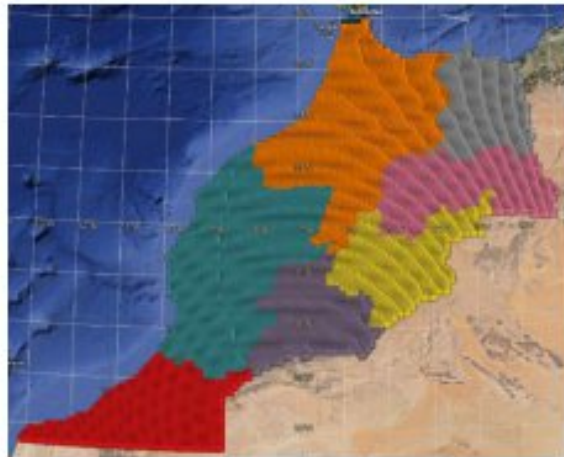


Regionalization (HiClimR) -> 7 regions with:

- Maximum intra-regional correlation
- Minimum inter-regional correlation

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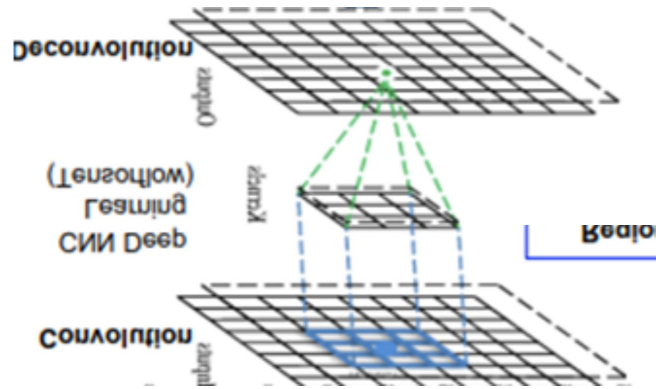


**regional predictions at 5km**

# USE OF CONVOLUTION NEURAL NETWORK

(monthly 2 km)  
↓ Prediction: CHIRPS

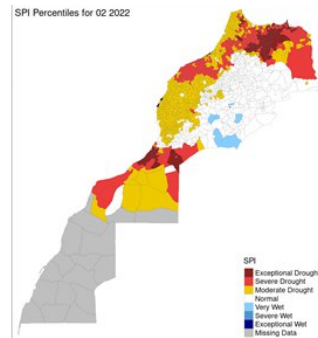
(monthly 100 km)  
↓ CHIRPS  
↓ GEOSS+CL2+MEMO+  
(predictions)  
↓ NMMR forecasts



↓ Training period 1981-2014  
↓ Test period 2015-2021



- Minimum inter-regional correlation
- Maximum intra-regional correlation with:  
Regionalization (HICIMR) -> 7 regions





# Predicting the Standard Precipitation Index as an eCDI component

November

December

January

February

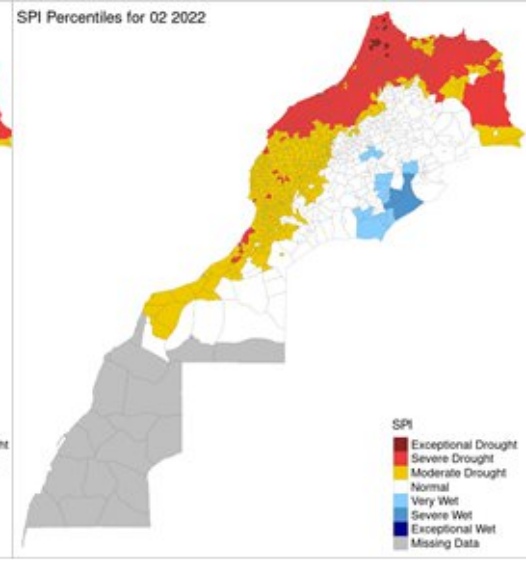
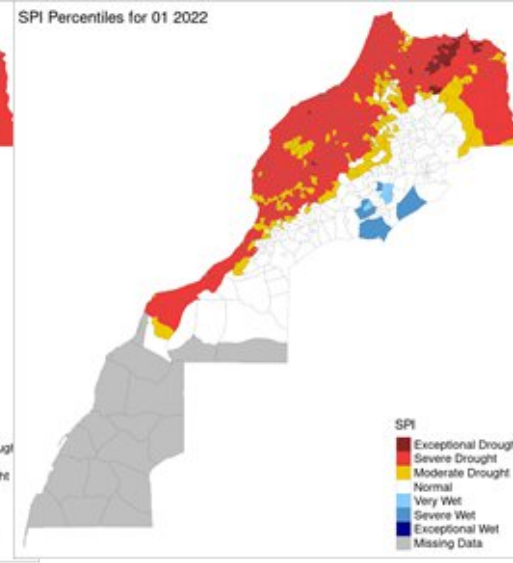
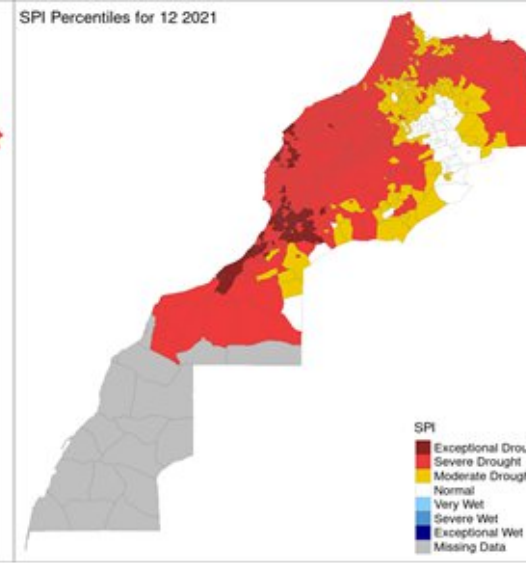
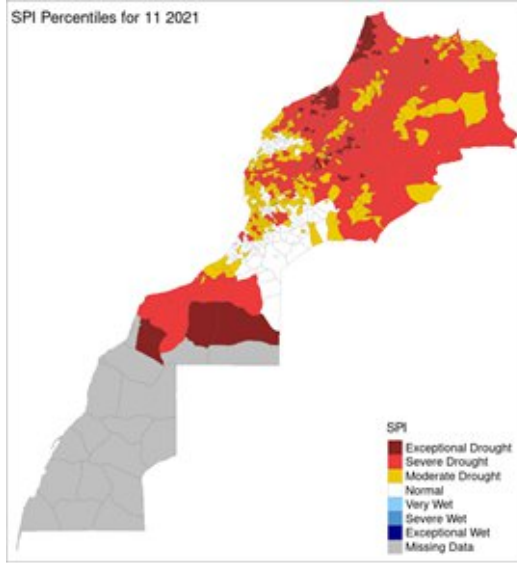
Observed

SPI Percentiles for 11 2021

SPI Percentiles for 12 2021

SPI Percentiles for 01 2022

SPI Percentiles for 02 2022



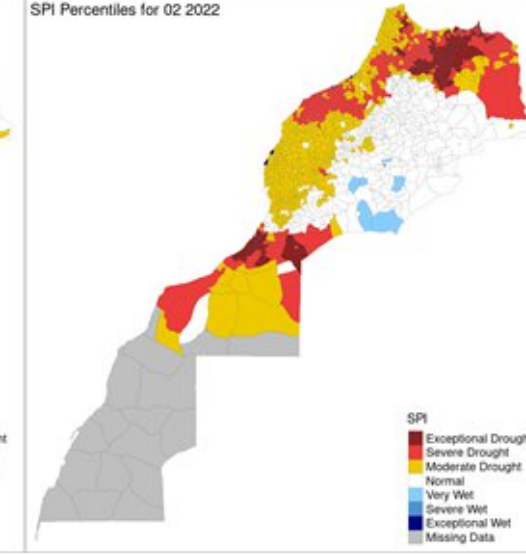
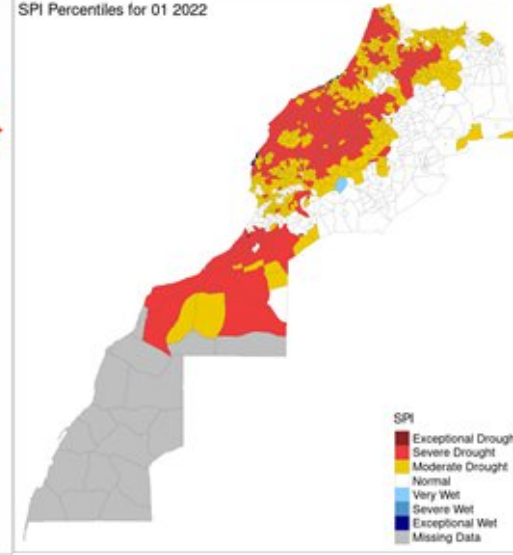
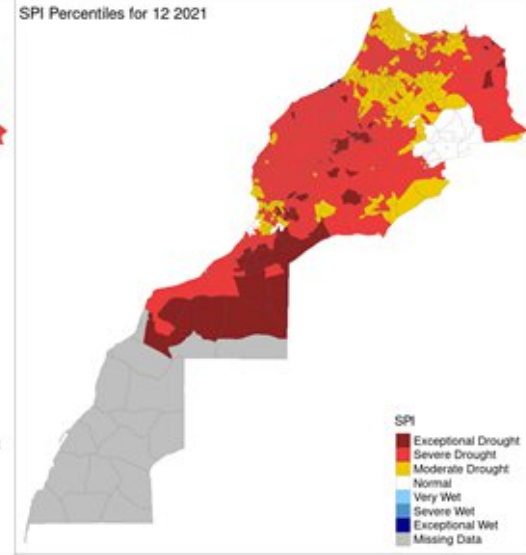
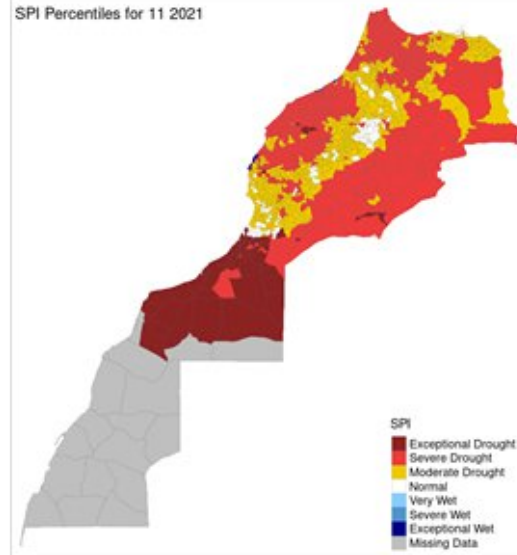
Forecasted  
(1 month)

SPI Percentiles for 11 2021

SPI Percentiles for 12 2021

SPI Percentiles for 01 2022

SPI Percentiles for 02 2022





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Thank you for your attention and  
welcome questions

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