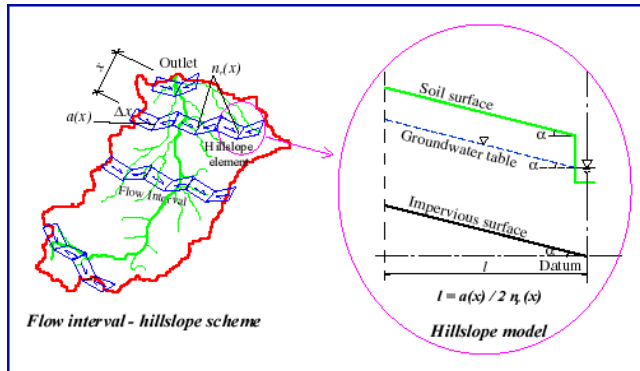


DIAS-based Agricultural Drought Monitoring and Prediction (DADMP)

Toshio Koike

Director, International Centre for Water Hazard and Risk Management (ICHARM)
Professor Emeritus, The University of Tokyo

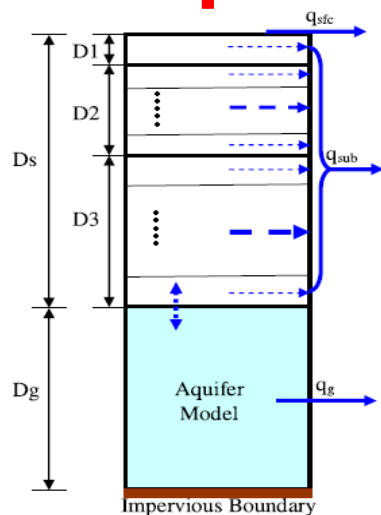
Water and Energy Budget-based Distributed Hydrological Model with Vegetation dynamics (WEB-DHM-Veg)



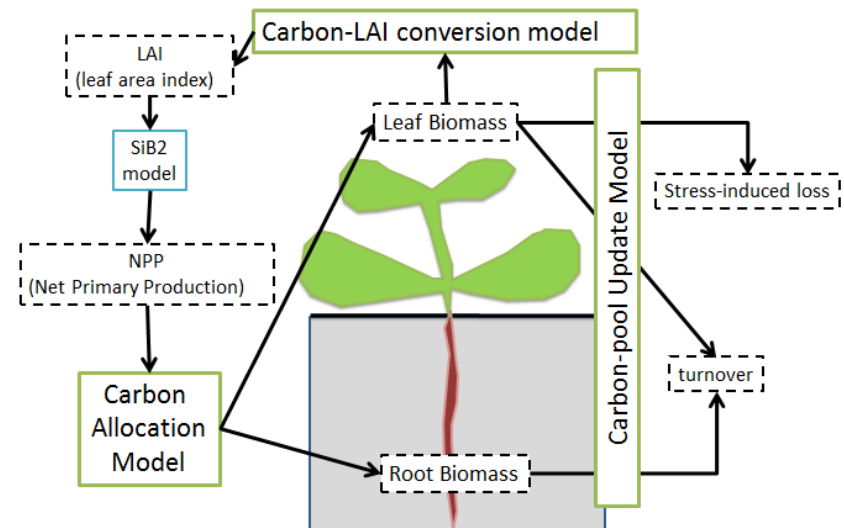
→ WEB-DHM-Veg can simulate soil moisture, groundwater, river discharge, and **vegetation growth** (and their **interactions**).

GBHM(river model)

Coupling



+



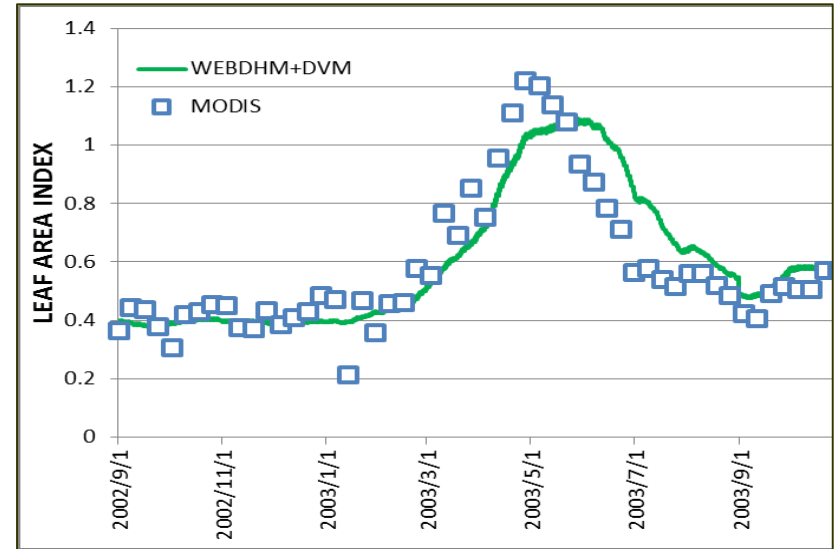
Dynamic Vegetation Model (DVM)

Hydro-SiB(Land surface model)

Sawada, Koike, Patricia 2014

Eco-hydrological Model for Identification of Droughts

LAI: Simulated vs. MODIS



NOV WEBDHM+DVM

DEC WEBDHM+DVM

JAN WEBDHM+DVM

FEB WEBDHM+DVM

MAR WEBDHM+DVM

APR WEBDHM+DVM

NOV AVHRR

DEC AVHRR

JAN AVHRR

FEB AVHRR

MAR AVHRR

APR AVHRR

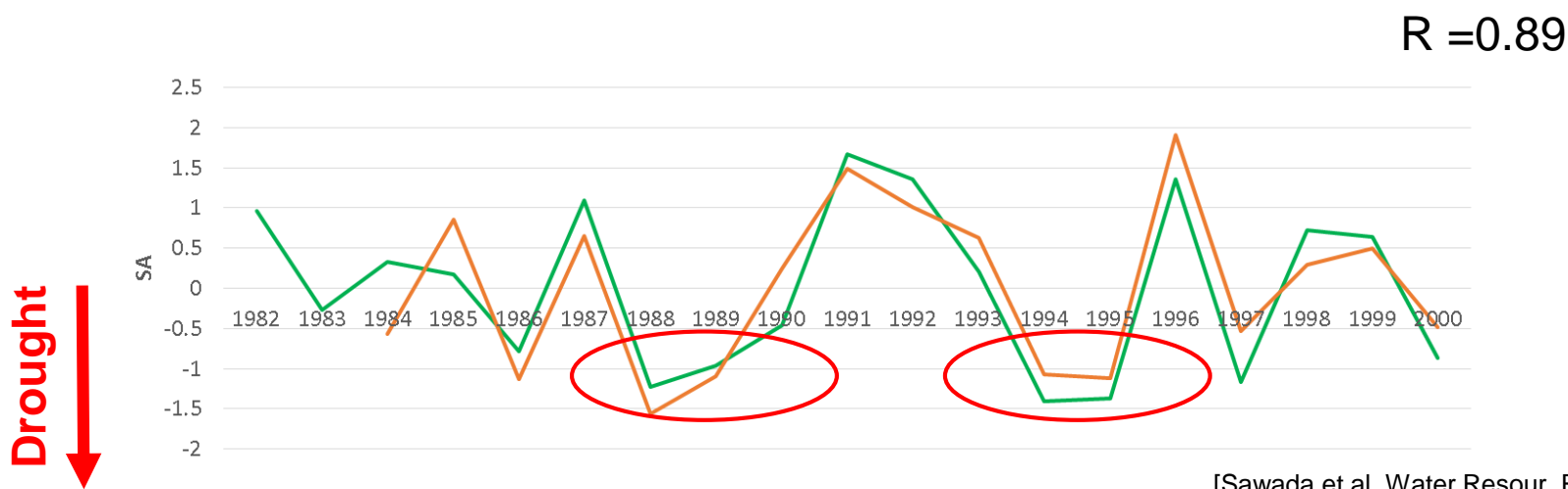


Model Verification

- Agricultural Drought Index -

Drought indices (SA index)

Green:simulated annual peak LAI and Orange:nationwide crop production



→ The drought index calculated from the model-estimated annual peak of leaf area index correlates well with the drought index from nationwide annual crop production.

→ Severe droughts (food shortage) in 1988-1989 and 1994-1995 are reported on FAO report [FAO, 2005]

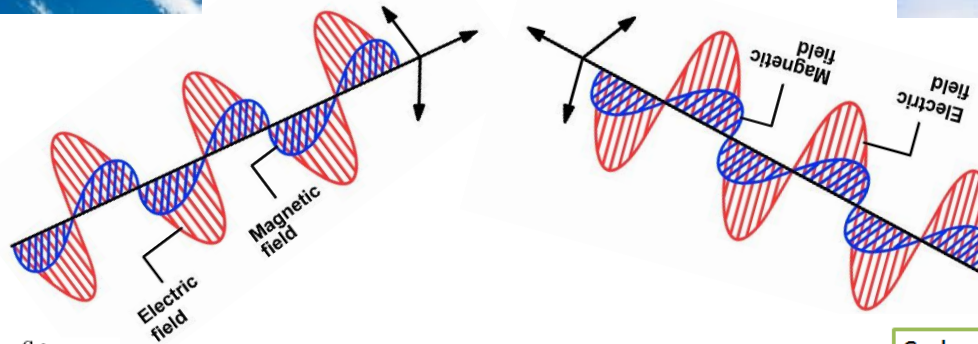
AMSR-E



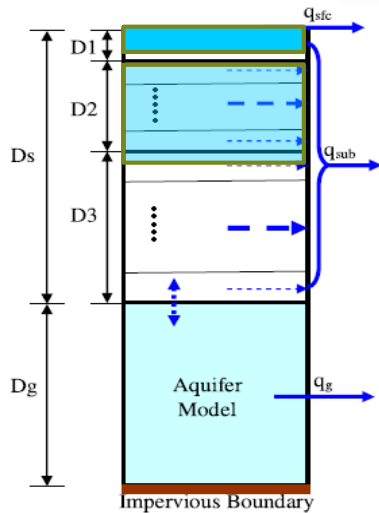
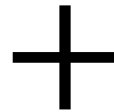
Coupled Data Assimilation



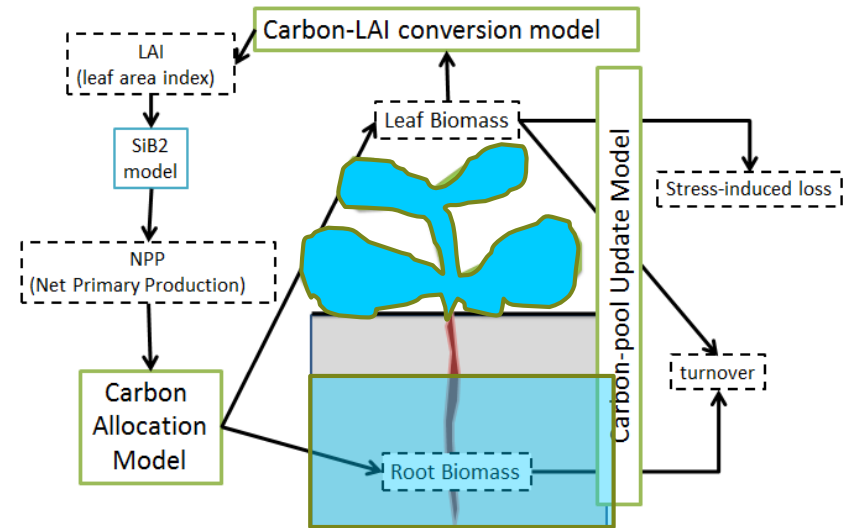
AMSR2



Electronic-Magnetic Wave



Land surface model



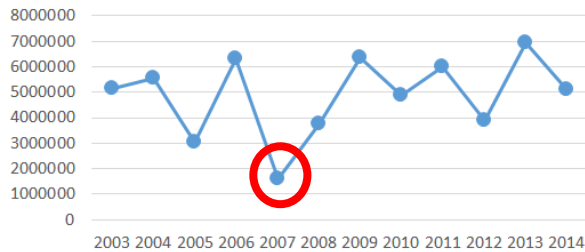
Dynamic Vegetation Model

Drought analysis

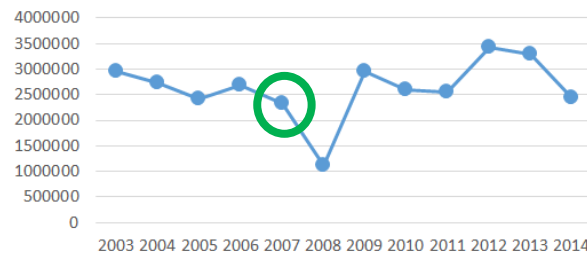
Wheat production

2007 Morocco Drought

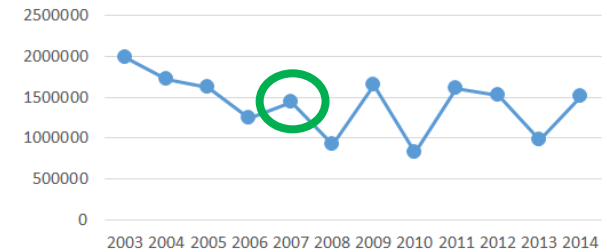
Morocco



Algeria

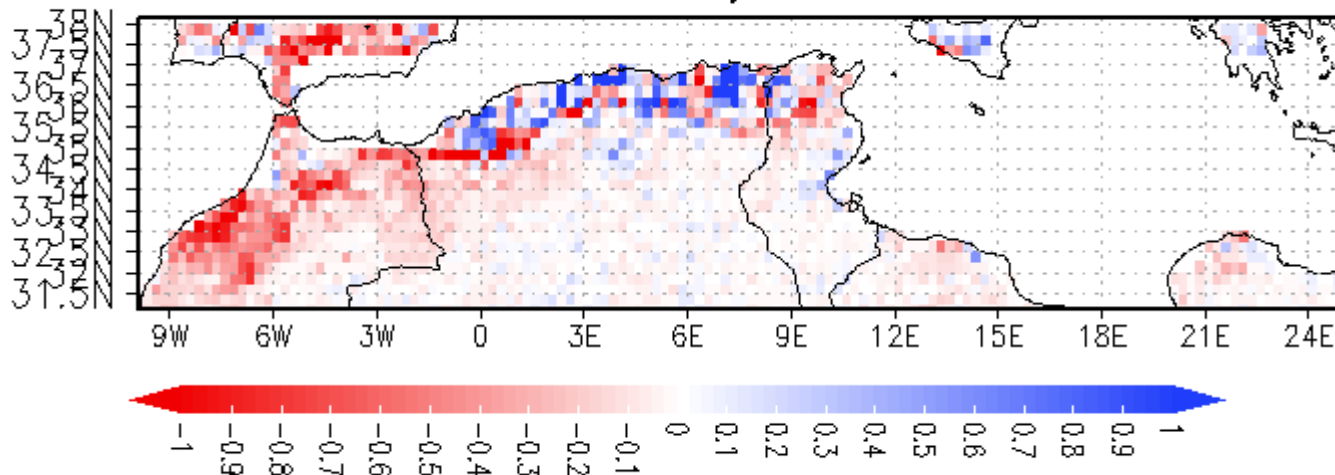


Tunisia



LAI anomaly from CLVDAS

LAI anomaly 20070401

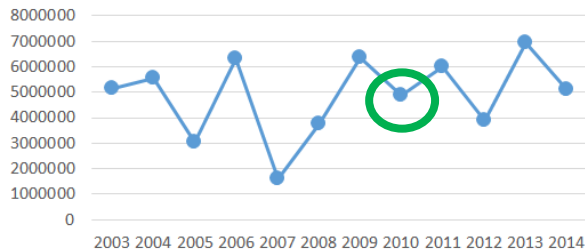


Drought analysis

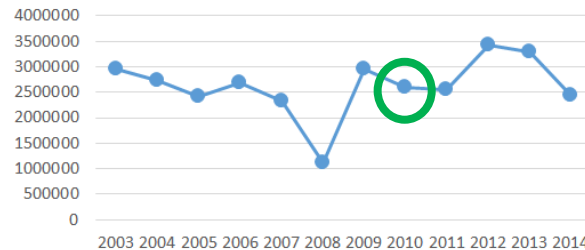
Wheat production

2010 Tunisia Drought

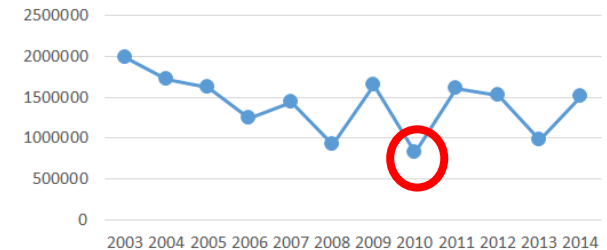
Morocco



Algeria

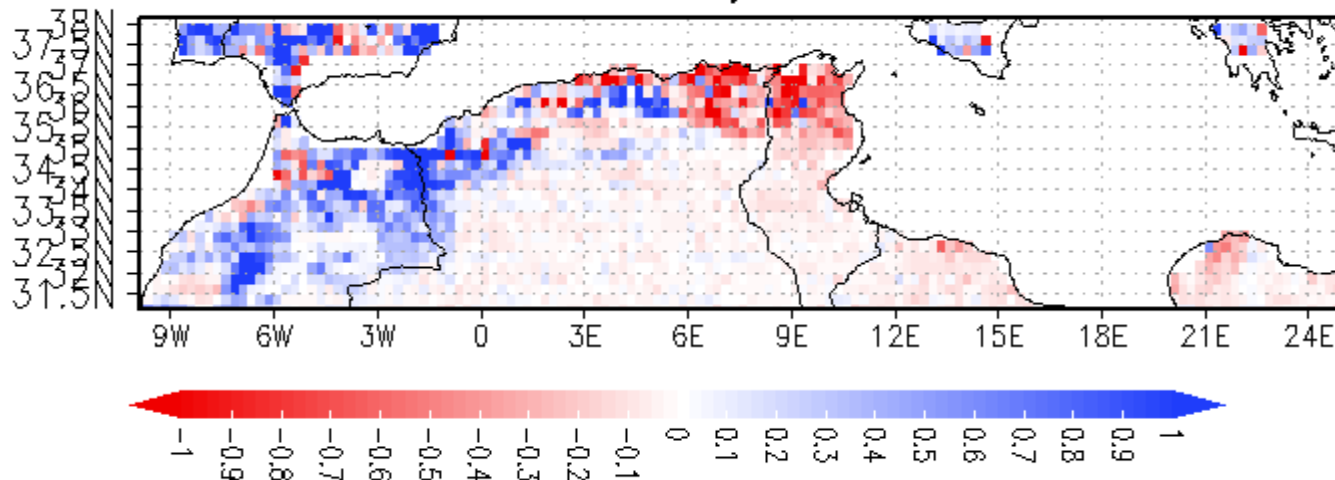


Tunisia



LAI anomaly from CLVDAS

LAI anomaly 20100401

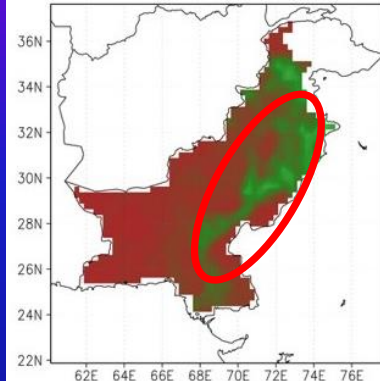
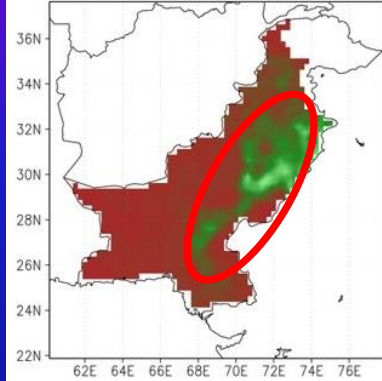


Agriculture

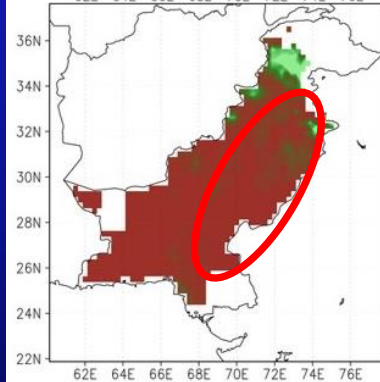
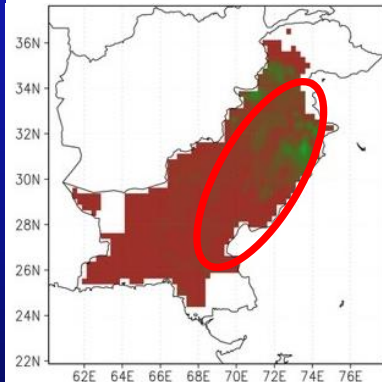
Winter, 2007

Summer, 2007

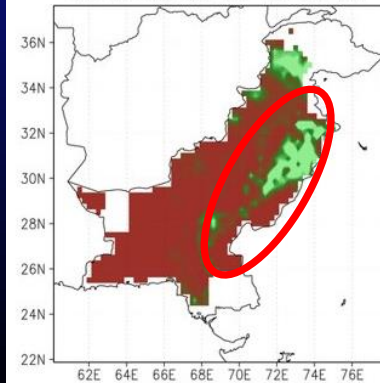
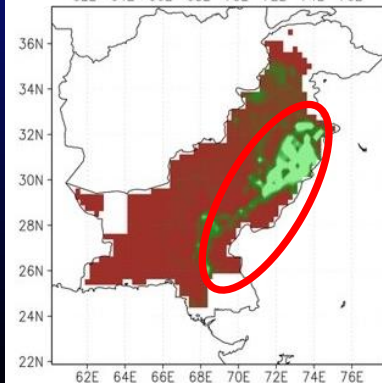
Satellite



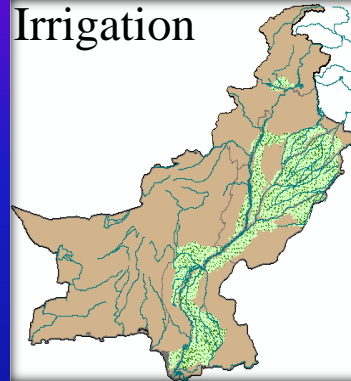
Preliminary



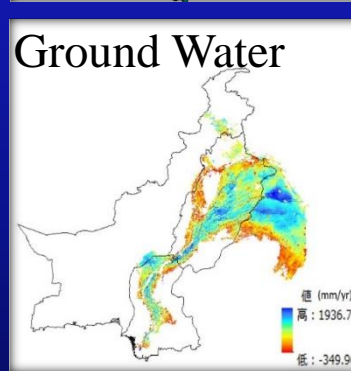
Improved



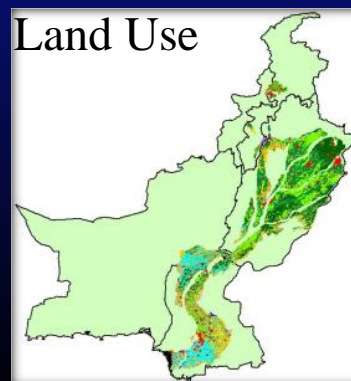
Irrigation



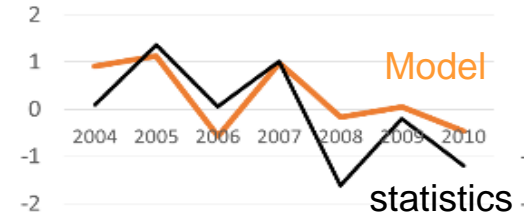
Ground Water



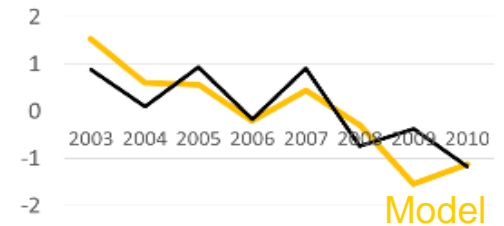
Land Use



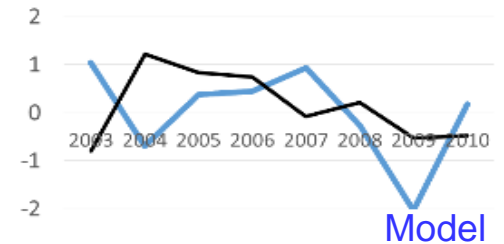
Punjab Wheat



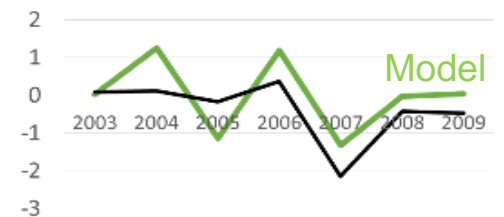
Punjab Rice



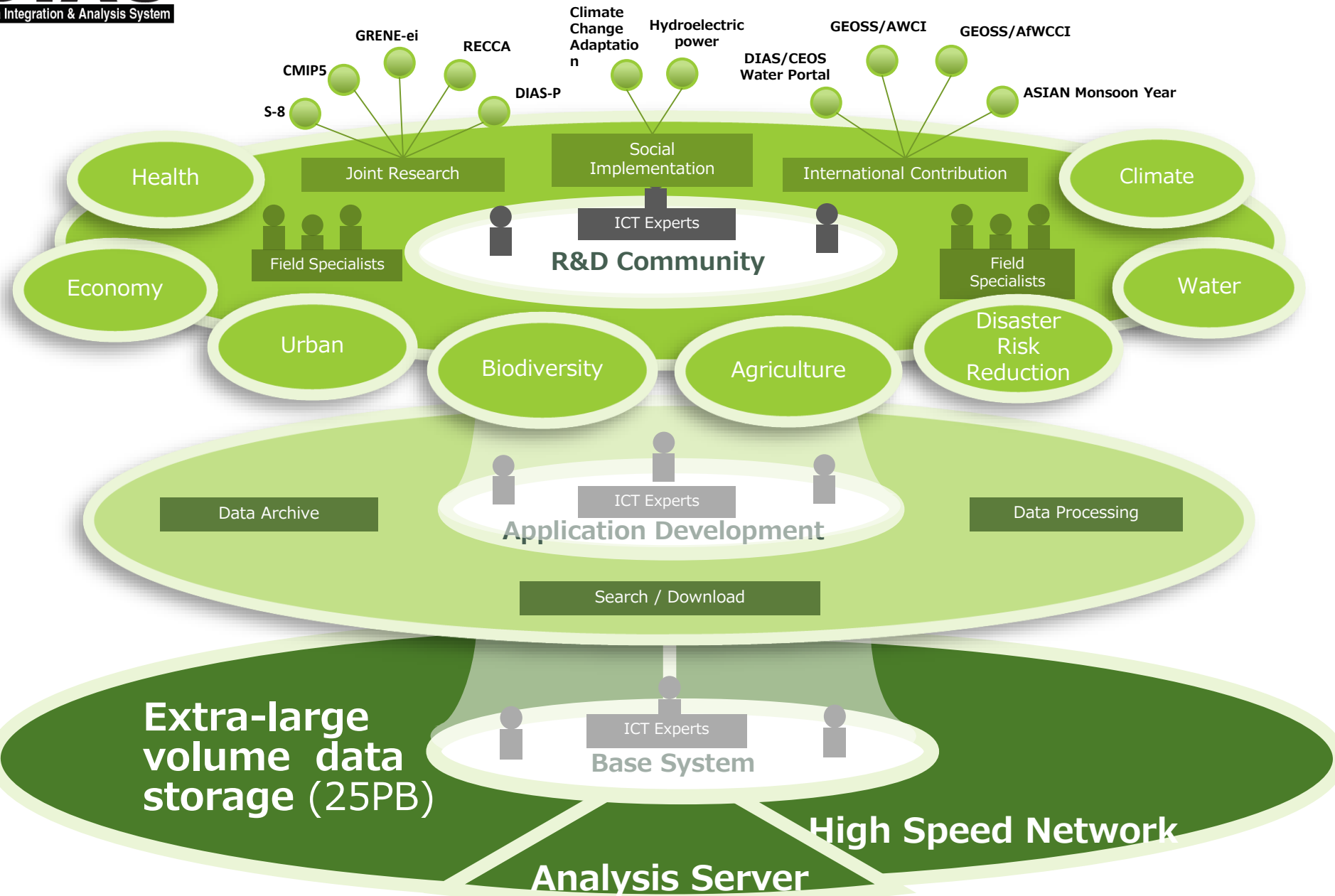
Punjab Cotton



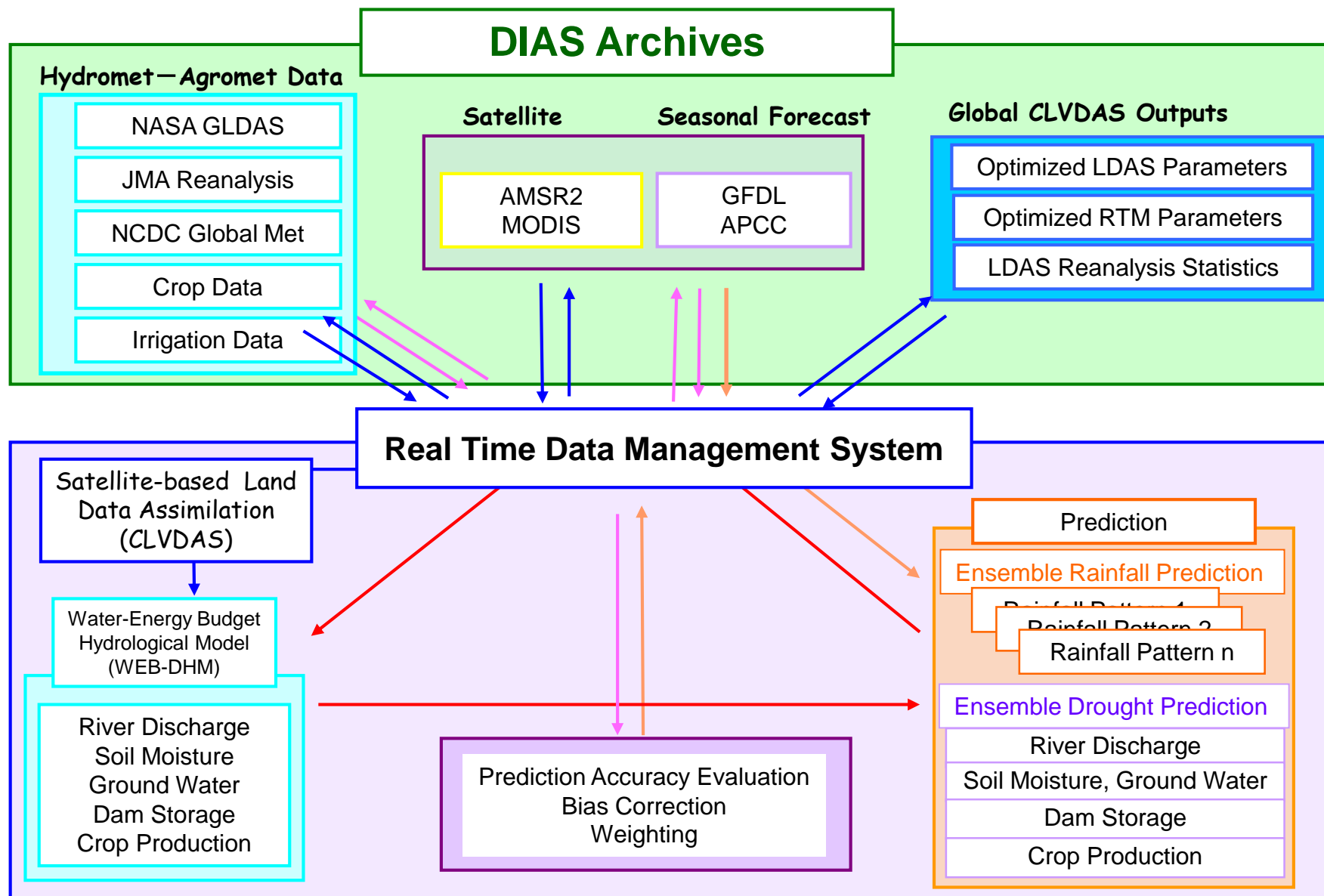
ROP Sugarcane



Challenges to variety, volume, velocity and veracity.



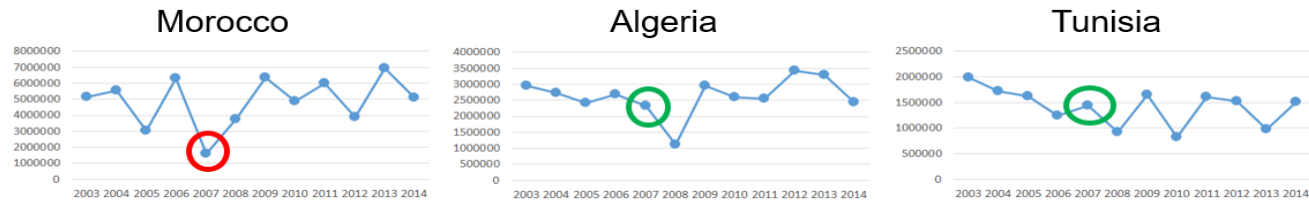
Drought Monitoring and Prediction



Drought Monitoring and Prediction

Wheat production

2007 Morocco Drought



LAI anomaly from CLVDAS

LAI anomaly 20070401

