

GEO Joint Experiment for Crop Assessment and Monitoring (JECAM):

2014 Site Progress Report

JECAM Test Site Name: Morocco

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Project Objectives

The original project objectives have not changed. They are:

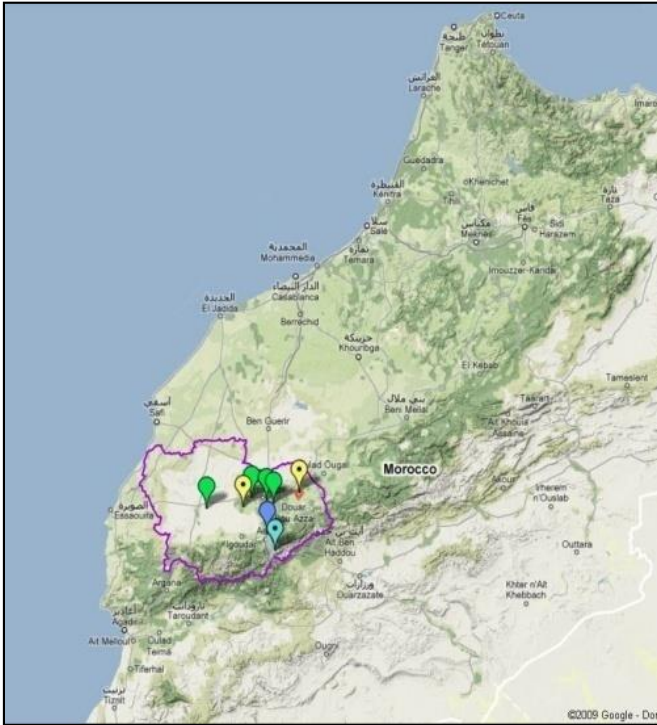
- Crop identification and Crop Area Estimation
- Crop Condition/Stress
- Soil Moisture
- Yield Prediction and Forecasting
- Crop Residue, Tillage and Crop Cover Mapping.

During 2013, we have been working on the following topics:

- Crop condition and stress with Remote sensing-FAO-56 method and Tseb: Phd of A Diarra began in 2013.
- Yield prediction: Phd of J. Toumi began in 2013.
- Irrigation driving: design of the Irrigation Priority Index and optimization of water delivery into an irrigated district (Belaqziz et al 2013 and 2014). Real time and life sized experiment of irrigation driving of a winter wheat field (Le Page to be published in 2014).
- Assimilation of Remote Sensing into a SVAT model (Tavernier et al, 2013).

Site Description

The watershed is located in the Tensift region of Marrakech in Morocco). Covering an area of about 20,000 km², it is composed of 3 hydrological parts. South of the basin, the northern slopes of the Atlas is well-watered and snow (up to 600 mm / year). Peaking at over 4,000 m, these mountains are the water tower of the Haouz plain. In the center, a vast plain, characterized by a semi-arid climate (rainfall 250 mm / year), and where the water flows are predominantly vertical except for wadis and water infrastructures. The main irrigated areas are located in the central and eastern part (2000 km²) and rain fed cereals are grown on the rest of the plain. Wheat is the main crop with over 80% of acreage in wheat, followed by olive trees which occupy about 13% of the plain, and the remainder is occupied by citrus, apricot, market gardens, vineyards, fodder. These proportions change significantly in the irrigated area where tree crops dominate. In the north, the small chain of arid mountains "Jbilet" has, as far as we know, little influence on the hydrological cycle in the region.



Two test sites are considered for JECAM:

- The R3 sector is a 3000 ha area with flood irrigation on demand located 40 km east of Marrakech. The main crop is Winter Wheat. The other crops, representing less than 20% of the cultivated area, are sugar beets, olive trees, etc. The soil texture is mainly Clay Loam. The growing season of winter wheat is December-June, sugar beets from November to June, and olive groves are evergreen with latency during the summer. The whole site has been under study since 2002 and benefited from several remote sensing campaigns with optical (SPOT, Landsat, Formosat), thermal (Aster, Landsat), and SAR (ASAR) satellite time series.

Figure 1: Location of the Tensift Watershed in Morocco

- The Agafay plantation is a mandarin orchard located 20 km east of Marrakech which occupies 500 ha. The plantation benefits from drip irrigation. The soil texture is loam, mandarin trees are evergreen with latency during the summer. The site has been monitored since 2006 with an eddy covariance system, soil temperature and humidity sensors, and flux meters. Sapflow measurements have been conducted for separation of evaporation and transpiration.

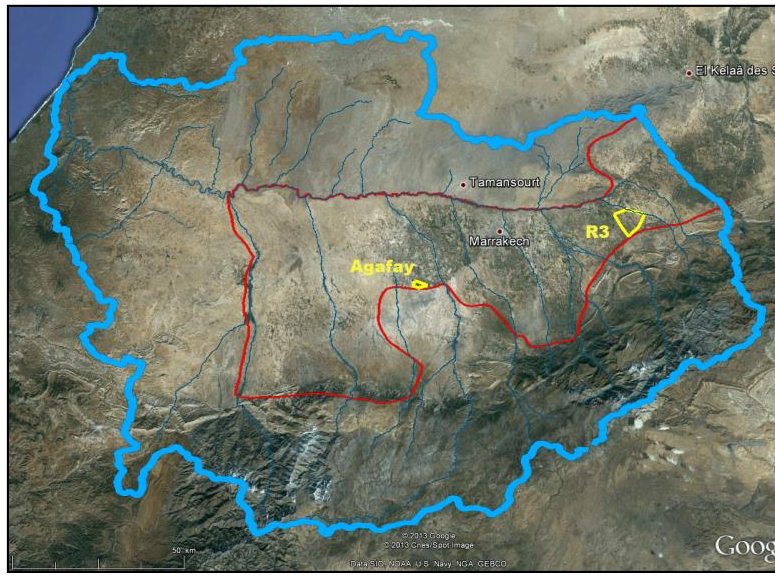


Figure 2: Location of the Haouz Plain (red) and the Two Sites (yellow) in the Tensift Watershed (blue)



Figure 3: A Wheat Field in the Haouz Plain of Marrakech, with the High Atlas Mountain in the Background

EO Data Received/Used

We have not received any EO through JECAM. The process of acquiring imagery through JECAM is unclear. The EO images used during 2013 are shown in Table 1.

	SPOT4 (Take5)	SPOT5	SPOT6
Space agency or Supplier	CNES	Astrium	Astrium
Optical/SAR	Optical	Optical	Optical
Number of scenes	20	12	4
Range of dates	Feb 2013 to June 2013	Dec 2012 to June 2013	July 2013
Spatial resolutions	20 meters	10 meters	5 meters
Processing level	Ortho + atmospheric corrected	Ortho corrected	Ortho corrected
Challenges, if any, in processing and using the data		SMAC atmospheric correction but problems with the photometer	

Table 1: EO Images Used during 2013

In situ Data

See Table 2.

Table 2: In situ Data for Tensift, Morocco Site

Group	Parameter	Instrument	Acquisition mode	Sampling	Site	Period(s)
Vegetation	Fraction cover, LAI, Biomass	Hemi-photo	O	10 days	R3	Field campaigns
		Destructive cut		Annual	Agafay	
	Yield (wheat)	Survey	O	Annual	R3	2003, 2004, 2006, 2012, 2013
Land cover And Agricultural practices	Land cover	Survey	O	Annual	R3+Agafay	2002, 2004, 2006 2010-...
		Remote sensing	A	Annual	R3, Agafay	2001-...
	Plowing	Survey	O	Agricultural Season	R3	Since 2006
	Sowing					
	Irrigation	Survey	O	By water turn	R3	2002, 2006, 2008-...
Drip (daily)				Agafay	2006-...	
Water and Energy Budget	Rn	Radiometer	A	30 min.	Intensive sites (table)	
	G	Flux plates				
	H	Turbulent fluxes				
	LE					
	Vertical profiles of temperature					
	Vertical profiles of humidity	Reflectrometry probes				
	Surface humidity	Capacitive probes	O	1-7days		
	Water fluxes	Fluxmeter	A	30 min.	R3	

Group	Parameter	Instrument	Acquisition mode	Sampling	Site	Period(s)
Weather	P	Weather station	A	30 min. - 1hr	15 stations (Figure 3)	
	U					
	RH					
	Ra					
	R0					
	Rain					
	Rain	Pluviometer	O	Daily	36 pluviometers (Figure 3)	From the 60's for some pluviometers
In Situ remote sensing measurements	Reflectance / NDVI	Cropscan	O	15 days	R3, wheat	Field campaign
	Ts	Thermoradiometer	A	30 mns	Intensive sites (table)	
	Optical depth and water vapor	CIMEL photometer	A	15 mns	Saada	2004-...

Collaboration

We have been solicited by the SenSyF project (<http://www.sensyf.eu/>) through Miss Julia Amoros, but only to use the dataset of Spot4-Take5 imagery and the land use cover we have collected.

Results



Figure 4: Border Irrigation of a Wheat Field and Eddy-covariance Measurement in the Background

Experience with the COVE Planning Tool

We were not aware of this tool and are interested in a short course.

Plans for Next Growing Season

We have not ordered high resolution imagery for the 2013-14 season, but are willing to renew the irrigation experiment for next year.

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