Regional Coordination on Improved Water Resources Management and Capacity Building Technical Assistance Project
- GEF funded project -

LDAS – MAROC
For improving water resources management and climate change adaptation

Module: Irrigation Optimization

Grant Implementing Agency:	**Royal Centre for Remote Sensing (CRTS)**
Partner for Project execution:	**Ministry of Energy, Mines, Water and Environment (Water Department)**
Grant Implementation Period:	**~3 years (2012 – 2015)**
Word Bank (GEF Grant):	**1.050.000 $**

Global Situation (Irrigated areas)

Lancement en 1967 de l'objectif d'aménagement d'un million d'ha irrigué à l'horizon 2000

Développement spectaculaire des superficies irriguées

1960: 150.000 ha

2013: 1.461.400 ha

16,8% de la SAU

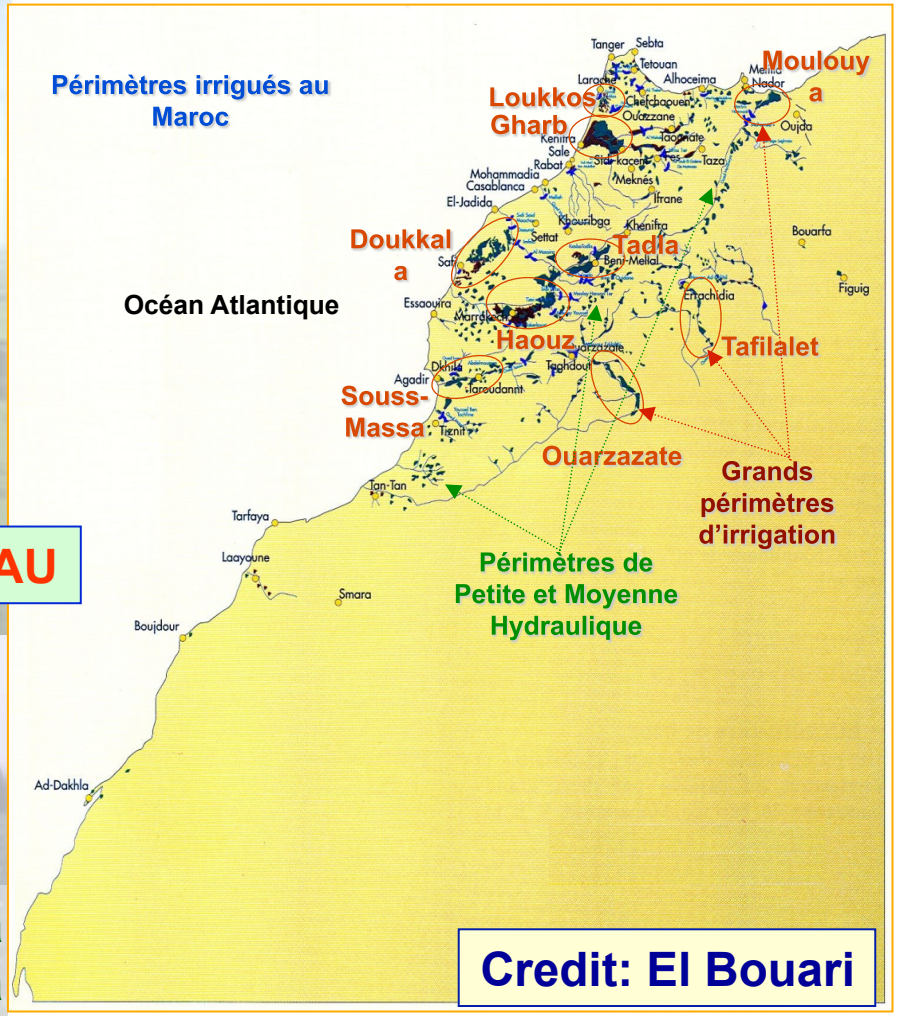
1.019.970 ha Aménagés par l'Etat

441.430 ha Aménagés par les privés

Grande hydraulique: 682.600 ha

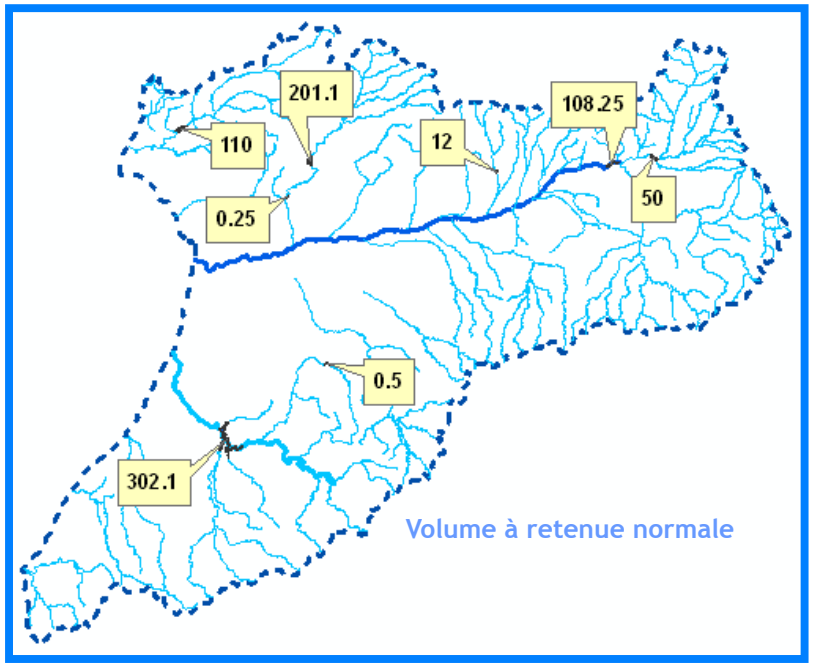
Petite et moyenne hydraulique : 337.370 ha

Irrigation de surface	1.001.650 ha	68%
Irrigation par aspersion	129.750 ha	9%
Irrigation localisée	330.000 ha	23%



CRST experience in Crop Mapping

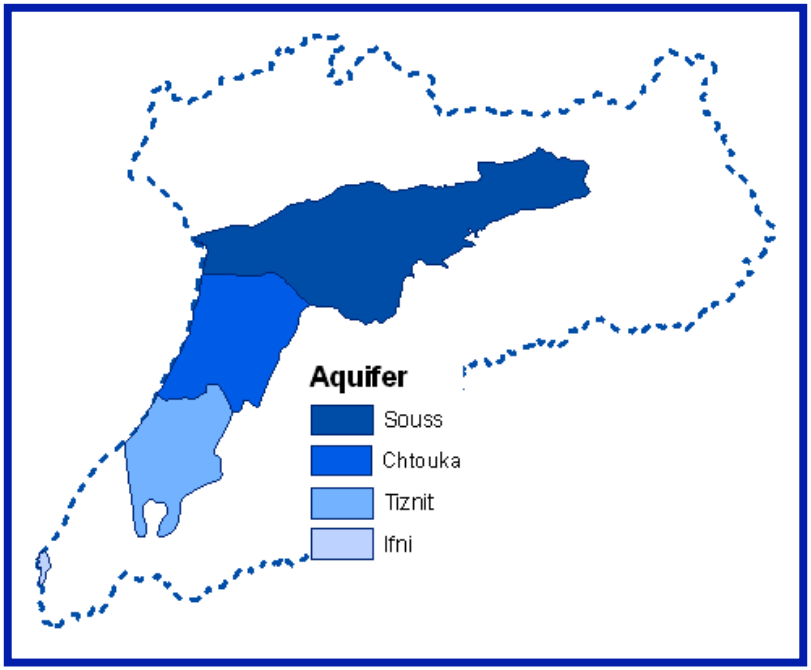
Souss-Massa Basin



Aquifer (2003)	Income (Mm³/an)	Irrigation (Mm3/an)	A.E.P.I (Mm3/an)
Souss	323	608	28.7
Chtouka	35	85	7
Source ABHSM			

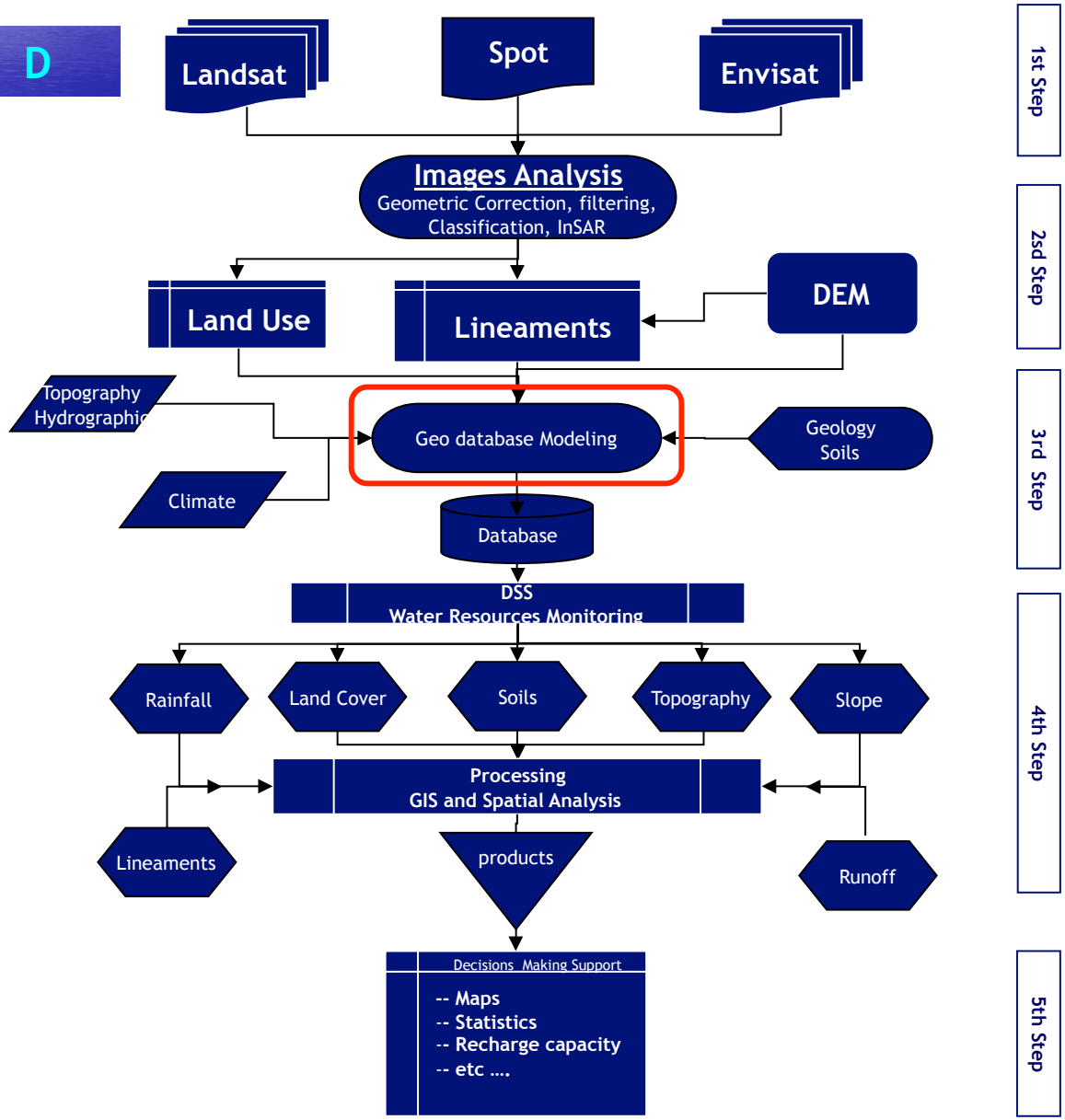
Water potentialities

- 8 Dams :
  - Volume : 797 Mm³
  - Regularized volume : 371 Mm³
- 9 small dams : with 15 Mm³



CRST experience in Crop Mapping

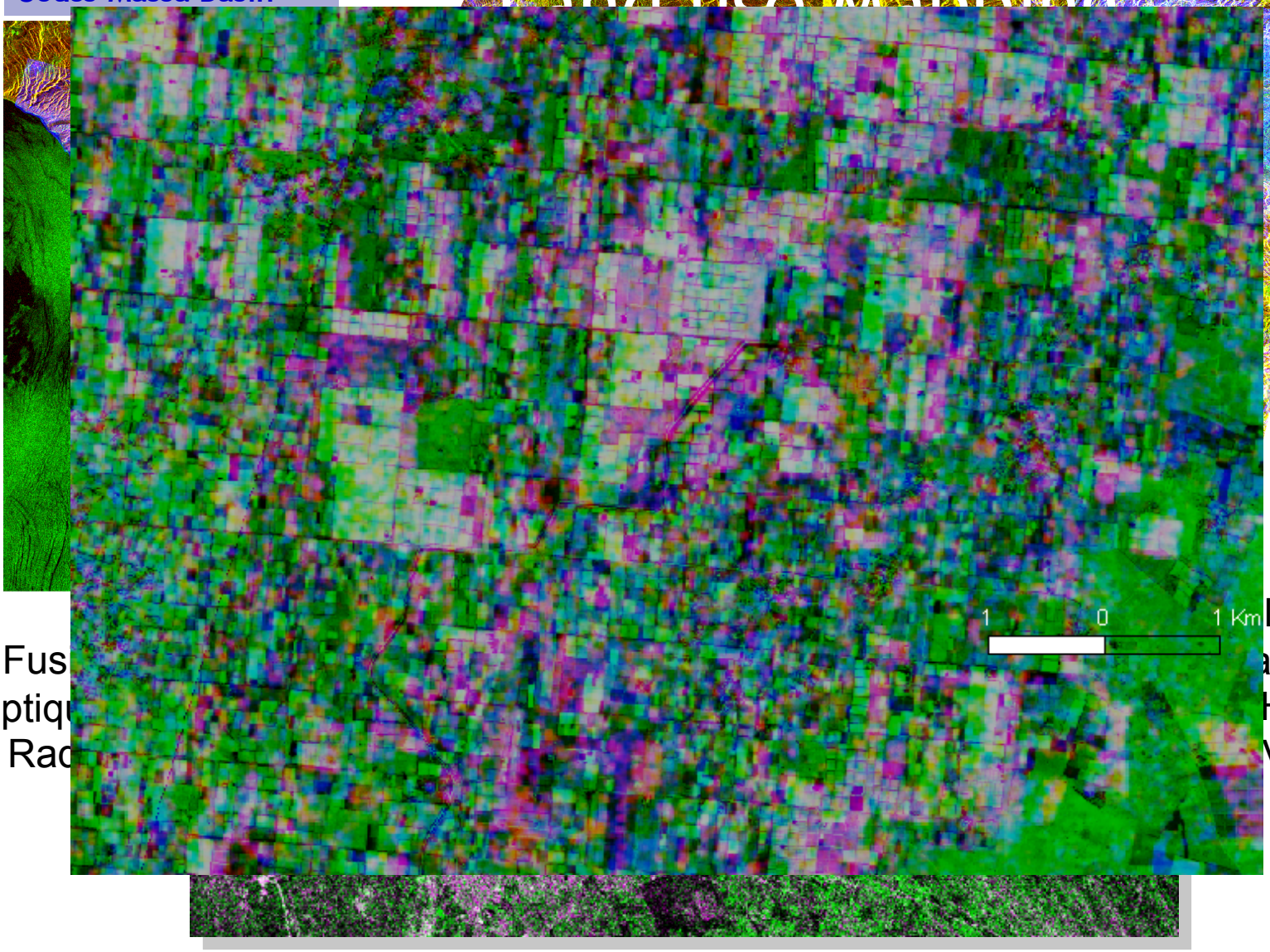
S I A D



CRST experience in Crop Mapping

Souss-Massa Basin

Land use Mapping

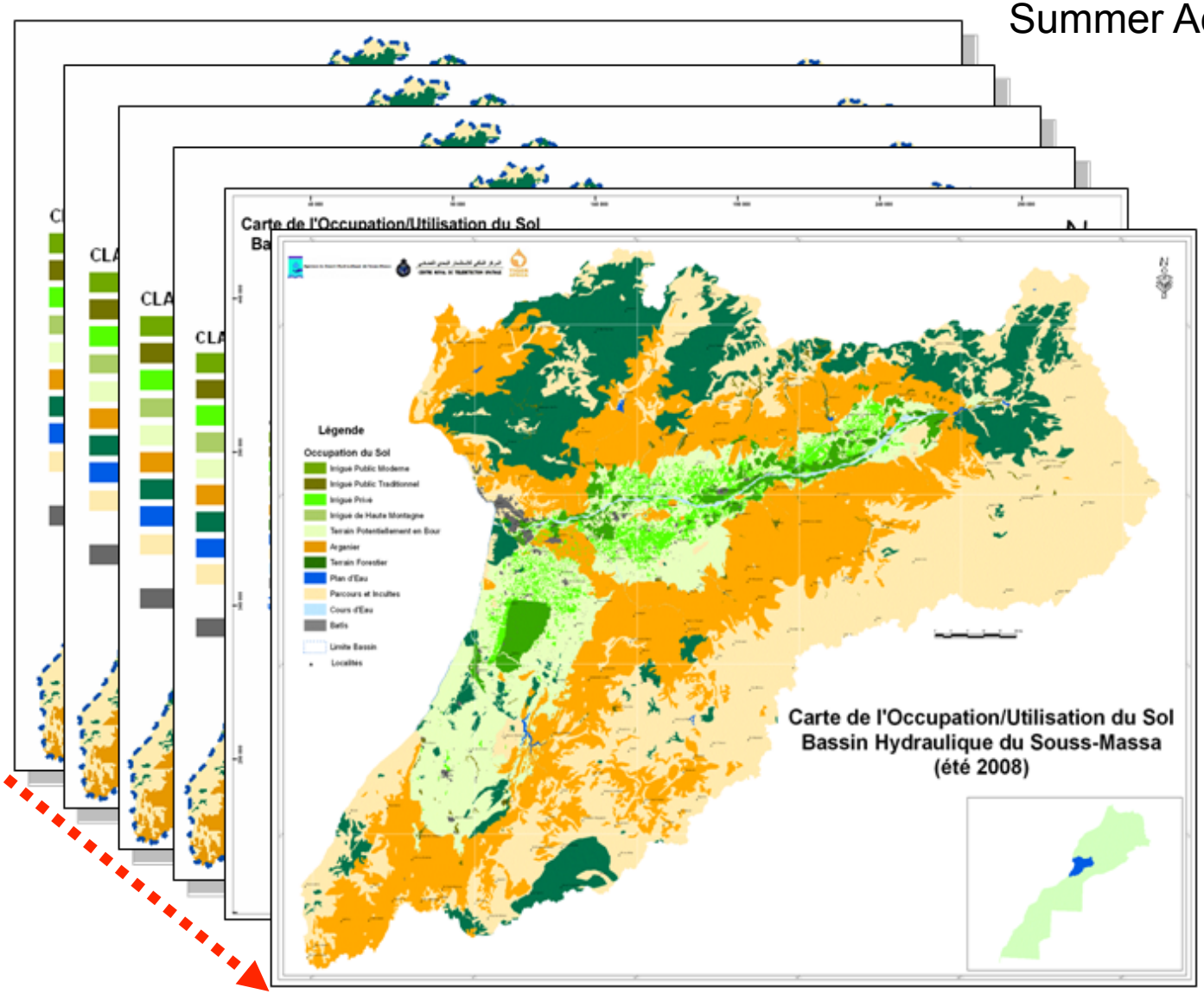


Fus larimétrie
Optiq alternée
Rad HH/VH
VV/HV

Souss-Massa Basin

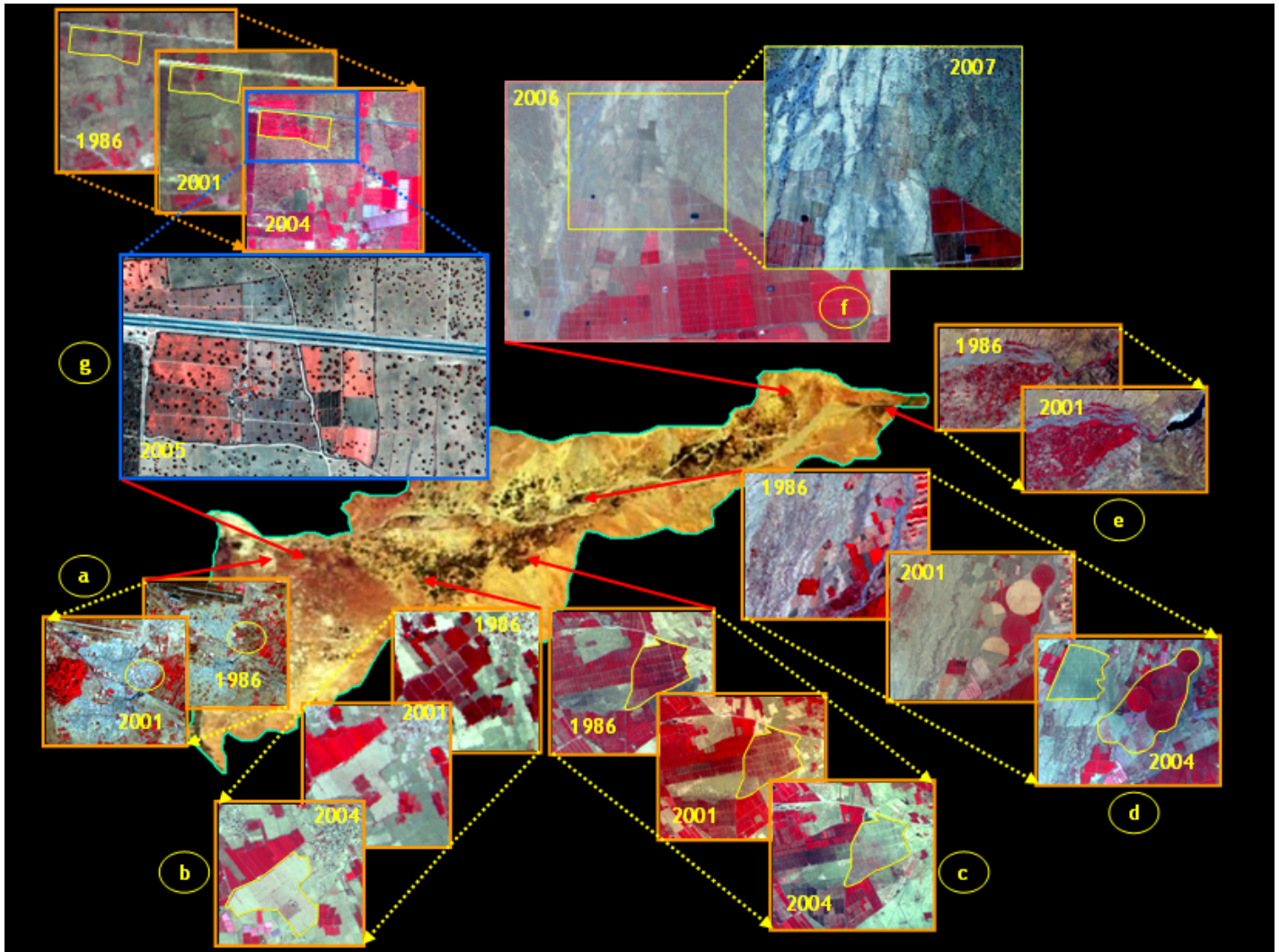
CRST experience in Crop Mapping

Summer Acquisitions



Souss-Massa Basin

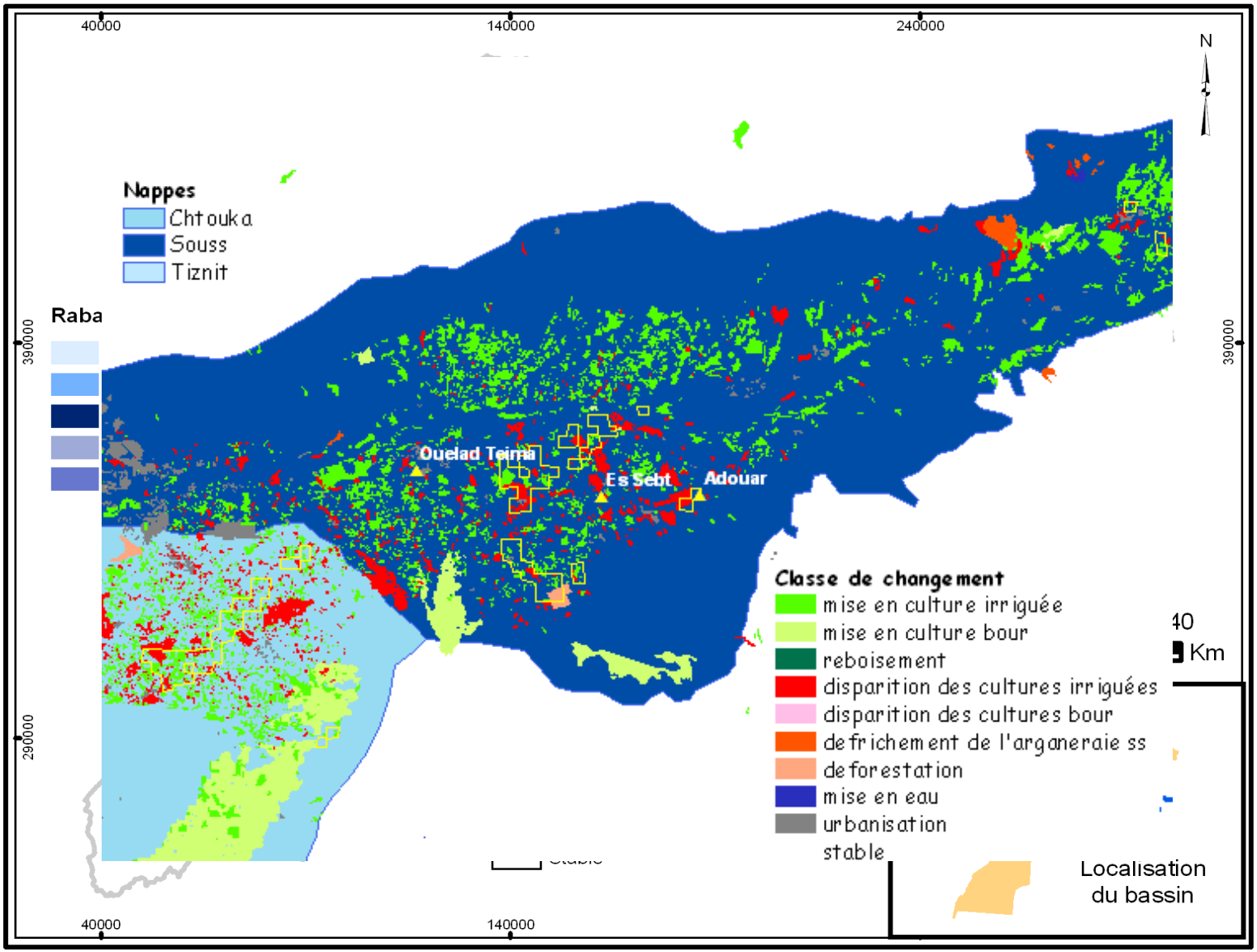
CRST experience in Crop Mapping



a- Urbanisation, **b**- Dégradation des sols, **c**- Surexploitation de la nappe, **d**- Changement de pratique agricole,
e- Densification de l'espace irrigué, **f**- Extension en zone amont, **g**- Extension en milieu forestier (cultures sous arganier).

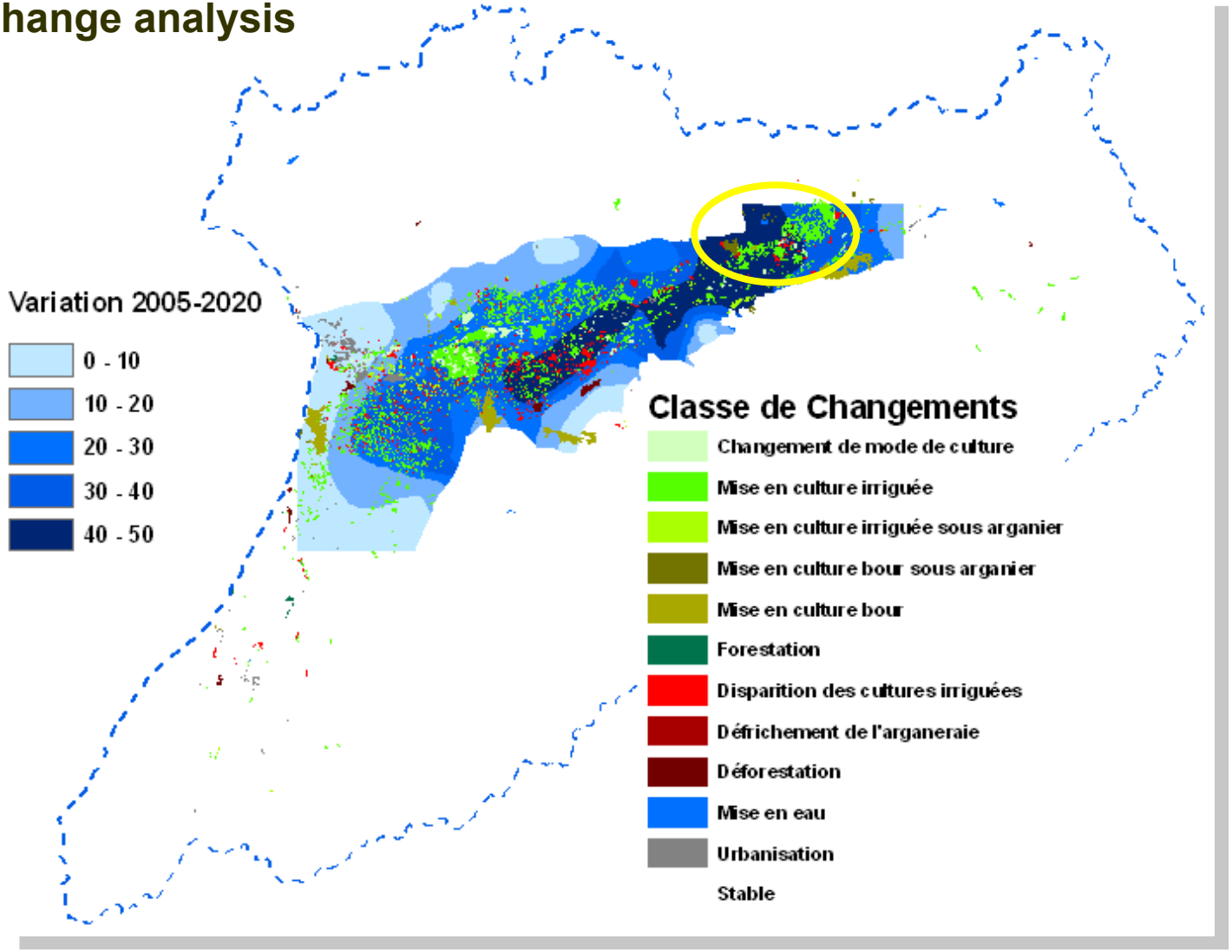
CRST experience in Crop Mapping

Change analysis



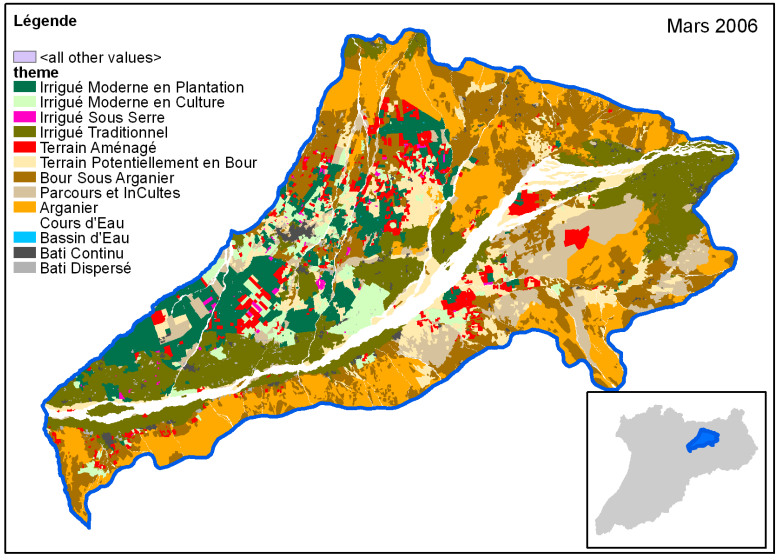
CRST experience in Crop Mapping

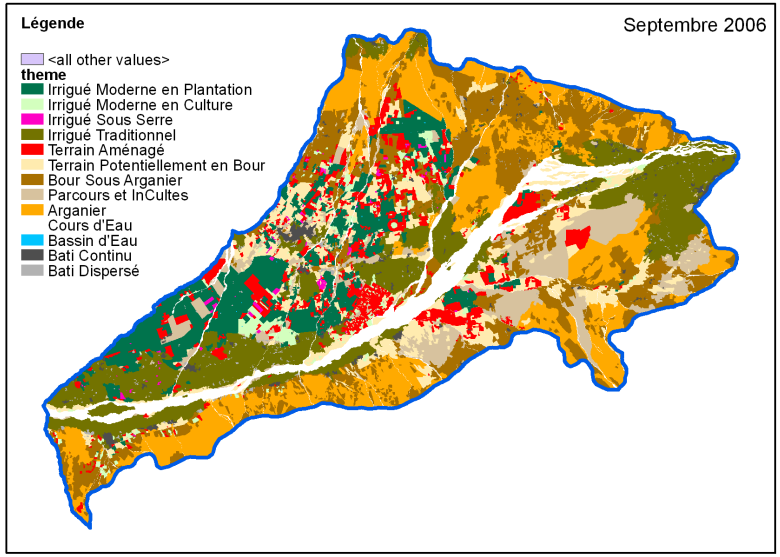
Change analysis

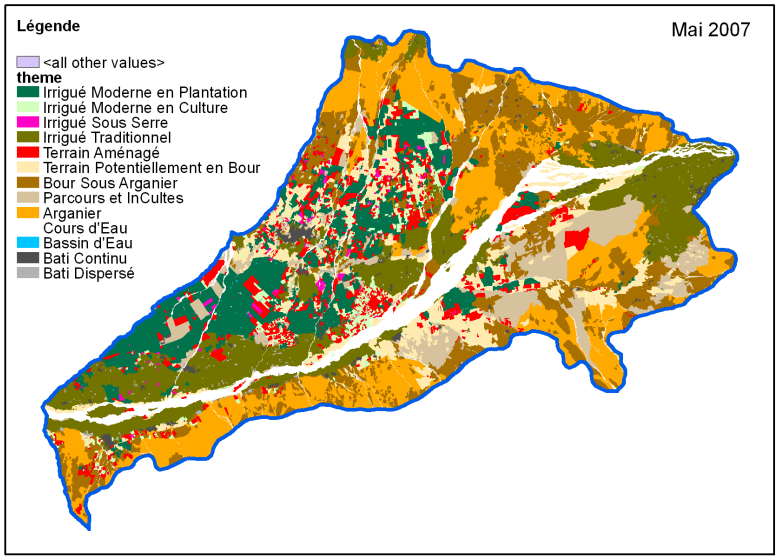


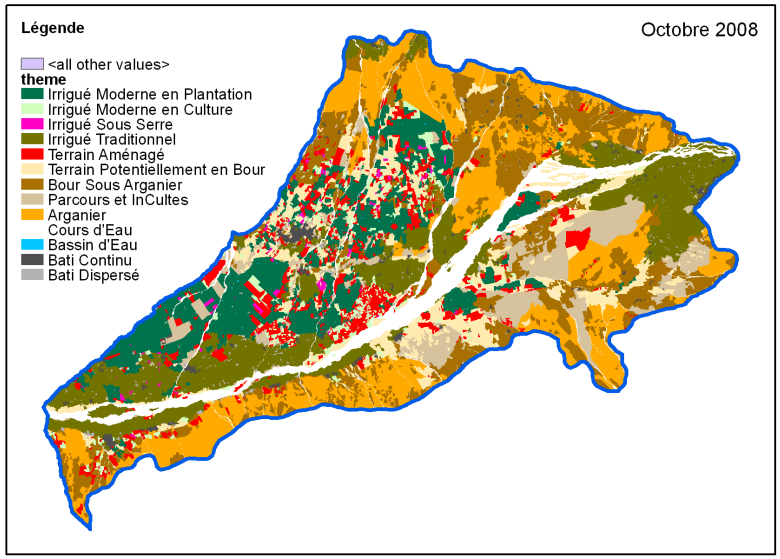
CRST experience in Crop Mapping

Irrigated areas Monitoring

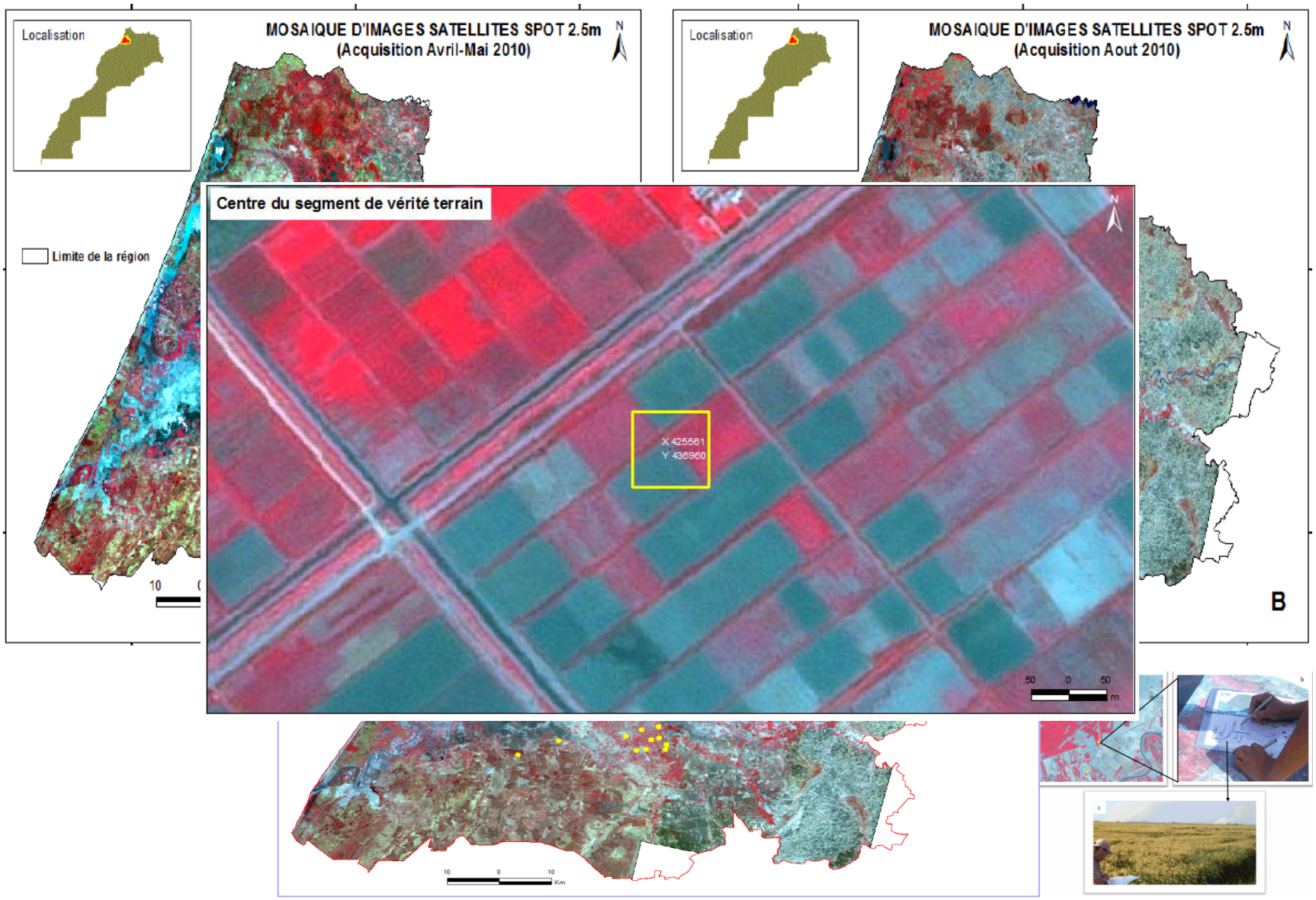








CRST experience in Crop Mapping



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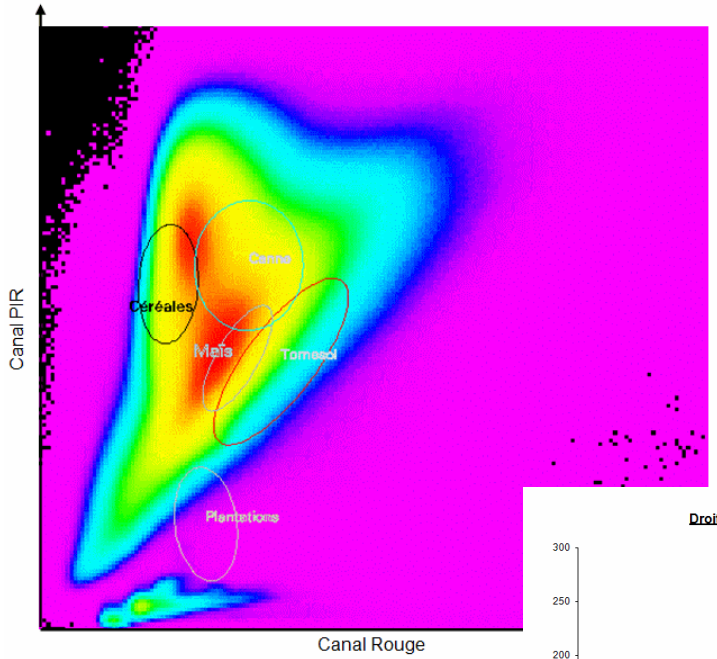
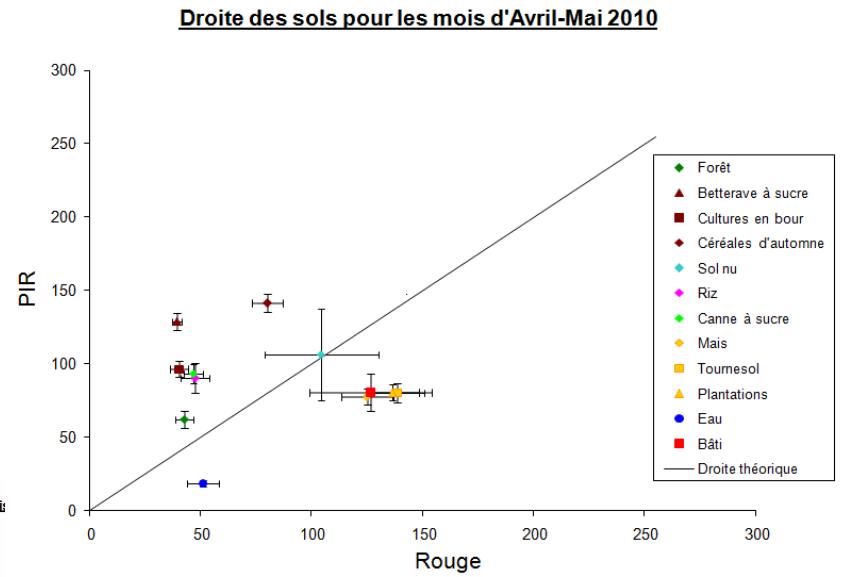
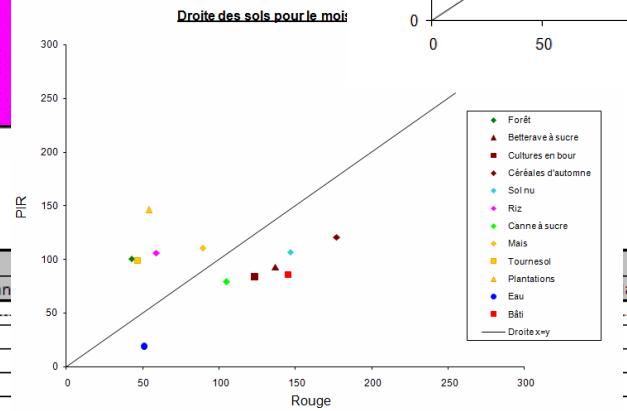
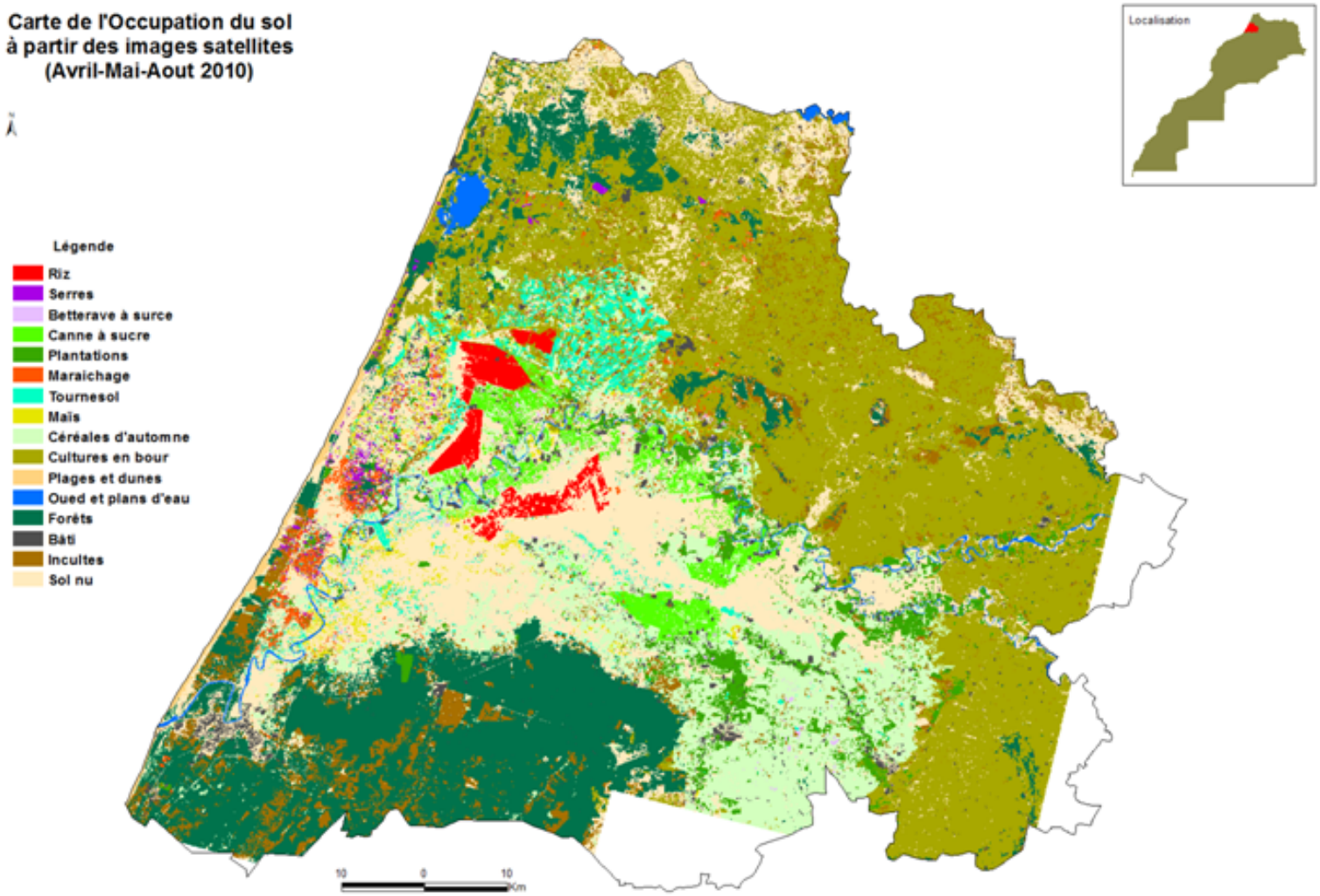






	eau	maïs	forêt	tournesol	cann					antations	riz	bâti	Total ligne	user's accuracy	commision
Classification	----------	----------	----------	----------	------					--------	----------	----------	----------		
eau	3578,85	0,00	0,00	0,00						0,00	0,00	10,76	3589,61	99,70	0,30
maïs	0,00	6588,80	0,00	0,00						0,00	0,00	0,00	7441,80	88,54	11,46
forêt	0,00	0,00	8350,16	0,00						0,00	0,00	0,00	8350,16	100,00	0,00
tournesol	0,00	0,00	0,00	6796,20						0,00	0,00	0,00	7407,20	91,75	8,25
canne à sucre	0,00	1636,28	0,00	456,00	37335,28	0,00	24,99	0,00	0,00	0,00	0,00	13,45	39466,00	94,60	5,40
cultures en bour	0,00	0,00	0,00	0,00	132,02	29515,32	0,00	0,00	0,00	0,00	0,00	0,00	29647,34	99,55	0,45
betterave à sucre	0,00	0,00	0,00	0,00	0,00	0,00	7326,01	140,63	0,00	0,00	0,00	0,00	7466,63	98,12	1,88
céréales d'automne	0,00	0,00	0,00	4,08	0,00	0,00	853,00	16872,66	0,00	0,00	1190,30	0,00	18920,04	89,18	10,82
sol nu	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	10685,59	0,00	0,00	166,76	10852,34	98,46	1,54
plantations	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	3953,00	0,00	0,00	3953,00	100,00	0,00
riz	0,00	0,00	0,00	0,00	0,00	0,00	0,00	5152,44	0,00	0,00	30466,70	0,00	35619,14	85,53	14,47
bâti	2,15	7,92	0,84	0,00	83,70	0,00	0,00	0,00	21,41	0,00	0,00	26662,00	26778,03	99,57	0,43
Total colonne	3581,00	8233,00	8351,00	7256,28	38404,00	30126,32	8204,00	22165,73	10707,00	3953,00	31657,00	26852,97	199491,30		
producer accuracy	99,94	80,03	99,99	93,66	97,22	97,97	89,30	76,12	99,80	100,00	96,24	99,29			
omission error	0,06	19,97	0,01	6,34	2,78	2,03	10,70	23,88	0,20	0,00	3,76	0,71			

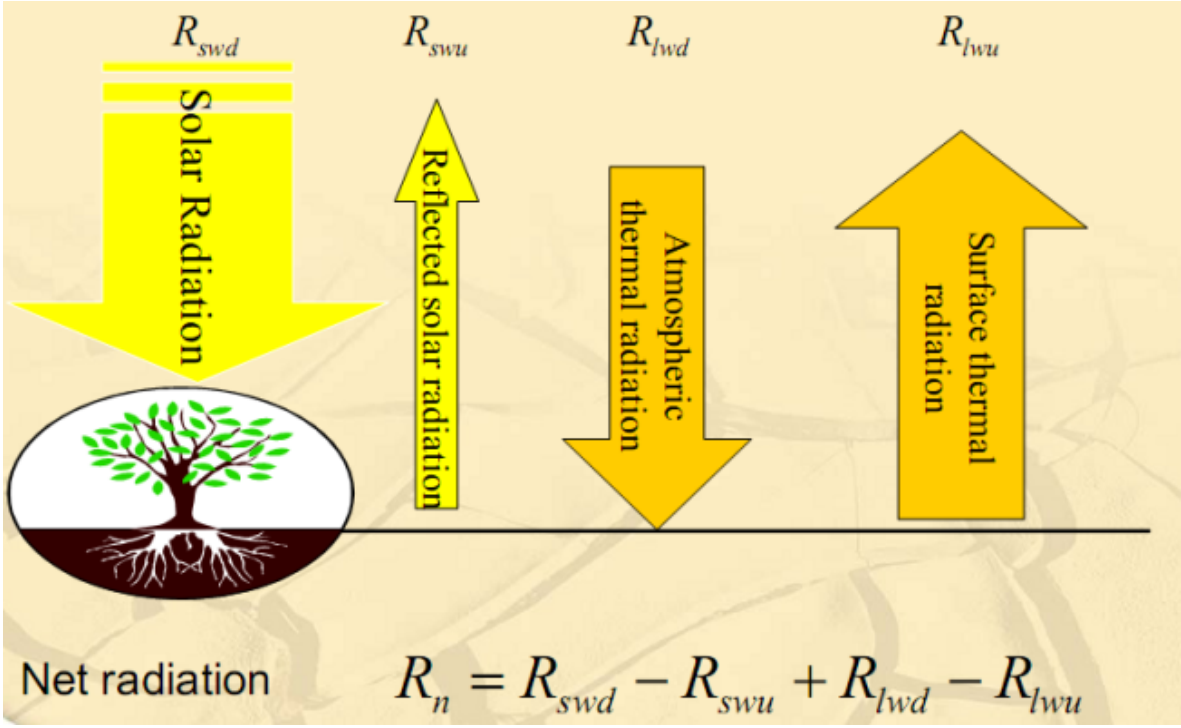
CRST experience in Crop Mapping

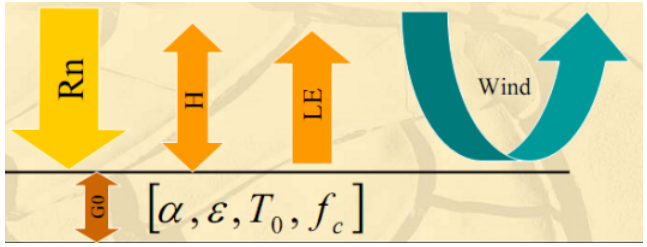


Source: ABHS

CRST experience in Crop Mapping

SEBS basics: Eta estimation





$$Rn = G_0 + H + \lambda E$$

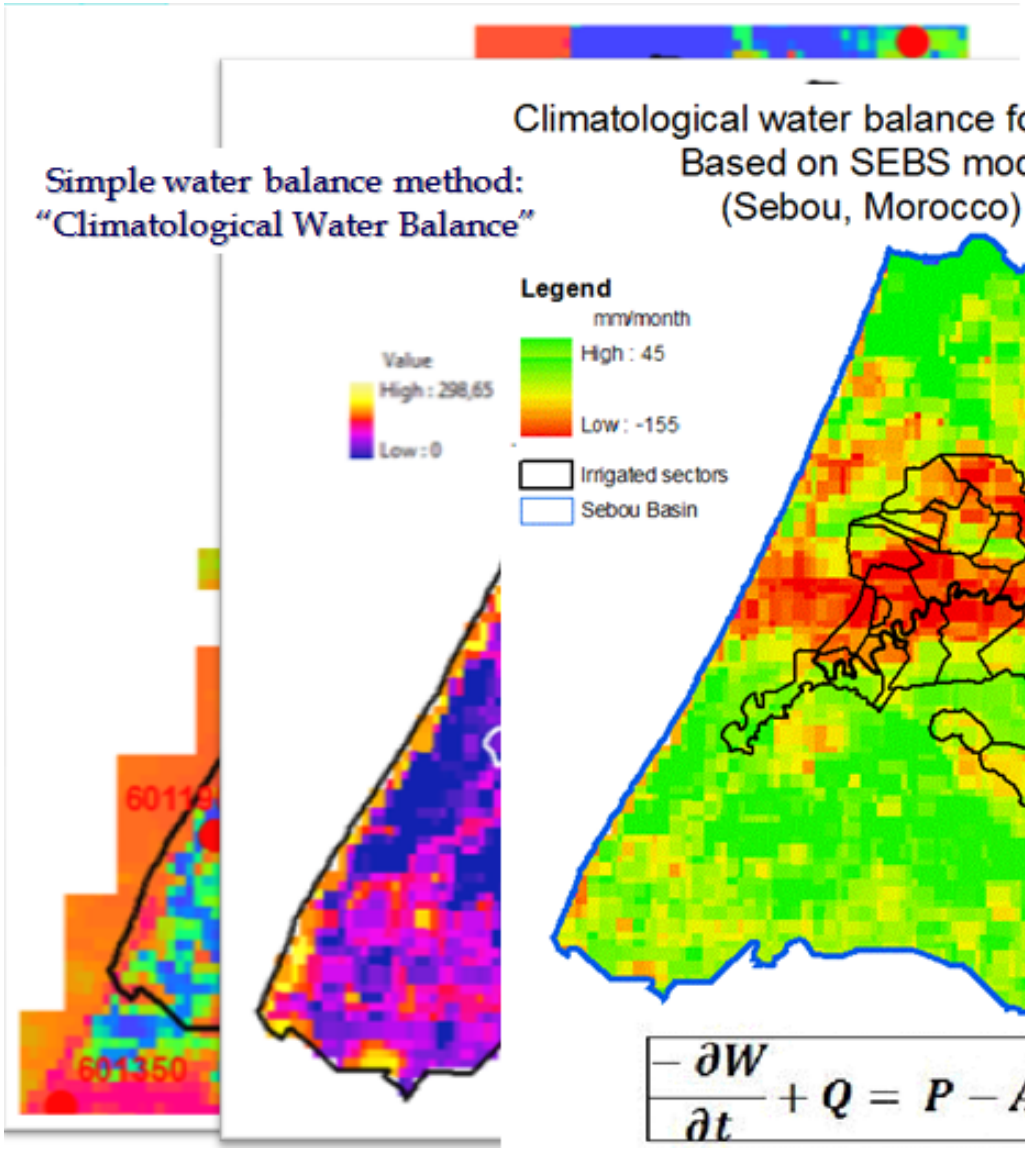
Source: B. Su

CRST experience in Crop Mapping

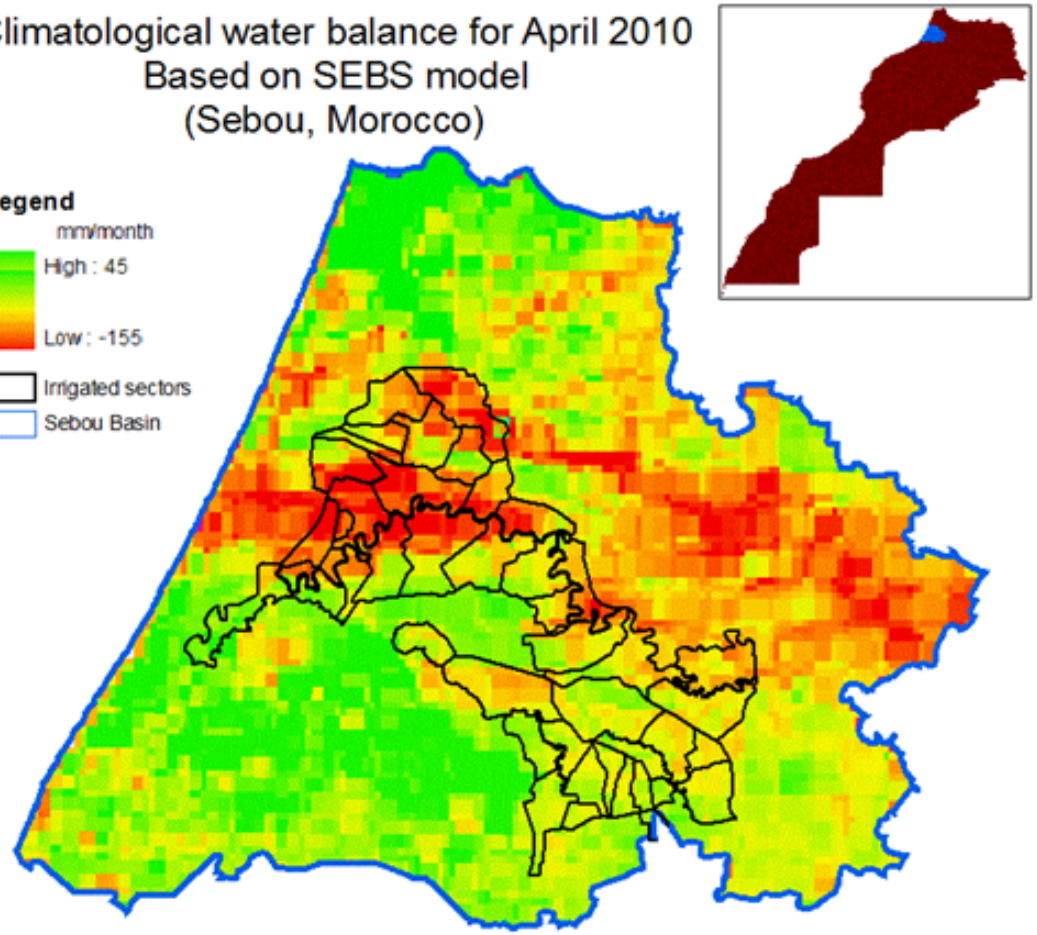
Eta estimation

Key Hydrologic parameter: ET

Simple water balance method:
"Climatological Water Balance"



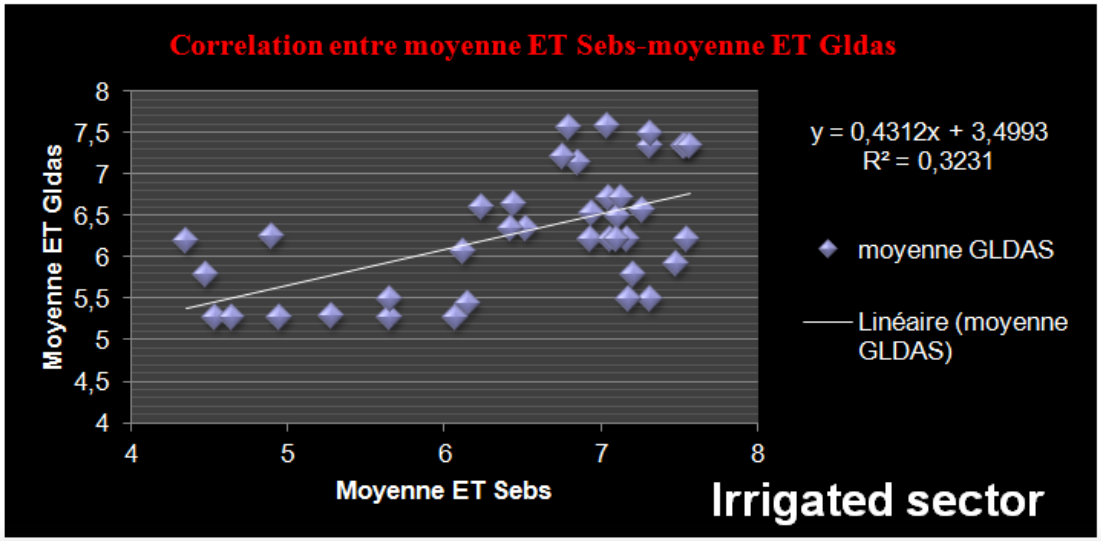
Climatological water balance for April 2010
Based on SEBS model
(Sebou, Morocco)

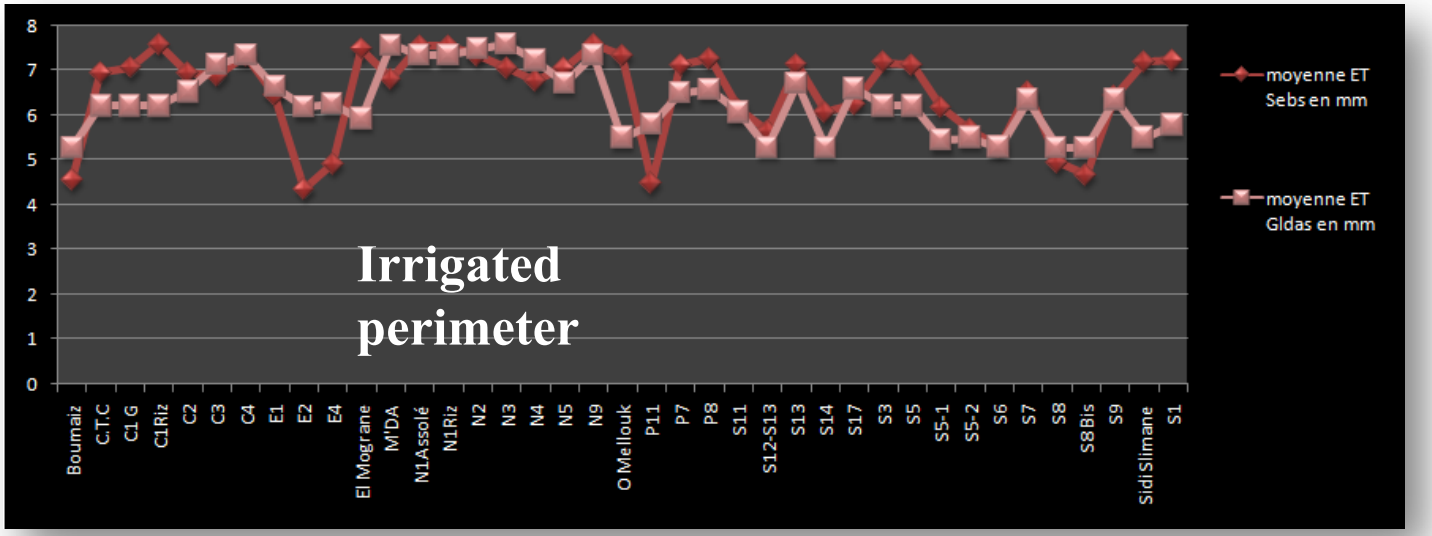


$$-\frac{\partial W}{\partial t} + Q = P - AET = \frac{\partial S}{\partial t} + Ro + Ru$$

CRST experience in Crop Mapping

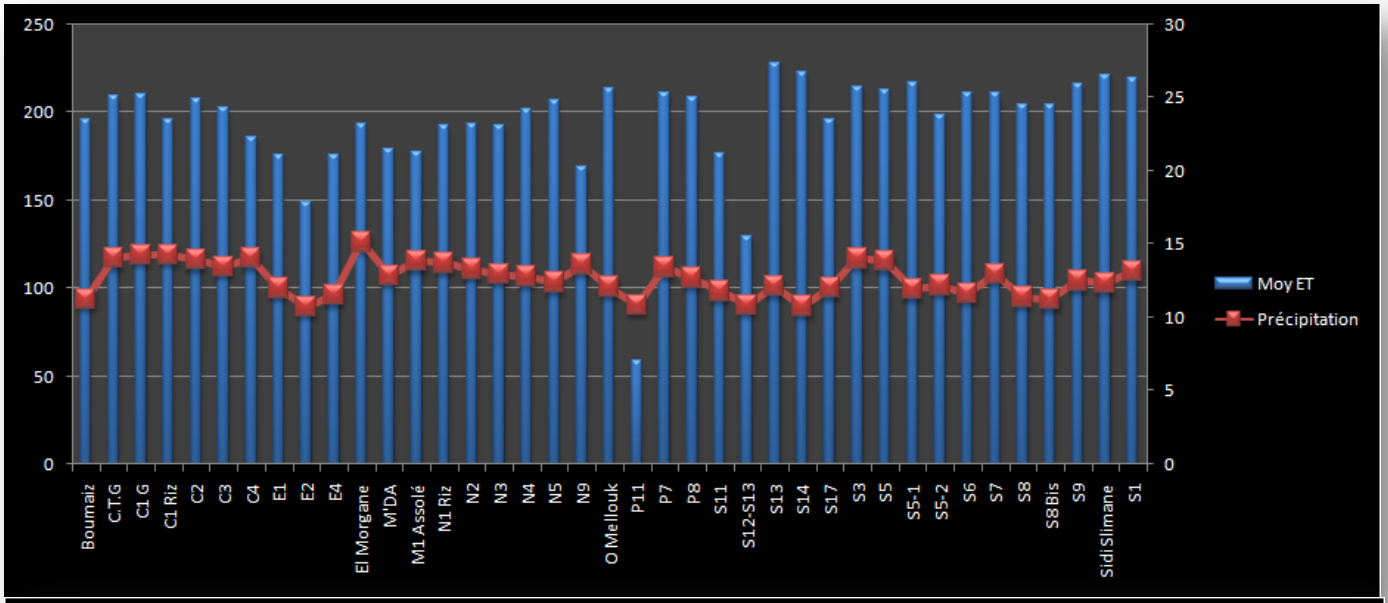
Eta estimation

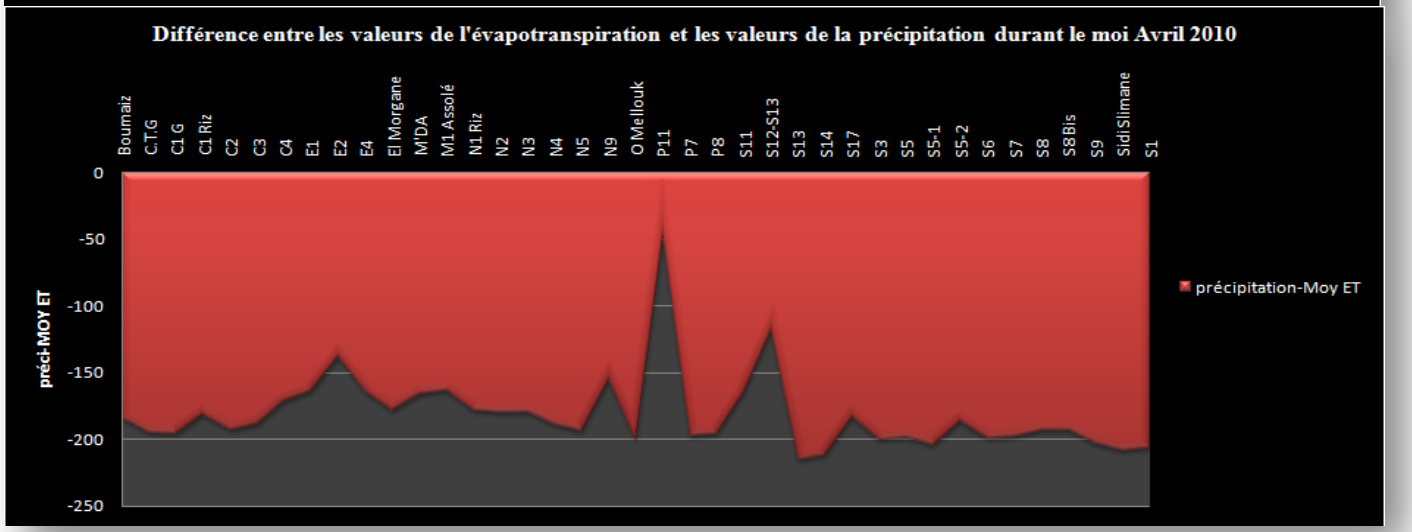




CRST experience in Crop Mapping

Eta VS Precipitation





CRST experience in Crop Mapping

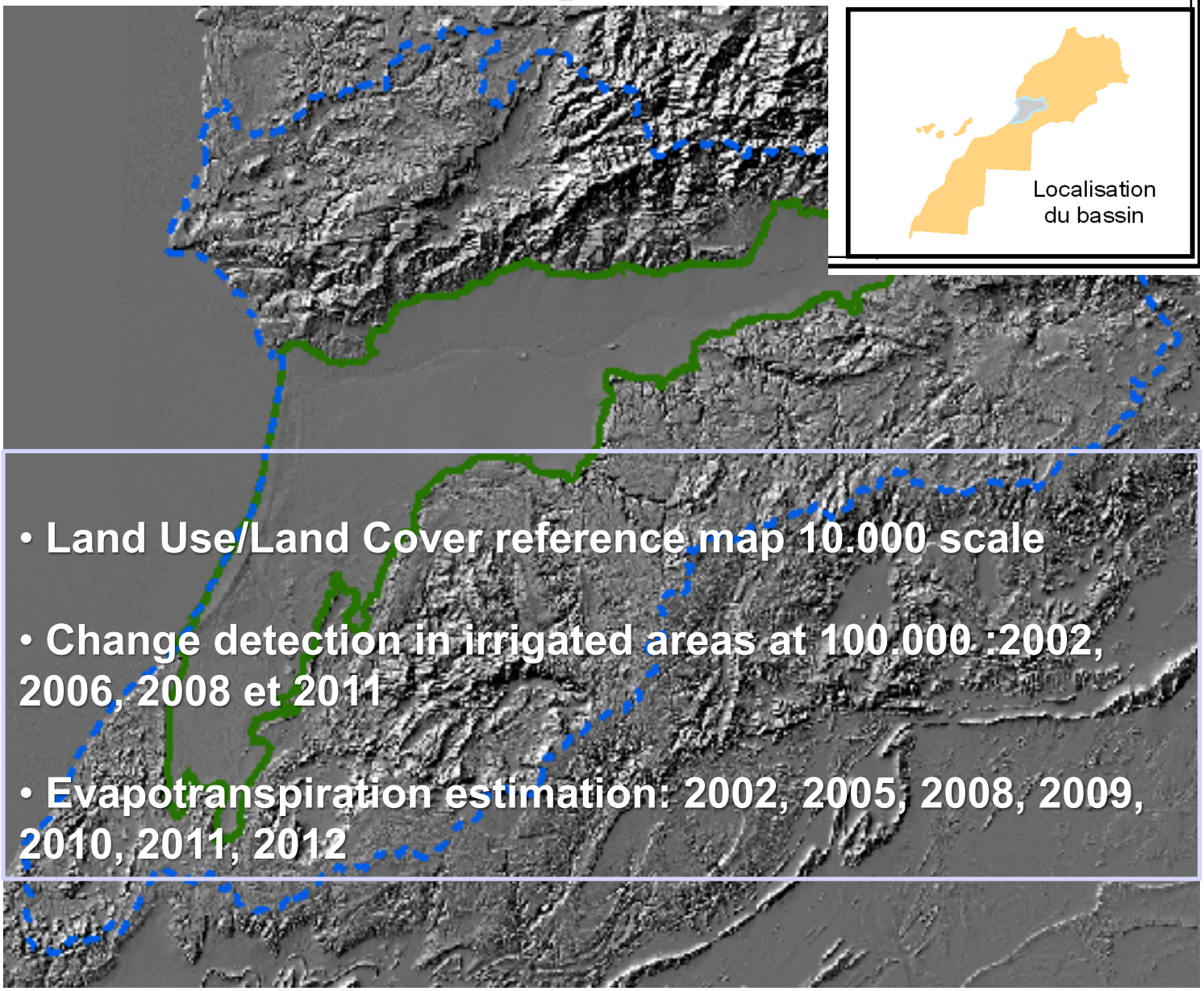
Programme d'Appui à la Gestion Intégrée des Ressources en Eau
برنامج دعم التدبير المندمج للموارد المائية

Elaboration de la carte d'occupation du sol, Suivi de l'extension des zones irriguées et Estimation de l'évapotranspiration dans la plaine de Souss-Massa

Auteur: Ahmed Er Raji

1er Mars 2013-Atelier de Démarrage

CRST experience in Crop Mapping



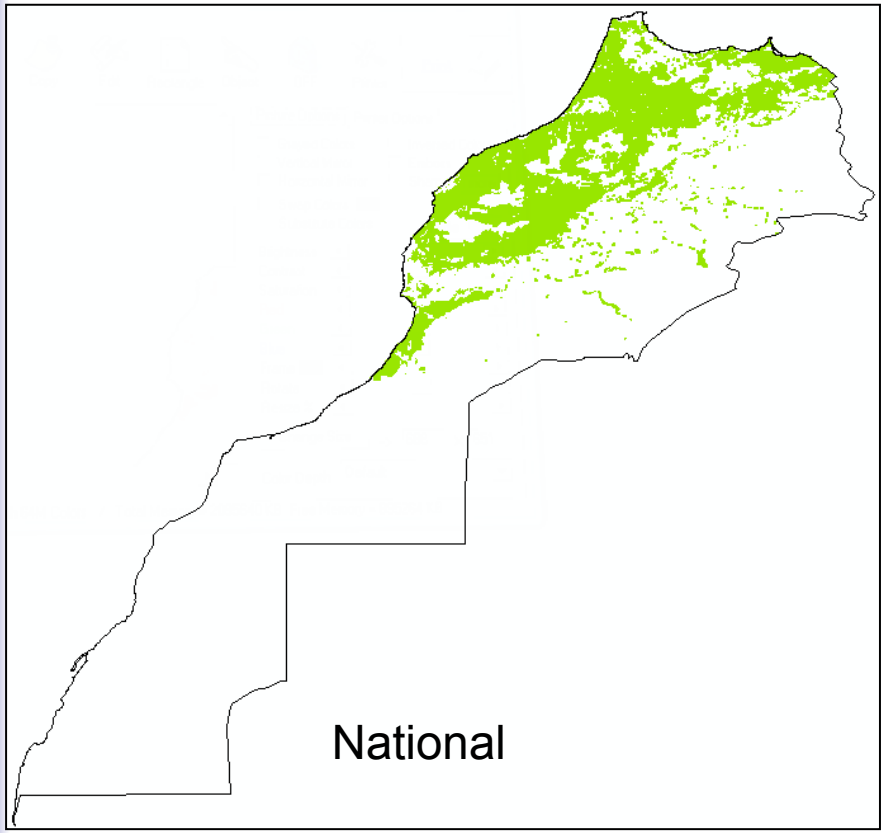
- Land Use/Land Cover reference map 10.000 scale
- Change detection in irrigated areas at 100.000 :2002, 2006, 2008 et 2011
- Evapotranspiration estimation: 2002, 2005, 2008, 2009, 2010, 2011, 2012

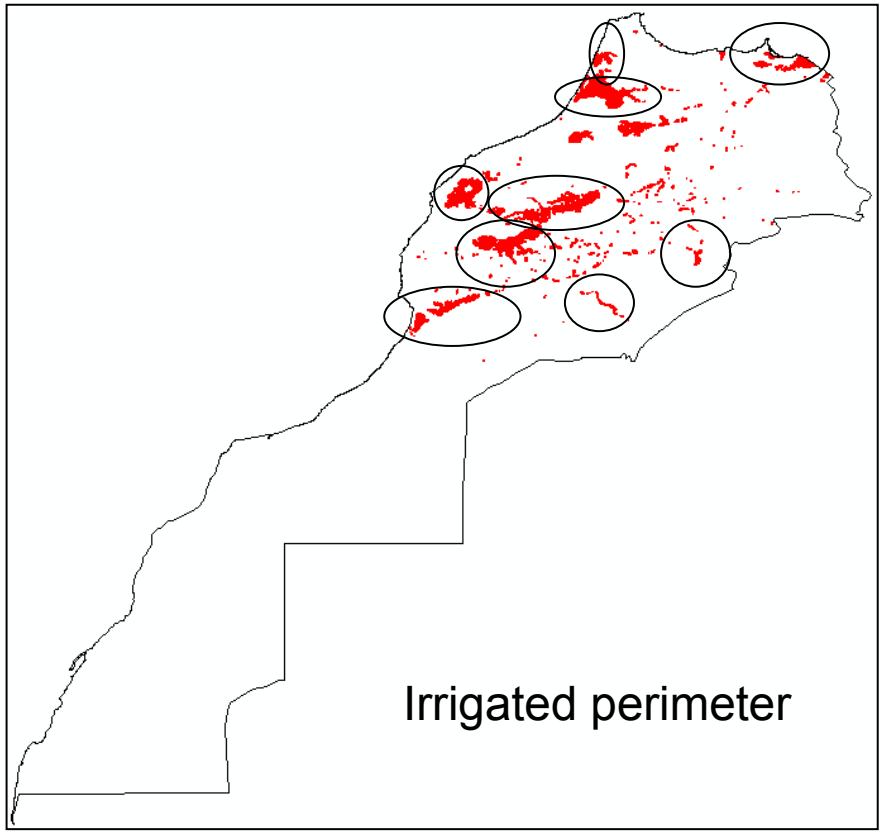
Outcomes:

- Produce **irrigated areas maps** (national and local level)
- Produce **water use/requirements maps** to better manage irrigated areas
- Estimate the agricultural **biomass production** including rain-fed areas

Module: Irrigation Optimization and Monitoring

Mapping: At different levels: national and irrigated perimeter





Module: Irrigation Optimization and Monitoring

- International expert selected : contract signed
- Training session on the approach (done in Wisc. Univ)
- Geo Database for Land Use / Land Cover maps (ongoing)
- End-User involved (MoU ongoing)
- First expert intervention expected in early January 2013