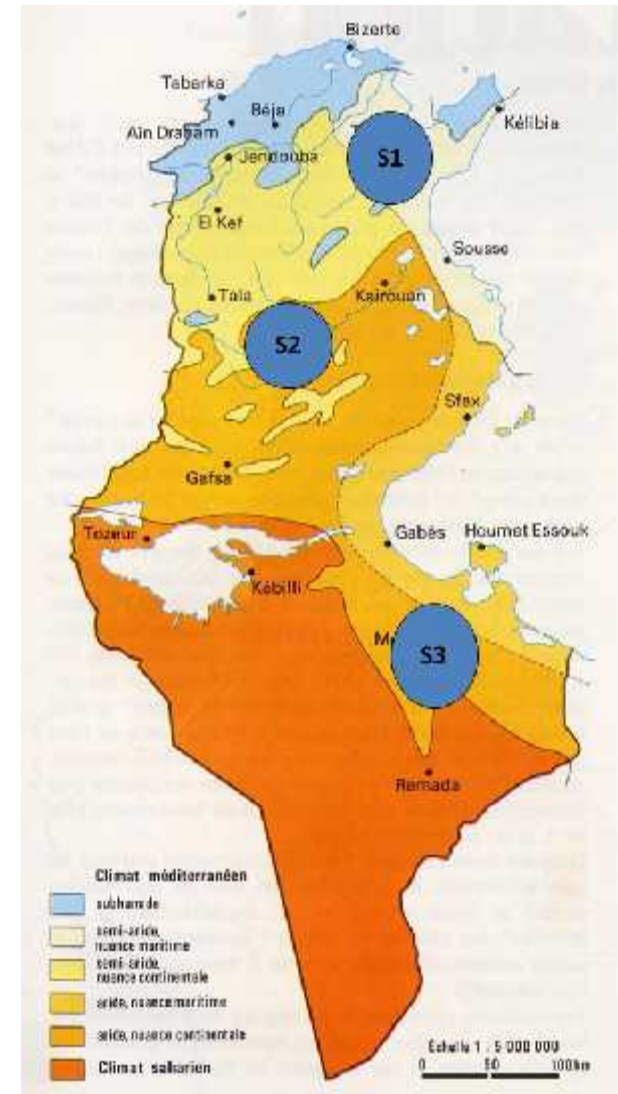


7th Regional Coordination Meeting
Amman - November 03-04, 2015

Water Management Strategies
and potential impacts on Livelihoods in
(TUNISIA)



WLI Goal and national policy


Overall Goal: to improve the livelihoods of rural households and communities in areas where water scarcity, land degradation, and associated problems are prevalent.

Intended Outputs:


1. Assessment of climate change effects on agro-systems
2. Management tools for Integrated water and land use
3. Enhanced knowledge, skills and qualifications for key stakeholders.
4. Tools for assessment of rural livelihoods improvements

National Policy Objectives in Tunisia :

1. Increasing the income per capita and reducing poverty
2. Enhancing food self-sufficiency
3. Water saving and rational use of natural resources



Improvement of water management in rangeland and crop-based production systems through field testing, adaptation and monitoring effects of water harvesting, irrigation management and using saline water to improve crop and livestock productivity.




Quantification of benefits from improved interventions and adaptation measures in terms of water savings and enhanced benefit/cost ratio



Assess future scenarios for Global Climate Change (GCC) and impacts on water resources, agriculture, and livelihoods for consideration by decision-makers



Capacity building for implementation, analysis and assessment of all adaptation measures



Outscaling and dissemination of outputs to other areas in Tunisia and WLI partnering countries

Research themes

ASSESS FUTURE SCENARIOS FOR GCC AND IMPACTS ON WATER RESOURCES, AGRICULTURE, AND LIVELIHOODS

WATER MANAGEMENT IN RANGELANDS AND CROP PRODUCTION SYSTEMS

QUANTIFICATION OF BENEFITS FROM IMPROVED INTERVENTIONS AND ADAPTATION MEASURES

Capacity building

Post doc placement in US Laboratories

Trainings

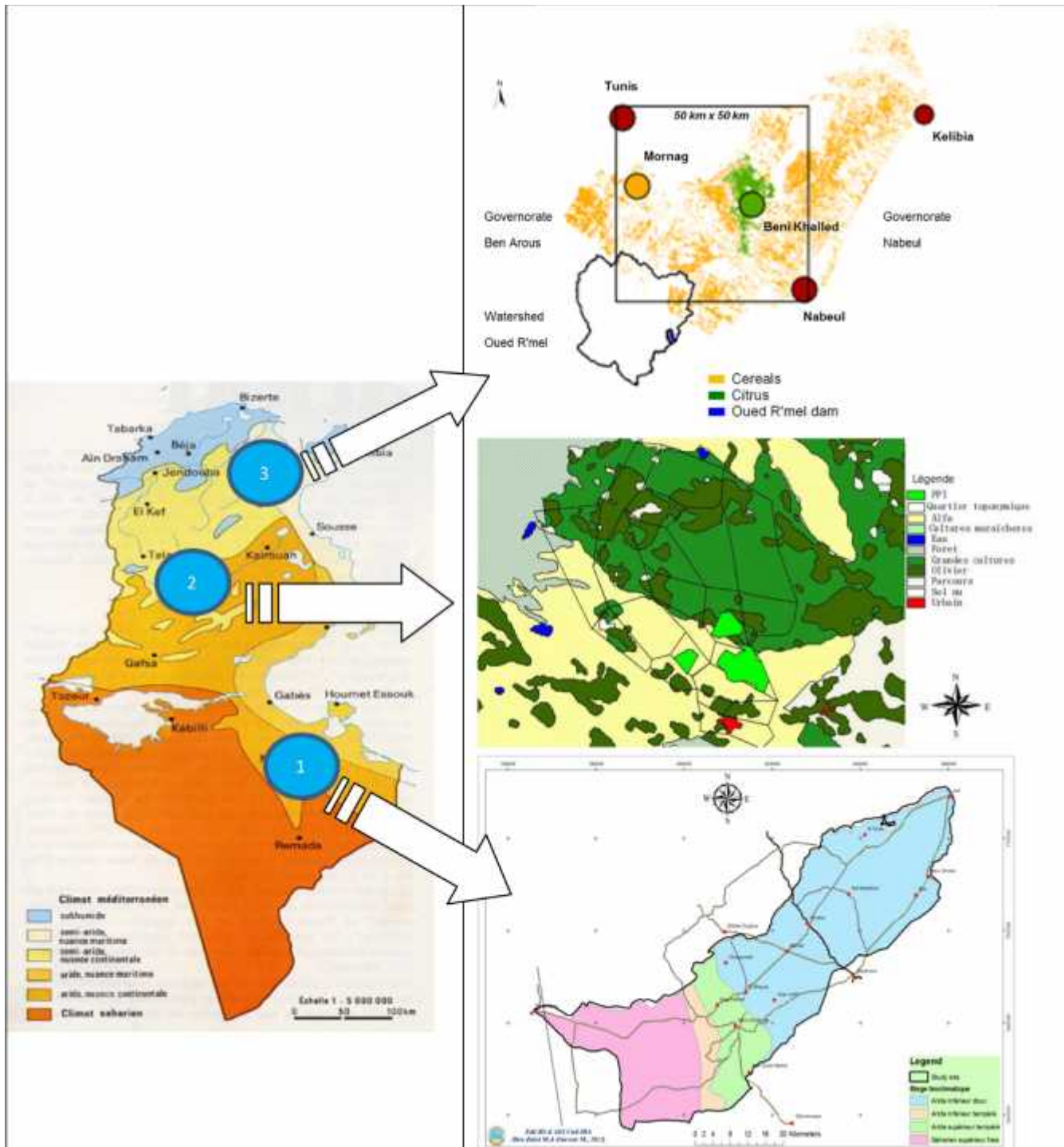
Outscaling and Dissemination

Workshops and seminars

Publications

Description of the 3 sites

Site	S1 : North	S2 : Centre	S3 : South
Surface area	50km x 50 km	740,000 ha	150,000 ha
Rainfall	450 mm	240 mm (80-2000)	Range 150-230 mm
Targeted Agrosystem	Durum wheat, Citrus	Barley Livestock Cactus	Small irrigation schemes (Fruit trees, Vegetables) Water harvesting
Population		410,000 inhab.	50,000 inhabitants
Benchmark site surface area		2914 ha	
Population		2241 hab. (2002)	
Pilot sites		8 (1-2 ha each)	5 (3-10 ha)



Mechanisms for Community Inclusion

Site Advisory Group Members	Associations Benefitted (FTF indicator)
CRDA Médenine	Farmers, NGOs
CRDA Sidi Bouzid	Farmers, NGO
CRDA Nabeul	Farmers
CTA Béni Khalled	Farmers

Understanding Water Management: Basin-level

Climate change and its possible impacts on barley production : Case of Sidi Bouzid

4 GCMs (Lars-WG)= HadCM3, MPEH5, GFCM21, IPCM4S / Crop model= DSSAT

•Annual rainfall (1984-2013) : 241 mm

Rainfall evolution (mean of the 4 GCMs in %)	A1B	A2	B1
2020-2030	-4,7	2,9	1,9
2050-2060	-12,9	-10,3	-12,0
2080-2090	-34,8	-30,2	-16,0

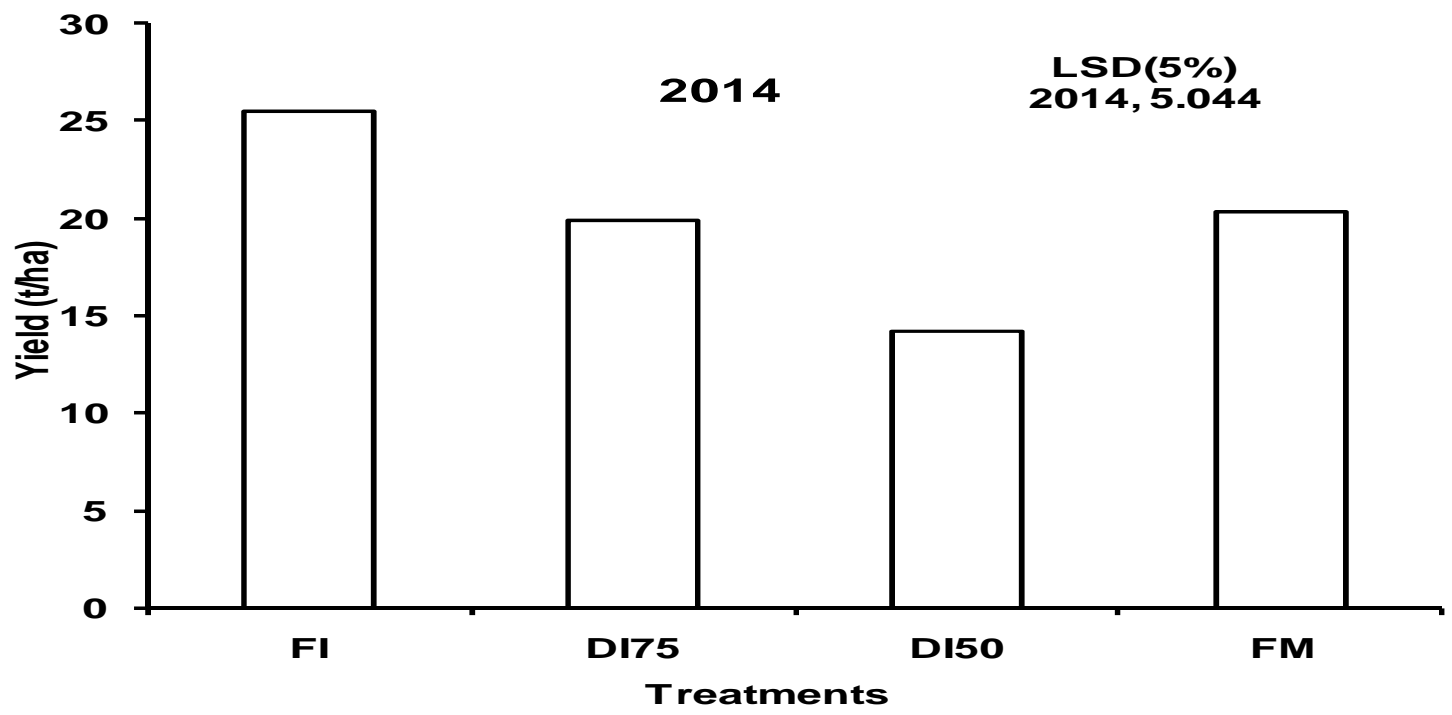
•Observed barley grain yield : 367 kg/ha (2002-2013)

Barley yield evolution (%)	A1B	A2	B1
2020-2030	-14,3	-3,5	2,5
2050-2060	-16,1	-9,2	-9,0
2080-2090	-32,1	-38,7	-20,6

- Predicted decrease of rainfall and also climate warming (T: +1-3° C) (<<end of 21 century) → **Negative impact on barley yield and land suitability**

- In Northern Tunisia, derived remote sensing data of leaf area index (LAI), radiometric temperature rise (ΔTRAD), evapotranspiration (ET) and rainfall maps were correlated with wheat yield.
- Temporal compositing anomalies of RS data were computed over 08 weeks moving windows at 7-day time steps.
- Depending on the rainfall regime in Northern Tunisia, results showed high yield correlations with rainfall data at the beginning of the wheat cropping season, while LAI showed its high performance during post-anthesis period.

Improving Water and Land Management: Field Level



Citrus yield, Médenine

	Irrigation (mm)	Water saving (m ³ /ha)	IWP (kg/m)
FI	704	-	3.51
DI75	522	1820	3.77
DI50	341	3540	4.06
FM	607	960	3.44
LSD (5%)	-	-	0.281

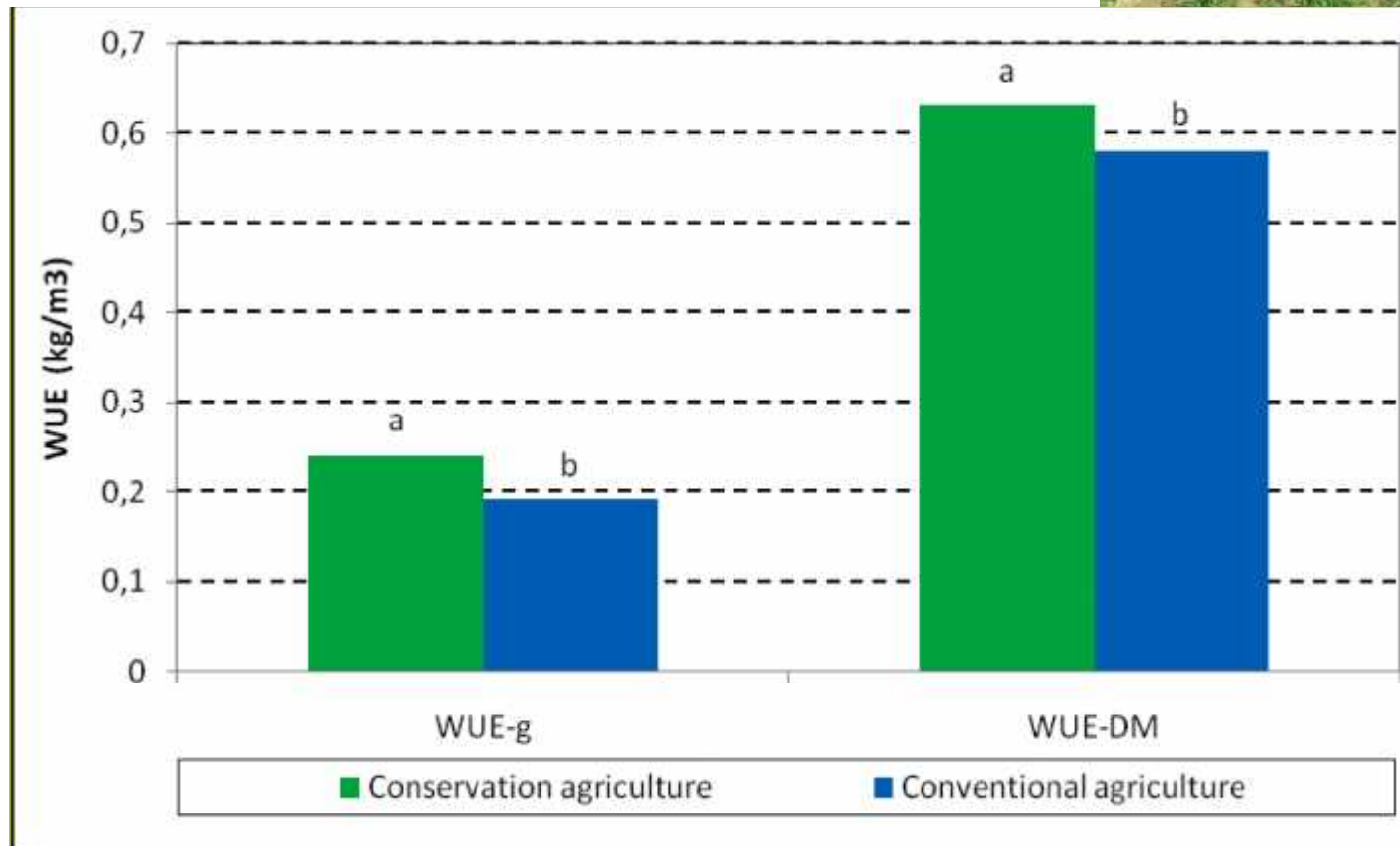
Water productivity,



Tested technologies to improve WUE: Case of Sidi Bouzid

Variation of grain water use efficiency (WUE) compared to baseline system (rainfed, ploughed):

- Supplemental irrigation : + 45%
- Conservation agriculture based on No-till: + 21%
- Alley cropping: + 30%



Example of Water Use Efficiency of barley under conservation agriculture

Understanding and improving Livelihoods : Cost benefit analysis of agricultural adaptation options to climate change

Beni Khedache site

IRR and sensitive analysis (WHT investment at farm level)

	IRR (%)		
	Observed	Costs (+ 10 %)	Benefits (- 20 %)
Financial CBA	24%	27%	21%
Economic CBA	27%	22%	23%
Extended CBA	23%	21%	20%

Net Present Value, WHT investment

	NPV (TD)				
Discount rate	12%	10%	8%	Costs (+10 %)	Benefits (-20 %)
Financial CBA	2491	3615	5231	2340	1691
Economic CBA	3023	4283	6092	2884	2140
Extended CBA	2073	3027	4402	1910	1333

Zoghmar site

Technologies	Number of farms	Net benefit TND/ha	Difference TND/ha
B : Rainfed barley	49	-104.3	
A : Irrigated barley	6	597.5	+701.8
B : Rainfed barley	49	-104.3	
A : young olive tree plantation / barley (Rainfed)	45	-230.7	-126,4
A : Productive olive tree plantation /barley (Rainfed)	36	105.5	+209.8
B : Barley (Irrigated)	6	597.5	
A : young olive tree plantation/barley (Irrigated)	10	246.0	-351.5
A : Productive olive tree plantation/barley (Irrigated)	6	746.3	+148.8
B : Livestock	7	786	
A : Livestock with cactus feeding	85	1279	493

Summary of Enhanced Knowledge, Skills and Qualifications at the Benchmark Site

POST DOC PLACEMENTS IN US LABS

Candidate	M. Annabi	F. Mokh	N. Sghaier
Organization	INRAT	IRA	INAT
Hosting Lab	Vegetable and Forage Crop Research Unit (USDA-ARS, Prosser, WA)	Conservation and Production Research Laboratory (USDA-ARS, Bushland, Texas)	USDA-ARS Hydrology and Remote Sensing Laboratory (Beltsville, MD)
Supervisors	Dr Ashok Alva	Dr. Paul D. Colaizzi	Dr .Martha Anderson
Period	Jan-Mar14; Jul-Sep14	Jun-Nov14	Sept14-Feb15
Topic	Estimating the effect of the future climate change on durum wheat productivity in Northern Tunisia and the potential benefits of conservation agricultural and sowing date advancing	Irrigation management and crop water modeling	Performance evaluation of ALEXI Evapotranspiration model in Northern Tunisia

TRAININGS

Some team members participated in the following training courses organized by ICARDA:

- “Climate Change Scenario Modeling using Soil and Water Assessment Tool (SWAT)”, Amman (Jordan), May 5-7, 2015.
- ‘Achieving Success with Technical Scientific Writing’, Amman (Jordan), 8-10 September 2015.

DEGREES

MSc theses, PhD theses, etc.

Table 5. Status of publications

Authors	Title	Status
Nagaz et al.	Potatoes response to irrigation regimes using saline water	Accepted
El Mokh et al.	AquaCrop simulations of full and deficit irrigation of corn in a semi-arid environment	Submitted
Nagaz et al.	Response of vegetable crops to irrigation regimes with saline water in southern Tunisia	Submitted
El Mokh et al.	Calibration of salinity stress parameters of AquaCrop for barley under different irrigation regimes in a dry environment	Submitted
Sghaier N. et al.	Wheat yield correlations with remote sensing satellite derived indices over Northern Tunisia	In preparation (50 %)
M'hamed et al.	Conservation agriculture as alternative to improve WUE of barley in semi arid region of Tunisia	In preparation (80%)
Sghaier M. et al.	Integrated impact assessment of livelihood & water management practices in Oum Zessar watershed, south east of Tunisia	Submitted (ILDAC2015 proceedings with Springer)

Thank you

National Research Teams	IRA	INRAT	INAT
Bio-physical Component	Houcine Khatteli Mohamed Ouessar Kamel Nagaz Mongi Ben Zaied Fathia El Mokh Amal Hachani Abderrahmen Sghaier	Mohamed Ben Hammouda Mohamed Annabi Hatem Cheik Mhamed Salah Ben Youssef	Netij Ben Mechlia Hammadi Habaieb Moncef Masmoudi Nabil Sghaier Asma Lasram Nawal Temani Zayani
Socio-economic Component	Mongi Sghaier Mohamed Abdeladhim Riadh Bechir	Hamed Daly-Hassen Najoua Esaaidi, Engineer Maher Bel Haj Kacem, Engineer student	

US Labs	Vegetable and Forage Crops Production Research Lab, Prosser, Washington	Soil and Water Management Research Lab, Bushland, Texas	Hydrology and Remote Sensing Lab, Beltsville, Maryland (in partnership with NASA on MENA WISP Project)
	Dr Ashok Alva	Dr. Paul D. Colaizzi Dr Steve Evett	Dr .Martha Anderson

Local stakeholders	South	Centre	North
	CRDA Médenine Farmers Local NGOs	CRDA Sidi Bouzid Farmers	CTA Béni Khalled GDA Famers