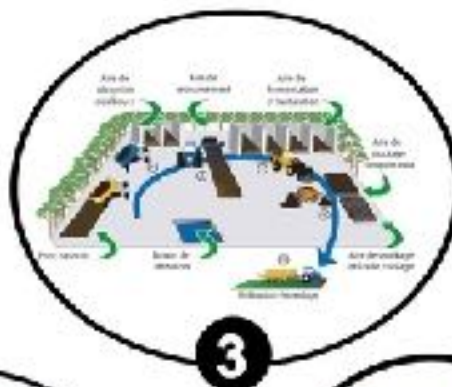
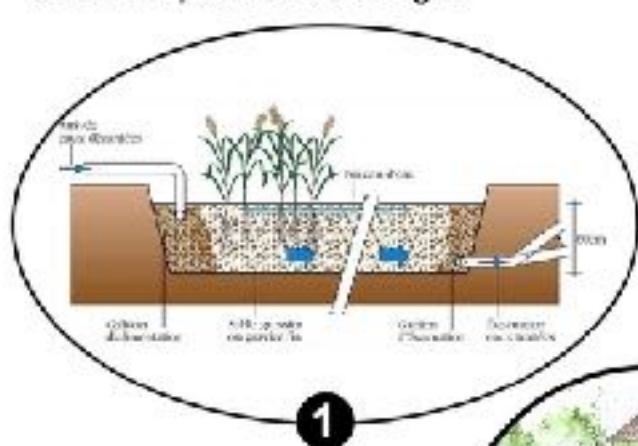


# PILOT PROJECT TO VALORIZE THE REUSE OF TREATED WASTEWATER IN THE IRRIGATED AREA OF BORJ TOUIL OF THE ARIANA GOVERNORATE

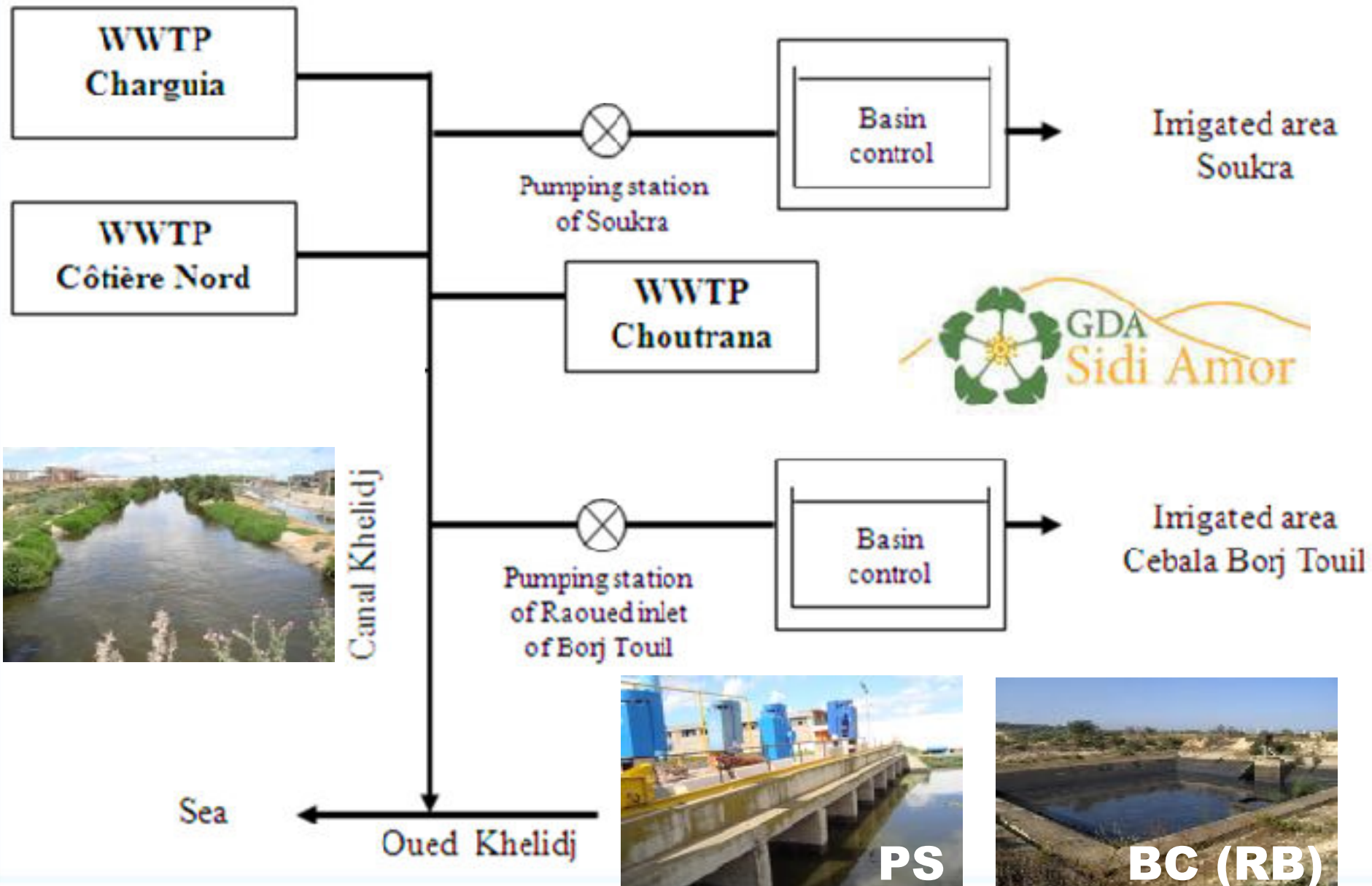
## COMPONENTS OF THE SIDI AMOR PILOT PROJECT

1. Construction of a constructed wetlands and sand filters
2. Establishment of an experimental and demonstration plant nursery
3. Establishment of a composting and valorization plant for sewage sludge
4. Resource Center: Experimental, Demonstration and Training Site on Wastewater Technology, Information Sharing, Networking
5. Laboratory: analyzes and evaluation of the quality of wastewater
6. Establishment of test and demonstration plots at the Sidi Amor site and among farmers in the irrigated area

dans le périmètre irrigué



# PUMPING STATION AND ADDUCTION OF TREATED WASTEWATER

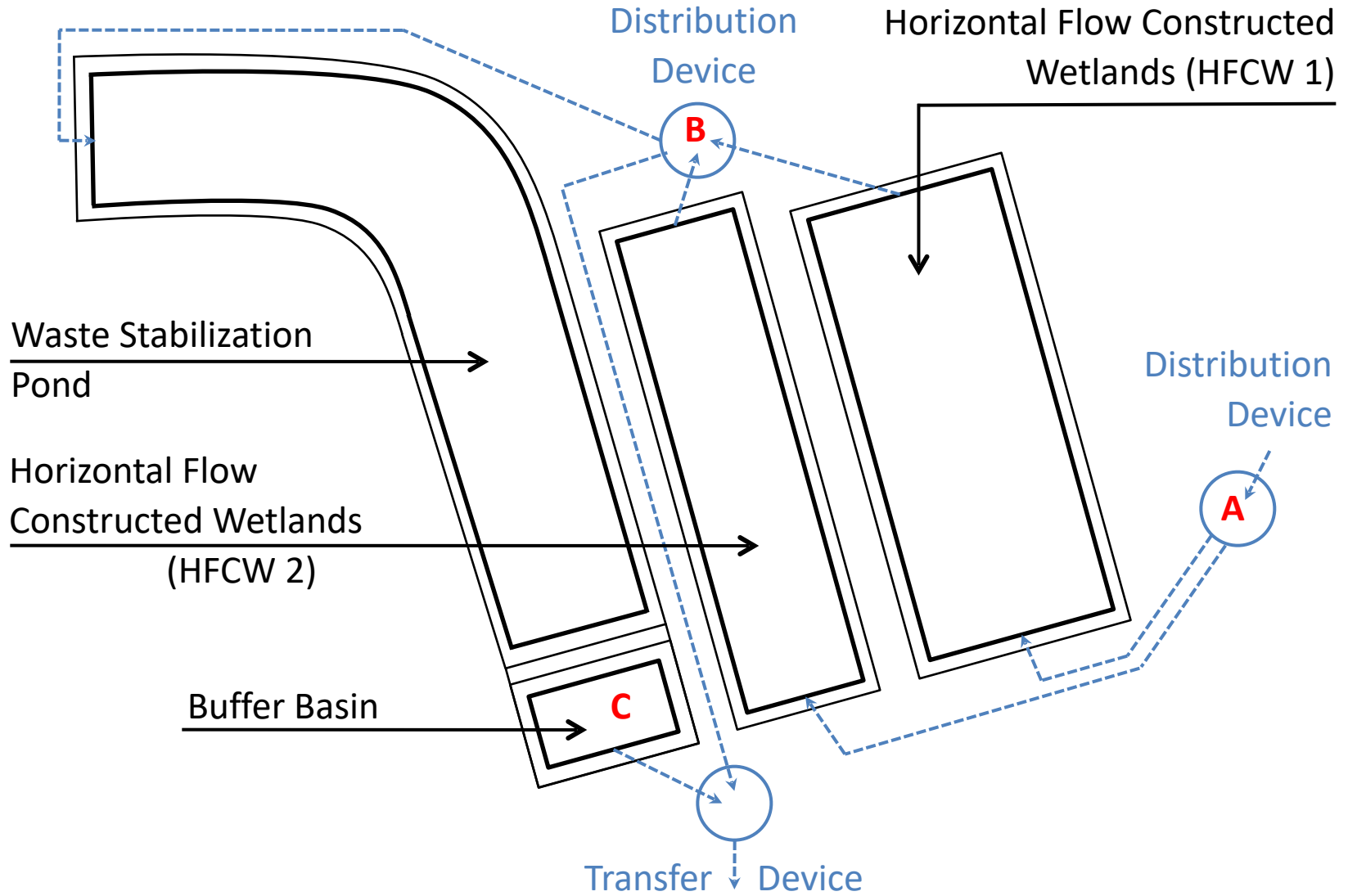


CRDA data	2012	2013	2014
TSS	77	82	87
COD	107	112	66
BOD <sub>5</sub>	43	50	46

**Quality of the treated wastewater in both Regulation Basin (BC) and Pumping Station (PS):  
First influent control (May – June – July 2015)**

Parameter	Unit	RB (14/05)	PS (29/05)	PS (12/06)	PS (24/06)	PS (29/06)	PS (13/07)	NT 106.02 (P.S.N.)	NT 106.02 (P.H.D.)
pH		7.45 (25.7 °C)	7.55 (21.5 °C)	-	-			6.5 to 9	6.5 to 8.5
TSS	mg/L	250	84	79	520		150	400	30
COD	mgO <sub>2</sub> /L	423	213	135	757		120	1000	125
BOD <sub>5</sub>	mgO <sub>2</sub> /L	140	52	39	190		77	400	30
Chlorides	mg/L	-	-	-	-		625	700	700
TKN	mgN/L	85.1	32.2	37.6	129		29.6	100	5
Ammonia nitrogen	mgN/L	26.5	18.5	-	-		-	-	-
Nitrates	mgN/L	<0.45	<0.45	-	-		-	90	50
Nitrites	mgN/L	0.039	0.014	-	-		-	10	0.5
TP	mgP/L	4.88	5.89	2.65	6.2		1.72	10	2
FC	log CFU/100 mL	>5.04	-	>3.04	-		-	-	3.30
FS	log CFU/100 mL	>5.04	-	>3.04	-		-	-	3.00
Salmonella	/100 mL	Absence	-	-				-	Absence

**TSS      100 mg/l                      COD      160 mgO<sub>2</sub>/l                      BOD<sub>5</sub>      60 mgO<sub>2</sub>/l**





**FEBRUARY 2016**



## **WASTEWATER POST-TREATMENT PLANT**



**MARCH 2016**

Quality of the treated wastewater following the impoundment of the post-treatment system: First compliance test (August 2016)

Parameter	Unit	A	B	C	NT 106.02 (P.S.N.)	NT 106.02 (P.H.D.)
pH	-	7.5 (22.5 °C)	7.45 (21.2 °C)	8.55 (24.4 °C)	6.5 to 9	6.5 to 8.5
EC	mS/m	384 (22.7 °C)	435 (21.5 °C)	636 (24.7 °C)	500	500
TSS	mg/L	790	2.4	9.8	400	30
COD	mgO <sub>2</sub> /L	797	30	49	1000	125
BOD <sub>5</sub>	mgO <sub>2</sub> /L	104	8	6	400	30
Chlorides	mg/L	819	958	1.54 10 <sup>3</sup>	700	700
TKN	mgN/L	58.2	7.32	5.09	100	5
TP	mgP/L	4.90	0.90	1.12	10	2
FC	log CFU/100 mL	4.63	2.84	2.47	-	3.30
FS	log CFU/100 mL	3.60	2.60	1.63	-	3.00
Salmonella	/100 mL	Absence	Absence	Absence	-	Absence
V. Cholerae	/100 mL	Absence	Absence	Absence	-	Absence
H. eggs	/5 L	Absence	Absence	Absence	-	<1/L



**FEBRUARY – MARCH 2016**

**LABORATORY**

**COMPONENTS OF THE PROJECT (IN PROGRESS)**





COMPOSTING AREA

**COMPONENTS OF THE PROJECT (IN PROGRESS)**



EPUVALISATION



# TRAINEES...



**MARCH 2016**





**OAT THATCH**

**MARCH 2016**

**CROP DIVERSIFICATION TRIALS**



**COTTON (100 m<sup>2</sup>) ?**

**APRIL 2016**



**APRIL 2016**



## **IRRIGATION AND FILTRATION SYSTEMS**



**APRIL 2016**



**MAY 2016**



## **GRADUATION PROJECTS INTERNSHIPS – 2016**



**MAY 2016**

**MAY 2016**



## **IRRIGATION WATER: THE QUESTIONS OF QUALITY AND QUANTITY**



**MAY 2016**



**MAY 2016**



**FILTER CLOGGING...**



**MAY 2016**





**WHICH IRRIGATION SYSTEM ?**







## LAND USE AND IRRIGATION

2018 | OriginalPaper | Chapter

### Land Use Land Cover Mapping of Borj Touil (Northern Tunisia) Irrigated District with Reclaimed Water Using Landsat-8 and Sentinel-2 Satellite Images

Authors: Asma Bettaibi, Makram Anane, Karim Ergaieg

Publisher: Springer International Publishing



Published in: Recent Advances in Environmental Science from the Euro-Mediterranean and Surrounding Regions





**JULY 2016**

## **SUMMER TRAINING 2016**



**JULY 2016**





**SEPTEMBER 2016**

## **PESTS AND PESTICIDES**



**AUGUST 2016**

# SOME KEY FIGURES

Rendement moyen	2 à 5 t seed-cotton / ha	Borj Touil 0.672 t
Rendement égrenage	33 à 38 %	Borj Touil 37.75 %
Rendement fibre	660 à 1600 kg/ha	Borj Touil 293.7 kg/ha



Bale ID	SCI	Grade	Mst [%]	Mic	Mat	UHML [mm]	UI [%]	SF [%]	Str [g/box]	Flg [%]	Rd	+b	CGrd Upland	TrCnt	TrAr [%]	TrID TrGrd	Amt
n	5																
Average	148		10.3	4.71	0.87	28.90	86.3	6.3	31.7	7.3	72.5	9.8	42-1	12	0.12	1	598
Std. Dev.	9		0.2	0.10	0.00	1.03	1.5	1.1	0.6	0.5	1.9	0.5		6	0.07		52.6
CV%	5.9		1.5	3.9	0.3	5.6	1.8	17.3	1.8	7.0	2.6	5.6		47.2	69.3		8.8
Q95% +/-	10		0.3	0.39	0.00	3.35	3.2	2.2	1.2	1.0	3.6	1.1		12	0.14		109.3
Min	130		10.1	4.59	0.86	28.66	83.7	4.8	31.2	6.6	69.7	8.7		6	0.06		523
Max	159		10.6	5.03	0.87	30.88	87.6	7.4	32.7	8.1	74.9	10.0		20	0.22		657



**SEPTEMBER 2016**



## **STUDENT FIELD TRIPS**



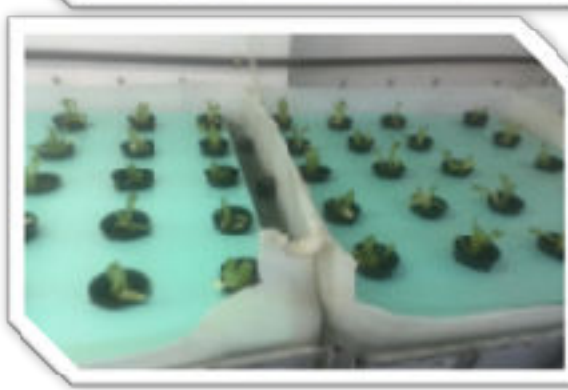
**SEPTEMBER 2016**



# JANUARY – OCTOBER 2016

Implementation test of an aquaponic system performed by Baya Aissaoui

Research Unit of Ecosystems and Aquatic Resources (INAT)





## THE PROJECT SIDI AMOR INVITED TO COP 22

### CoOPLA-NET

Les Pilotes du Changement / the Change Pilots



An international network of experts supporting stakeholders at all levels (from communities to governments, NGOs, companies and scientists) in CoO- designing, implementing, adapting, evaluating effective and sustainable change processes using the CoOPLAaGE principles and methods



**JANuary 2017**



## **EXPERIMENTAL PLOTS OF ROSE AND GERANIUM**



**JANUARY 2017**



**JANUARY 2017**



**TEAMWORK GDA SIDI AMOR – INAT AT BORJ TOUIL**



**JANUARY 2017**





## TEAMWORK GDA SIDI AMOR – INAT AT BORJ TOUIL

A SUMMER IN  
BORJ TOUIL

4:12

A summer in Borj Touil  
on Vimeo

Oussama Houij  
Vimeo - 25 févr. 2017



**FEBRUARY 2017**





MINISTRY OF ENVIRONMENT,  
PLANNING AND ECONOMIC DEVELOPMENT  
STATE OF PALESTINE



WORLD BANK GROUP

WAMDA

# Mediterranean Water **Heroes** Youth Contest

**YOUTH INNOVATION...**





# YOUTH INNOVATING WITH WASTEWATER FOR A SUSTAINABLE MEDITERRANEAN

## WASTEWATER REUSE – MARS 2017, MARSEILLE





**APRIL 2017**



**BORJTOUILIAN**

[HTTPS://WWW.FACEBOOK.COM/BORJTOUILIAN/](https://www.facebook.com/BORJTOUILIAN/)

**PINK SOLUTION...**



**APRIL 2017**



**APRIL 2017**



**WHICH IRRIGATION SYSTEM WITH REGARD TO WASTEWATER QUALITY...**



**APRIL 2017**



APRIL 2017



## PRÉPARATION OF THE FESTIVAL OF THE ROSE







# Dignosti la chaîne de valeur de la Rose de l'Ariana

## PROPOSAL FOR REGIONAL DEVELOPMENT PLAN

Faten khamassi Enseignante chercheur INAT  
Nadia Azza étudiante en 3<sup>ème</sup> CI INAT

### Forces

3000 ha terres irrigables avec l'eau traitée à Borj Touil

Petite précocité

Producteur de roses / savoir faire  
GDA Sidi Amor

Développement de pépinières

### Opportunités

Un taux d'accroissement en valeur en augmentation continue **+ 27%**

Le développement du tourisme médical

Proposition des produits de niche de qualité

Forte rentabilité à l'ha

### Faiblesses

Absence d'appui spécifique au niveau de la filière

Seulement **300 ha en irrigué** avec l'eau traitée sont actuellement utilisé par les agriculteurs, **pour diverses raisons techniques**

Logistique transport / conditionnement et export n'est pas encore mise en place

### Analyse SWOT

### Menaces

Concurrence mondiale de plus en plus rude

Imposition d'un quota sur le marché de l'UE

Abandon des savoir faire traditionnels

Développer l'international au détriment du local



**FESTIVAL OF THE  
ROSE AT INAT  
14 MAY 2017**

# SIX STEPS TO MAKE FRAGRANCE REVOLUTION

1. **IDENTIFICATION**  
Identification of the plant species and the geographical origin of the raw materials.
2. **EXTRACTION**  
Extraction of the essential oils from the raw materials.
3. **ANALYSIS**  
Analysis of the chemical composition of the essential oils.
4. **FORMULATION**  
Formulation of the fragrance based on the chemical composition.
5. **TESTING**  
Testing of the fragrance on a panel of experts.
6. **MARKETING**  
Marketing of the fragrance to the public.

**COM' SCI**

**CYCLE DE CONFÉRENCES  
SCIENTIFIQUES**

**PARTENARIAT UNESCO**



# **EAU** CHANGEMENT CLIMATIQUE & SOCIÉTÉ

Une conférence-débat avec :

**FLAVIA SCHLEGEL**

Sous-Directrice générale de l'UNESCO

**ABDELGHANI CHEHBOUNI**

Directeur de Recherche, IRD, Marrakech

**CHRISTIAN LEDUC**

Directeur de Recherches IRD, Montpellier

**KARIM ERGAIEG**

Chercheur à l'INAT

**JEUDI 18 MAI 2017 / 16H30 > 19H**

Auditorium de L'Institut français de Tunisie  
20 / 22, Avenue de Paris - Tunis



[www.institutfrancais-tunisie.com](http://www.institutfrancais-tunisie.com)





**MAY 2017**



**FARMERS SEEM TO BE INTERESTED IN GERANIUM...**

**MAY 2017**





**JUNE 2017**



**WHAT I'VE LEARNED IN A SINGLE YEAR IN BORJ TOUIL AND WITH GDA SIDI AMOR...**

**AUGUST 2017**



**"Zabaltuna", the awarness campaign  
launched by a young Tunisian in pictures**

**A young Tunisian 27 years old has  
embarked on an ambitious adventure...**



**JULY – AUGUST 2018**



**JULY 2017**



## **SUMMER TRAINING 2017**



**AUGUST 2017**





**SUMMER TRAINING 2017**



**JULY 2017**



**PLATFORM FOR EXCHANGE AND INSPIRATION FOR YOUTH**



**NOVEMBER 2017**





**PLATFORM FOR EXCHANGE AND INSPIRATION FOR YOUTH**



**NOVEMBER 2017**





**OCTOBER 2017**

**JANUARY 2018**

**ONE YEAR LATER**



**FEBRUARY 2018**



**FEBRUARY 2018**



## **SCHOOL VISITS – ENVIRONMENTAL EDUCATION**



**FEBRUARY 2018**





**FEBRUARY 2018**

## **PARTNERS – TRAINING**



**FEBRUARY 2018**





**FEBRUARY 2018**

## **GDA SIDI AMOR –BORJ TOUIL IRRIGATED AREA**



**FEBRUARY 2018**





**FEBRUARY 2018**

## **MONITORING OF EXPERIMENTAL PLOTS**



**FEBRUARY 2018**





**MARCH 2018**

## **PLATEFORME OF EXCHANGE AND LEARNING**



**MARCH 2018**





MARCH 2018

## NATURE- BASED SOLUTION FOR WATER AND CLIMATE CHANGE ADAPTATION IN MEDITERRANEAN AREA – EGYPT 2018



Mediterranean  
Water Heroes  
أبطال المياه  
في المتوسط

#WaterHeroes





**END OF MARCH 2018**

## **BORJ TOUIL – GDA SIDI AMOR**



**END OF MARCH 2018**





**END OF MARCH 2018**

## **DISTILLATION OF BORJ TOUIL GERANIUM AT GDA SIDI AMOR**

**END OF MARCH 2018**





**AT THE BEGINNING OF AVRIL 2018**

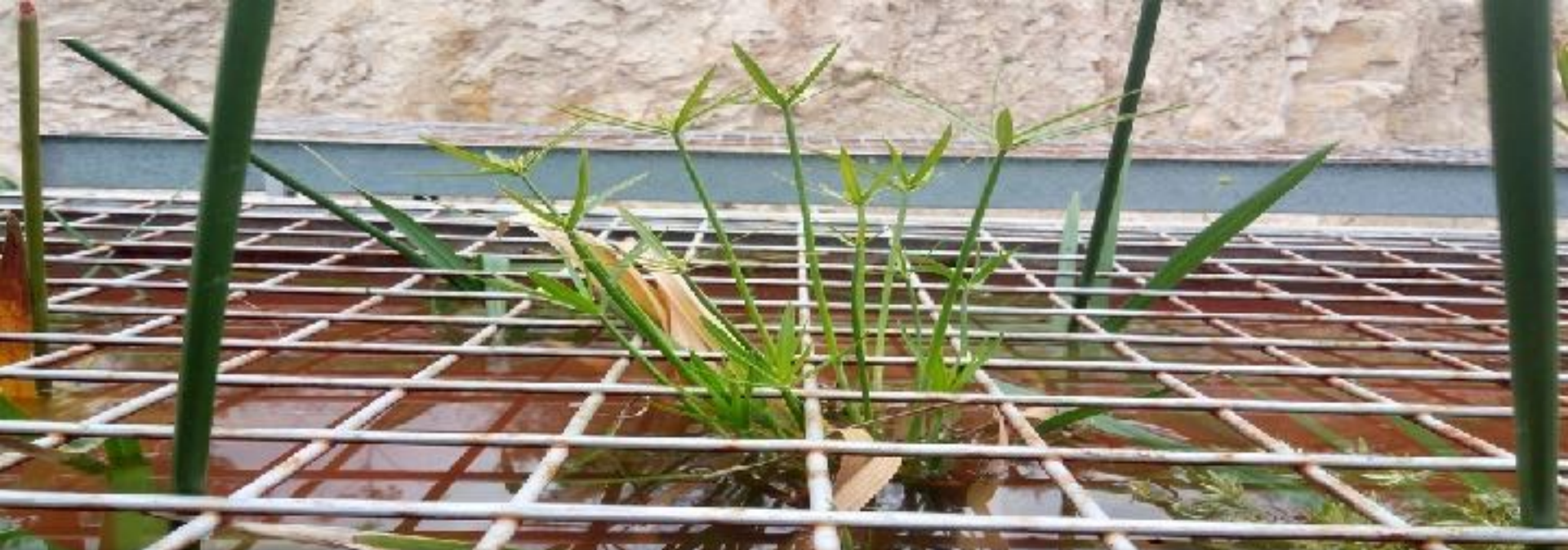


## **NATURE-BASED SOLUTIONS**

**AT THE BEGINNING OF AVRIL 2018**







## NATURE-BASED SOLUTIONS





**AT THE BEGINNING OF APRIL 2018**



## **DRIP IRRIGATION SETUP AT BORJ TOUIL**



**AT THE BEGINNING OF APRIL 2018**



LA PROMOTION DE LA REUTILISATION  
DES EAUX USEES TRAITEES EN AGROFORESTERIE

Colloque du 24 avril 2018  
Parc Nahli

En partenariat avec



Problématiques et Perspectives de Développement dans le  
Périmètre Irrigué de Borj Touil-Ariana

*Réflexion à partir du site pilote de promotion de la Réutilisation  
des Eaux Usées Traitées en agroforesterie au GDA Sidi Amor*

**YOUTH ENGAGEMENT AND ADVOCACY...**





Parameter	Unity	Inlet	HFCW1	HFCW2	BB
pH		7.18	7.22	7.18	8.12
Conductivity	μS/cm	3560	3560	3660	3680
Salinity	g/l	2.14	2.14	2.2	2.21
NaCl	%	7.2	7.3	7.1	7.12
Turbidity	NTU	11.8	8.3	7.6	19.5
COD	mgO <sub>2</sub> /l	87	59	66	83
MES		34	20	16	29
BOD <sub>5</sub>	mgO <sub>2</sub> /l	29	17	14	17
Temperature	°C	18.6	19	18.7	19.5
O <sub>2</sub>	mg/l	2.37	2.87	2.07	1.15

Source ONAS 24 avril 2018





**MAY 2018**

## **NATURE-BASED SOLUTIONS**



**MAY 2018**





**MAY 2018**

## **THE QUESTION OF WASTEWATER QUALITY... SUMMER TRAINING...**



**JUNE 2018**





**JULY 2018**

## **SUMMER TRAINING 2018**



**JULY 2018**



**JULY 20, 2018 – LOCATION: CHEBIKA – TEMPERATURE 26 ° / 40 °  
(IRRIGATION IN PROGRESS)**



**GENERAL OVERVIEW OF THE PLOT: JULY 20, 2018 - AUGUST 22, 2018**

**AUGUST 22, 2018 – LOCATION: CHEBIKA – TEMPERATURE 21 ° / 32 °  
(SOIL MOISTURE QUITE HIGH)**





**JULY 20, 2018**  
(Cotton bud – Cotton blossom)



Overview in the middle of the plot

**AUGUST 22, 2018**  
(Cotton blossom – Cotton boll)



Height ~ doubled





**AUGUST 2018**

## **EM TRIALS – BORJ TOUIL**



**AUGUST 2018**





**SEPTEMBER 2018**

**FIELD TRIP WITH FARMERS OF BORJ TOUIL - LIVESTOCK AND PASTURE OFFICE (OEP)**



**SEPTEMBER 2018**





OCTOBER 2018

NOVEMBER 2018







**DECEMBER 2018**

## **AGRONOMIC TRIALS CONTINUATION – BORJ TOUIL**



**MARCH 2019**



JANUARY 2019



## SCHOOL AND YOUTH VISITS

AVIIL 2019







**COLLABORATION AND INNOVATION 2019 (IN PROGRESS)**







**COLLABORATION AND INNOVATION 2019 (IN PROGRESS)**







OCTOBER 2019

