IFAD-ICARDA- PROJECT "Use of Conservation Agriculture in Crop-Livestock Systems (CLCA) in the Drylands for Enhanced Water Use Efficiency, Soil Fertility and Productivity in NEN and LAC Countries". (CLCA II, 2018 - 2022).

Main Achievements (April 2019- March 2020)









National Partners

IRESA مؤسسة البحث و التعليم العالي الفلاحي

المعهد الوطني للبحوث الزراعية بتونس INRAT

INGC المعهد الوطني للزراعات الكبرى Institut National des Grandes Cultures

الجمهورية التونسية وزارة الفلاحة ديوان تربية الماشية و توفير المرعى

International Partners

ICARDA Science for resilient livelihoods in dry areas

CIMMYT International Maize and Wheat Improvement Center

IFAD INTERNATIONAL FUND FOR AGRICULTURAL DEVELOPMENT

Overview of the project management/coordination

CLCA team meeting

Annual Meeting (April 2019– Tunisia)

❖ Several meeting of the CLCA team project were held (8 meeting)

- Discuss and define the activities by component

- Discuss the progress in the activities implementation and discuss the problems of the implementation

- Discuss and planning the organization of field days, national events, training….

- Discuss the work plan of 2020-2021

Extension of the CLCA networks

Outscaling:

Implication of new partners and/or strength existing collaboration:

-Several meeting were held with AVFA, CRDA-Zaghouan, DGACTA/Pacte project, INGC, OEP, Cotugrain company , APAD…….



- Collaboration with others existing R-D projects

(Food security project, PEER project, CRP-wheat,.....)

Up-scaling:

Expand study areas and establishment of relationships in the field

(12 information/field days were held in different project sites)

Number of farmer and implemented area (ha) under CA (2019-2020)

Gouvernorate	Number of Farmer		Area (ha)
	Male	Female	
Zaghouan	16	15	435
Béja	18	5	406
Siliana	19	1	486
Kef	10	1	75
Jendouba	06		42
Sub-total	69	22	
Total	91		1444

Distribution of area under CA by crop in Zaghouan (2019-2020)

Crop	Area (ha)
Vetch	22
Vetch-triticale	2
Vetch-oat	14
Vetch-barley	8,5
Oat	13
Fenugreek	73
Barley	157
Sulla	2,5
Canola	31
Durum wheat	112
Total	435

Distribution of area under CA by crop in Siliana (2019-2020)

Crop	Area (ha)
Vetch	16
Vetch-triticale	4
Oat	50
Triticale	5
Barley	168
Forage mixture (4 species-Méteil)	11
Alpha alpha	4
Faba bean	14
Durum wheat	214
Total	486

Distribution of area under CA by crop in Beja (2019-2020)

Crop	Area (ha)
Vetch	11
Vetch-oat	6
Oat	31
Barley	63
Forage mixture (4 species-Méteil)	8
Canola	26,5
Faba bean	51,5
Durum wheat	209
Total	406

Distribution of area under CA by crop in Kef (2019-2020)

Crop	Area (ha)
Vetch	4
Triticale	5
Oat	19
Barley	36
Forage mixture (4 species-Méteil)	6
Durum wheat	5
Total	75

Distribution of area under CA by crop in Jendouba (2019-2020)

Crop	Area (ha)
Vetch-triticale	4
Forage mixture (4 species-Méteil)	4
Triticale	10
Durum wheat	24
Total	42

Distribution of area under CA by region/site in Zaghouan (2019-2020)

Region/site	Number of farmer	Area (ha)	Crop
Saouef	4	12	Orge; vesce, vesce-triticale
	Ferme OEP	20	Orge; avoine, vesce-avoine, sulla
	Ferme Prison	20	Blé dur
Bouslim/Oued Zite	4	243	Orge; vesce, fenugrec, Colza, blé dur
Fahs	6	65	Orge; vesce, vesce-triticale, blé dur, avoine
Bir Mchergua	1	65	Orge
Oued Sbaihia	14 (women)	10	Vesce-avoine, vesce-triticale
Total	**31**	**435**	

Distribution of area under CA by region/site in Beja (2019-2020)

Region/site	Number of farmer	Area (ha)	Crop
Rihana	02	6	Vesce-avoine
Teboursouk	02	6	Vesce, orge, méteil
Khalled	01	13	Vesce, avoine, orge
Amdoune	01	08	Féverole
Gssar tir-Gueboulat	08	315	Blé dur, colza, vesce, avoine, féverole, méteil,
Béja sud et medjaz bab	04	45	Méteil, blé dur, vesce, blé dur, féverole
Béja Nord	04	08	Méteil, blé dur, Colza, féverole
Nefza	01	01	Méteil
Total	**23**	**402**	

Distribution of area under CA by region/site in Siliana

Region/site	Number of farmer	Area (ha)	Crop
Laaroussa	04	265	Orge, avoine, blé dur, féverole, vesce, méteil, vesce-triticale
Krib	01	100	Orge, avoine, blé dur, féverole, vesce, méteil, vesce-triticale, Triticale, luzerne
Chouarnia et sned haddad	12	91	Orge, avoine, blé dur, vesce, méteil, vesce-triticale, Triticale
Sidi Bourouiss	01	20	Orge
Bargou	02	10	Blé dur
Total	**20**	**486**	

Distribution of area under CA by region/site in Kef

Region/site	Number of farmer	Area (ha)	Crop
Boulifa	02	18	Orge, avoine
Seres	08	42	Orge, blé dur, méteil, triticale, avoine, vesce
Kalaa Khesba	01	15	Orge, avoine
Total	**11**	**75**	

Distribution of area under CA by region/site in Jendouba

Region/site	Number of farmer	Area (ha)	Crop
Fernana	05	12	Blé dur, vesce-triticale, méteil
Bousalem	01-ferme Sodan	30	Blé dur, triticale
Total	**06**	**42**	

Activities implementation (2019-2020)

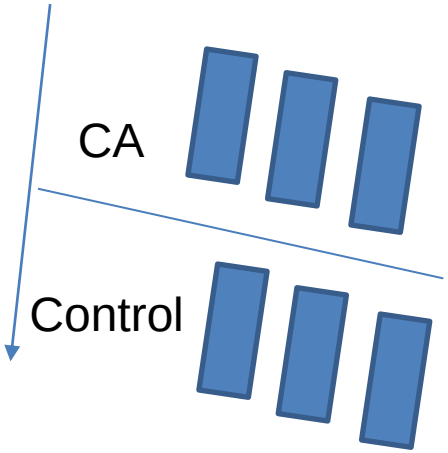
- **Agronomy component: WUE, erosion, soil fertility**
- **Forage-livestock component**
- **Socio-economic component**
- **Knowledge management component**

Agronomy component

Activity 1.2
Assessment of the adoption of CLCA practices on soil erosion, SOM and WUE in Tunisia

Progress activities and main achievement, year 2

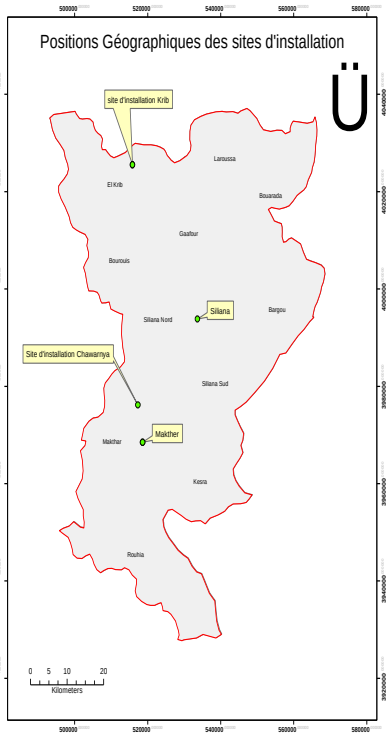
National Team : Mohamed Annabi, Taoufik Hermassi, Haithem Bahri, Hatem Cheikh M'hamed

Activity target outputs	On farm (farmers implementing CLCA)	
-50% erosion on steep slopes **+3/5% SOM** **+20% WUE**	Chouarnia 2 paired plots (CLCA/Control CV)  El Krib 2 paired plots (CLCA/Control CV)	Runoff/sediment yield - Wischmeier plots Runoff/sediment yield - rainfall simulation by Eijkelkamp field device Infiltration by double-ring method Penetrometry by…. device Aggregate stability by Le Biss. Method Soil bulk density? Total SOM (POM and labile carbon, Microbic respiration by Li-850) Soil water content start and end of cropping season by gravimetric method TXT, Carbonates, EC

Krib site

- Gouvernorat: SILIANA
- Delegation: Krib
- À 110 km de Tunis

- 3 plots under CA
- 3 plots under CovA
- Installation date : 24/12/2019







Krib Site

23/01/2020





06/02/2020



Chouarnia site

- Gouvernorat: SILIANA
- Delegation: Makther
- À 163 km de Tunis
- À 10 km de la ville Makthar

- 3 plots under CA
- 3 plots under CovA
- Installation date : 25/12/2019









Chouarnia site

6 February 2020





Landscape level

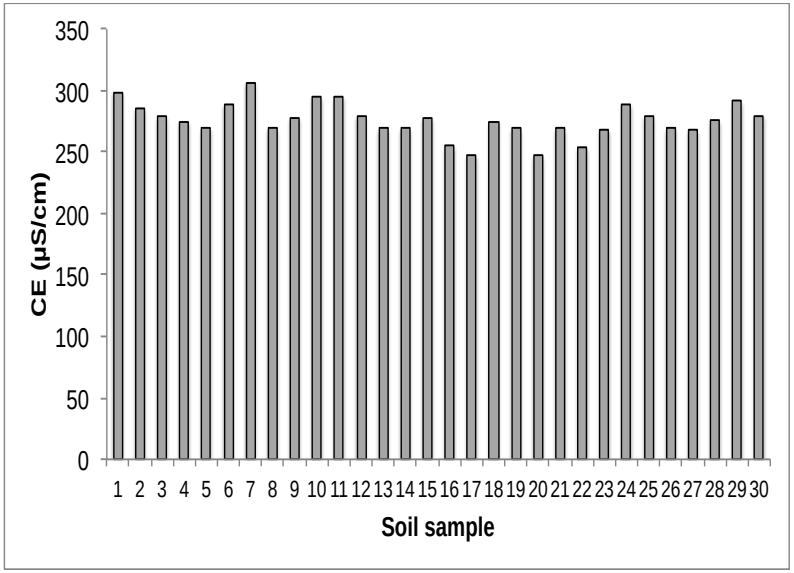
Baseline DATA (Soil surface erodibility & runoff gen, SOM, physical and chemical soil properties…) of (20) new CLCA farms already done and will be done at the end of the project

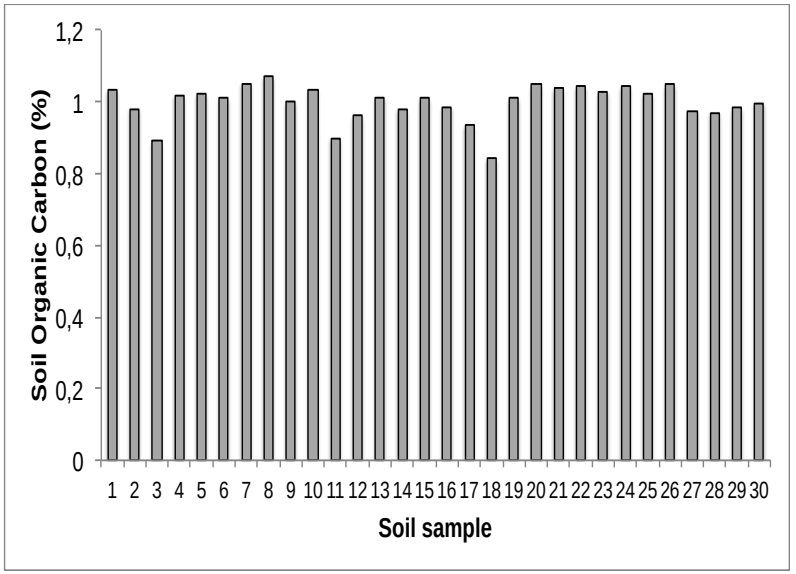
Experimental station of Kef

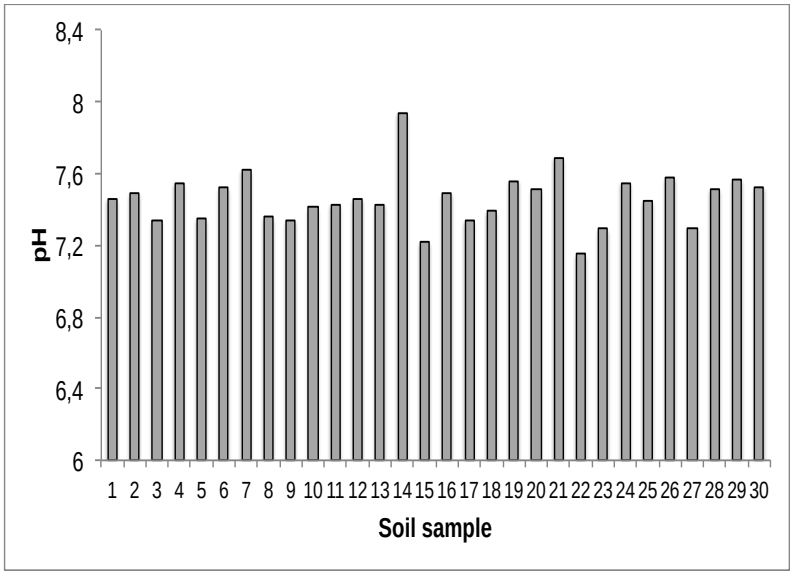
(long-term trial including rotations similar to those of CLCA project)

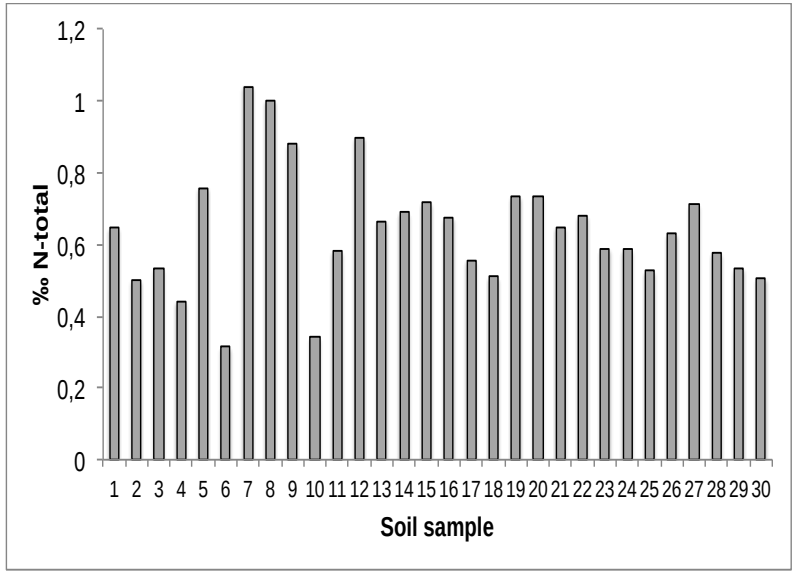
Assessment of SOM and WUE under controlled conditions: Soil sampling are already done and the analysis is ongoing on the Agronomy Lab

Results of soil analysis



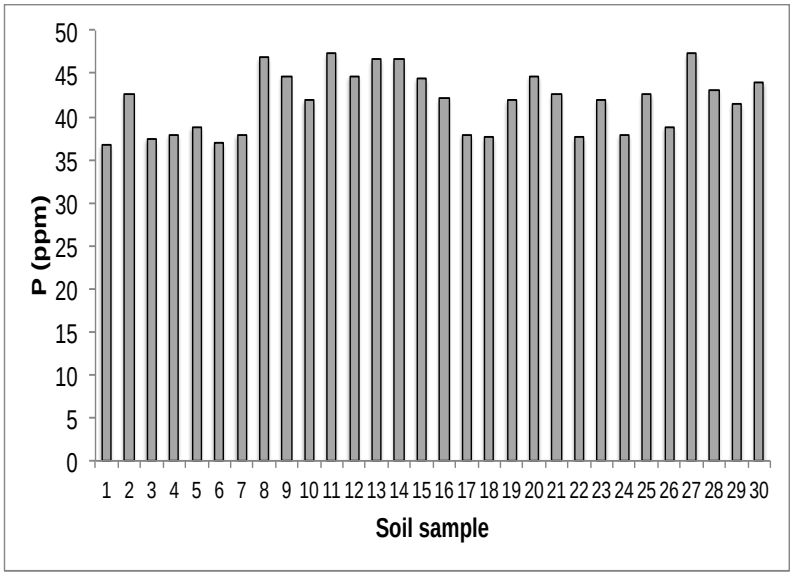


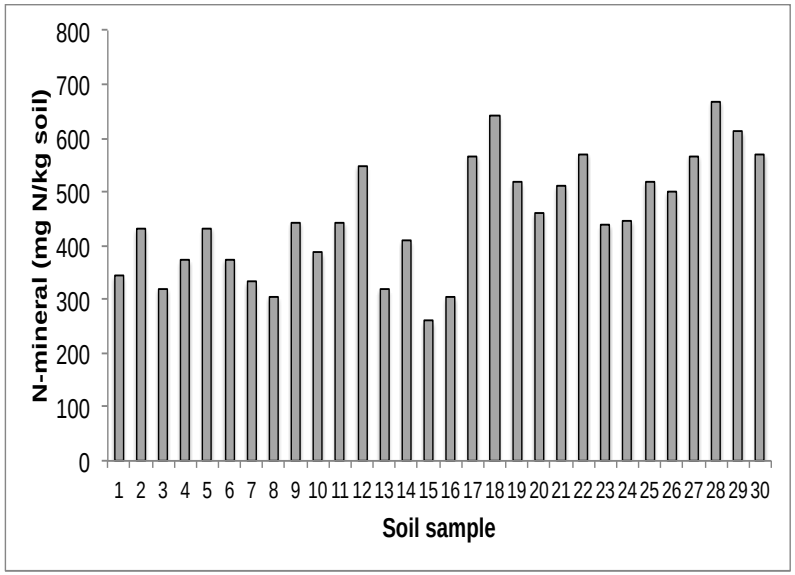


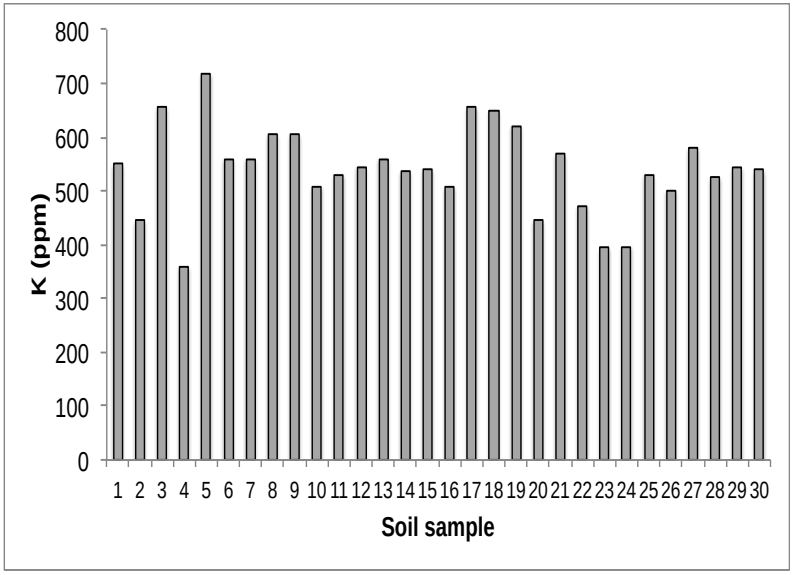


→Sols non salés (moy=275±14 µS/cm), légèrement alkalins (pH moy=7,46±0,15), moyennement pauvres en matière organique (C moy= 0,99±0,05%) et en azote organique (Ntot moy= 0,64±0,16‰)

Results of soil analysis







→Sols moyemment riches en phosphore assimilable (P_2O_5 moy=41,7±3,4 ppm), riches en potassium échangeable (K_2O moy=540,4±80,8ppm) avec N minéral moy= 454,0±109,5% mg N/kg sol.

Forage-livestock component

Integrated Crop-Livestock Conservation Agriculture for Sustainable Intensification of Cereal-based Systems in Central and West Asia and North Africa

Enhanced crop-livestock integration in CA through optimized stubble grazing strategies and increased fodder availability

Annual meeting



INAT Team

Pr. Nizar Moujahed
Dr. Cyrine Darej
Hajer Guesmi (PhD student)

March 5th and 6th 2020, Tunis

ICARDA
Science for Better Livelihoods in Dry Areas

Feeding Trial 2018: Optimizing stubble grazing using the model 30/30

GENERAL INFORMATIONS

- Farm of Adnen Abdrabba (Region of Krib, Governorate of Silina).

- Area of 1 ha for a stocking rate of 30 ewes/ha

- Stubble of durum wheat cultivated according to conservation agriculture

- Duration of the trial: 30 days

OBJECTIVES

- Optimize crop residue management and livestock feeding under CA systems.

- Stimulating adoption and dissemination of the 30/30 stubble grazing model.

Feeding Trial 2018: Optimizing stubble grazing using the model 30/30

METHODOLOGY

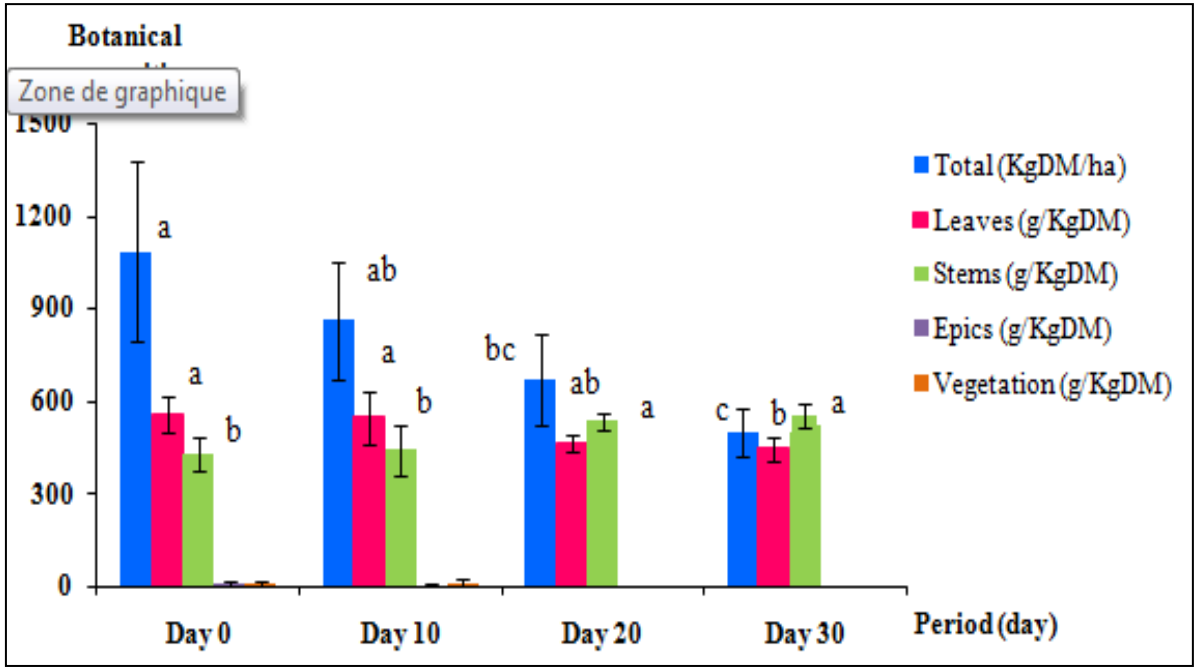
Collect of Biomass (4 times every 10 days)

Animal weighting (4 times every 10 days)





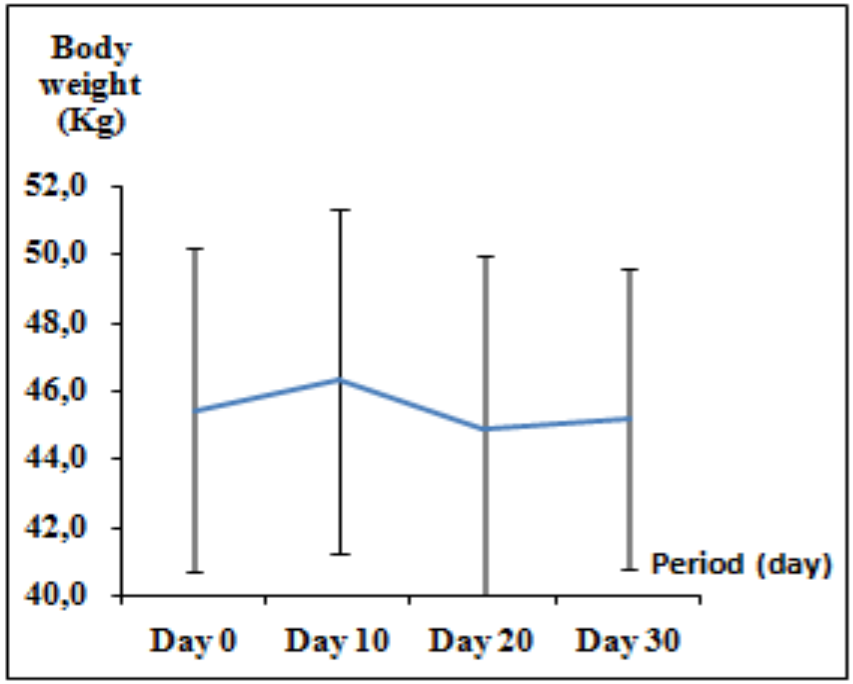
RESULTS



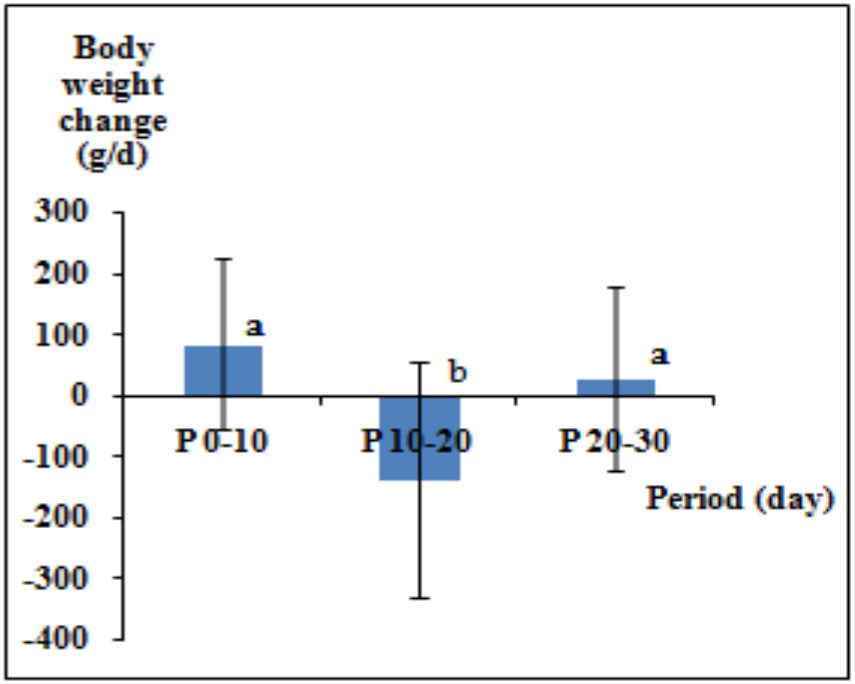
Biomass dynamic and botanical composition variation according to sampling period

a, b, c: Different letters mean different values according to sampling period

❖ Ewes' performances



(a)

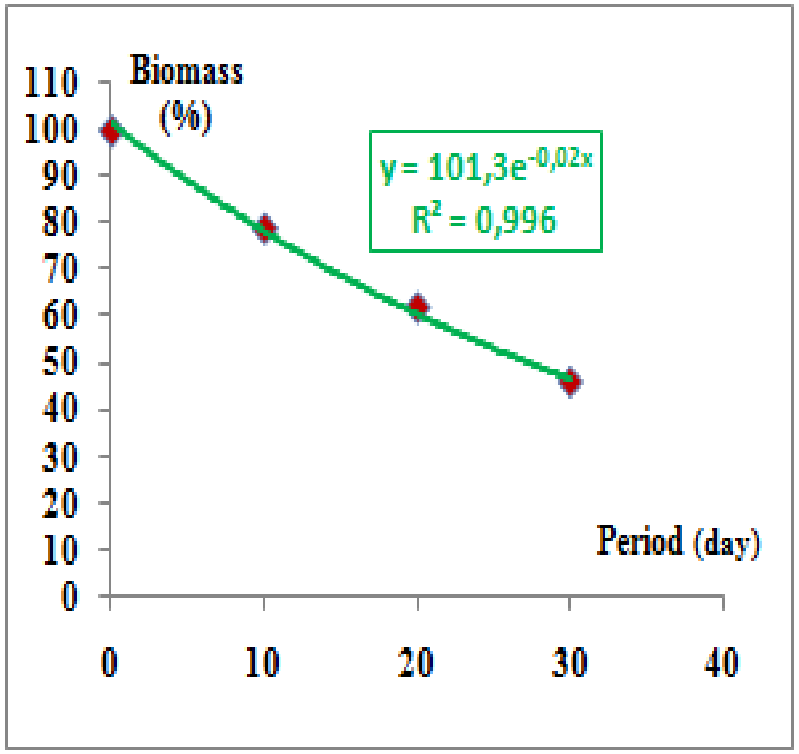


(b)

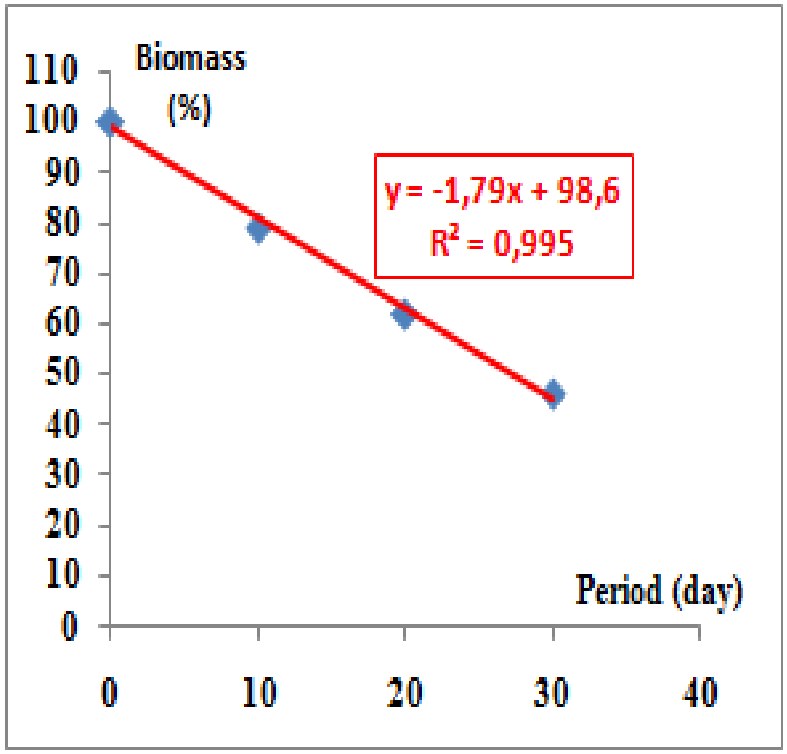
LW (a) and DLWG (b) variation according to period

a, b: Different letters mean different values according to sampling period

- Body condition of animals was preserved
- Biomass in the plot was not limiting and enough to sustain live weight of animals
- Stubble could contribute to safeguard livestock even in absence of supplementation



(a)



(b)

Relation between biomass and grazing period under CA conditions in exponential curve (a) and linear curve (b)

Survey 2018: Survey on perception and the use of crop residues in farms practicing CA

❖ Objectives

-Identifying constraints to adoption of CLCA package by smallholder farmers and ways of enhancing adoption.

-Understanding the stubble management typologies and how "good" practices could be disseminated within farmers.

❖ Materials and Methods

- 3 governorates: Beja , Siliana and Zaghouan
- 8 delegations: Makther, Krib, Zaghouan, Fahs, Saouaf, Mjez el Beb, Beja South and Guebolat
- 44 farmers including 26 in Siliana, 14 in Zaghouan and 4 in Beja

The survey items are subdivided into four groups:

- Identification of the farm: name of the farmer, age and education level, principal activity, number of persons living on farm and membership
- Livestock activity
- Stubble under Conservation agriculture
- Evaluation of extension services and the role of woman

Trials 2019: Optimizing the integration crop-livestock in 14 farms practicing conservation agriculture

Farmers	Regions	Grazing duration (days)	Superficies	Species	Number of ewes	Stocking Rate/ha
Adnen Abderabba	Krib	27	25ha	Faba bean	150	6
Tawfik Ben Ammar	Chwamia	60	3ha	Wheat	50	16
Arbi Ben Ammar	Chwamia	60	5ha	Barely	50	10
Moez Ben Ammar	Chwamia	60	1ha	Oat	50	50
Nabil Sahli	Chwamia	63	1ha	Wheat	15	15
Nizar Ben Ammar	Chwamia	63	2ha	Wheat	30	15
Jamel Sahli	Chwamia	59	5ha	Oat	50	10
Yassine Lasswed	Chwamia	63	1ha	Wheat	25	25
Habib Kharouba	Chwamia	60	1ha	Oat	25	25
Adel Sahli	Chwamia	59	4ha	Oat	30	7
Mousadek Ben Mehrez	Chwamia	59	0.5 ha	Oat	25	50
Khaled Djebbi	Béja	26	8ha	Oat	58	7
Nizar Nawali	Laaroussa	37	4ha	Wheat	250	62
Adel Jaouadi	Femana	35	2ha	Wheat	15	7

Study 2020: Cartography of the feeding systems in CA practicing regions

❖ Objectives

- ➢ Collect of data
- ➢ Local resource description and proposition of feed calendars
- ➢ Feeding strategy during the period August-October

❖ Cartography

IN PROGRESS

Activity 2. Up-scaling of forage mixture options and new enhanced varieties of Oat and barley

Forage Seeds acquired

Through CLCA budget

- Vetch : 2,8 Tons
- Ready to sow mixture N°1 : 2,5 T
- Ready to sow mixture N° 2 : 1,8 T

Other origins

- Vetch : 1,2 Tons from OEP
- Oat : 1 T from Bourabiaa-INRAT station
- Narbon vetch Faiza , (INRAT/OEP)
- Barley Cv Lemsi: 0,2 T (INRAT/OEP)
- Winter triticale Cv Our : 0,2 T (INRAT/OEP)

Forage crop options to be scaled

Monocrops for forage and feed grain:

- Oat (3 varieties); ***19 ha***
- Vetch (one variety), ***53 ha***
- Sulla, ***2,5 ha***
- fenugreek, ***73 ha***
- *Faba bean*, ***65 ha***
- Triticale, ***10 ha***
- Barley, ***424 ha***

Forage mixtures

- Vetch – Oat, ***20 ha***
- Vetch- barley, ***14,5 ha***

New forage varieties (CA on-farm evaluation trials)

- Forage hooded barley variety Lemsi, *4 ha, 6 farmers*
- Forage triticale, variety Our, *2 ha, two farmers*
- *Narbon vetch, variety Faiza, 4 ha, 3 farmers*
- *Vicia villosa variety Sejnane, 0,5 ha, 2 farmers*

In rotation with cereals under CA

Up scaling through collaboration with a private seed campagny : Cotugrain

- CLCA team proposed two crop mixtures with vetch, oat, and triticale seeds they already sells as sole crops
  - ✓ **Mix 1 : Vetch 71%- triticale (29%) to sow at 135 kg/ha**
  - ✓ **Mix 2 : Vetch 60% - Triticale 15% - Oat (12.5 %) & Fenugreek (12.5%): to sow at 165 kg/ha**
- **The idea** is to sell legume-cereal mixture with ready to sow mixed seeds bags
- In a first step, the project acquired 2,5 and 1,8 T from the first and the second mixture, respectively
- 40 ha are sown from the two mixtures and more …
- ***The need for such kind of mixed seeds is born !***

Further steps

- Yield sampling,
- data collection on implemented fields through survey

Under construction… (www.caf.tn)

Creation of website (*in three languages*) showing how to calculate seeding rates of each crop constituting the mixture from initial percentages, thousand grains weight and total seeding density.

The website would be available to farmers, technician, researchers …

Capacity Building: Programed for 2020

- Field days
- Extension documents : forage mixtures, vetch, animal nutrition, producing high quality oaten hay …

Socio-economy component

Knowledge management component

Workshop (2019-2020)

Date	Topic	Collaboration
12 December 2019	Expert Panel Meeting on: "Characterisation and scope of *agroecological practices* in the agricultural production systems of Tunisia"	CRP-wheat, Agronomy Lab-INRAT Peer project-INAT

Field-information days organized

Date	Region/site	Topic	Participants	Women
30-31/7/2019	Saouef-Fahs-Krib-Zaghouan-Laaroussa	Assesement of the animal health	23	3
09/10/2019	INGC	Forage crops and small machinery	26	3
21/11/2019	Oued sbaihia	Mixture forage crops and gender	28	20
28/11/2019	Gssar tir/Béja	Encouraging farmers association	39	7
07/12/2019	Saouef	No-till seeder calibration	9	0
12/12/2019	INRAT	Expert Panel Meeting on agroecology	41	14
30/1/2020	Gssar tir/Béja	Best agriculture practices under CA	32	7
11/2/2020	Fahs	Best agriculture practices under CA	49	13
18/2/2020	Bargou/Siliana	Best agriculture practices under CA	32	4
21/2/2020	Zaghouan	Best agriculture practices under CA	22	8
24/2/2020	Oued Sbaihia	Animal health	62	30
26/2/2020	Gssar tir/Béja	Animal health	22	1
04/3/2020	Saouef	Animal health	45	12
Total			**430**	**122**

Field-information days programed

Date	Region/site	Topic
09/ 3/2020	Oued sbaihia	Forage crops and animal nutrition
11/ 3/2020	Saouef	Forage crops and animal nutrition
17/ 3/2020	Chouarnia	Forage crops and animal nutrition













Studients supervision

Student	Level	Supervisor	Topic	Status
Samar Bejaoui	PFE	Ayoub Fouzaii and Mohamed Abdeladhim	Analyse de l'adoption et la diffusion de l'agriculture de conservation sous systèmes de production mixtes Céréales-Elevage dans les zones semi –aride en Tunisie	Defended 2019
Jaouher Aloui	PFE	Salah Ben Youssef and Sourour Abidi	Caractérisation agronomique et nutritionnelle de trois association fourragères installées à Z'hir, Safsafa, Ksar Cheikh, et à Fernana	Defended 2019
Wafa Ameur	Master	Ayoub Fouzaii and Mohamed Abdeladhim	Assessment of trade-offs related to the use of cereal residues in mixed Crops-livestock production systems of Northern Tunisia	Defended 2019
Villamor Aiza	Master	Ayoub Fouzaii and Mohamed Abdeladhim	Analysis of options for enhancing the large-scale adoption of Conservation Agriculture practices in small mixed-farming systems of North Africa: Case of Tunisia	Defended 2019
Rania Lassoued	Master	Mohamed Annabi and Haithem Bahri	Impact de l'érosion hydrique sur la dynamique du carbone organique des sols agricoles	Defended 2019
Amina Khalfalli	Master	Mohamed Annabi and Haithem Bahri	Suivi des sols cultivés après adoption de l'agriculture de conservation	Defended 2019

Studients supervision (ongoing)

Student	Level	Supervisor	Topic
Nesrine Bououen	PFE	Ayoub Fouzaii and Mohamed Abdeladhim	Perception des acteurs locaux de développement de l'AC : principaux problèmes et stratégies de développement proposées.
Ines Harzli	PFE	Ayoub Fouzaii and Mohamed Abdeladhim	Evaluation des techniques de vulgarisation pour une meilleure diffusion de l'AC
Jihène Omri	PFE	Ayoub Fouzaii and Mohamed Abdeladhim	Agriculture de conservation et allocation optimale des ressources.
Chaima Fetoui	PFE	Ayoub Fouzaii and Mohamed Abdeladhim	Analyse coût-avantage de l'agriculture de conservation dans le gouvernorat de Zaghouan.
Raja Hamdi	PFE	Ayoub Fouzaii and Mohamed Abdeladhim	Agriculture de conservation et analyse spatial : identification des sites potentiels dans le gouvernorat de Zaghouan.
	PFE	Sourour Abidi and Saida Nasri	Nutritional evaluation of multi- species mixture forages
Nawel Moujahed	Master	Hatem Cheikh Mhamed	L'agriculture de conservation comme système pour optimiser l'efficience de l'utilisation de l'eau et l'azote du blé dur dans le semis aride Tunisien: Essais de longue durée.
Hajer Guesmi	PhD	Nizar Moujahed	
Sayda Jaziri	PhD	Mohamed Annabi	Résilience des systèmes culturaux basés sur le blé à travers le semis sous couverture végétale vivante permanente

Publication

Impacted article

•**Bahri H., Annabi M., Cheikh M'hamed H., Frija A., 2019.** Assessing the long-term impact of conservation agriculture on wheat-based systems in Tunisia using APSIM simulations under a climate change contexte. Science of Total Environment, 692: 1223-1233. (published)

•**Guesmi.H, Ben Salem. H and Moujahed.N.** Wheat stubble from conventional or conservation agriculture conditions grazed by ewes at different stocking rates in dry areas: Biomass dynamic and animal grazing parameters (Submitted: under revision)

•**Guesmi.H, Ben Salem. H and Moujahed.N.** Conservation agriculture and livestock interaction: Current challenge (Submitted: under revision)

•**Guesmi.H, Ben Salem. H and Moujahed.N.** Biomass variation and ewes' rumen fermentation and body weight changes on wheat stubble from conventional and zero-tillage cropping system in semi-arid region (Submitted: under revision)

Indexed Article

•**Guesmi.H, Ben Salem. H and Moujahed.N. 2019.** Integration crop-livestock under conservation agriculture system**.** Journal of new sciences, Agriculture and Biotechnology, 65(1), 4061-4065 . (published).

• **Abidi S. Benyoussef S, Ben Salem H., Nasri S. and Frija A. 2019** .Vetch summer grazing (VSG) under conservative agriculture (CA): promising alternative to cereal residue grazing for better Barbarin lambs response. 6th International Conference on Sustainable Agriculture and Environment. Proceeding book. 477-483. (published)

• **Abidi S. Benyoussef S, Ben Salem H.**. Foraging behavior, digestion and growth performance of sheep grazing on dried vetch pasture cropped under conservation agriculture. **Submetted** Nov 2019 in Journal of Animal Physiology and Animal Nutrition – JAPAN (Submitted: under revision)

Oral communication

Abidi S. Benyoussef S, Ben Salem H., Nasri S. 2019 .Vetch summer grazing (VSG) under conservative agriculture (CA. *International Conference on Sustainable Natural Resources Management Under Global Change, held in Hammamet, Tunisia on 10-11-12 April 2019*

Abidi S. Benyoussef S, Ben Salem H., Nasri S. and Frija A. 2019 .Vetch summer grazing (VSG) under conservative agriculture (CA): promising alternative to cereal residue grazing for better Barbarin lambs response. 6th International Conference on Sustainable Agriculture and Environment. Konya, Turkey, October 3-5, 2019 .

Brochure/leaflet

1 brochure on Animal health

Thank You For Your Attention



Many Thanks for all the team