



MONTHLY REPORT

Month Covered in this Report:	April 2017 (Period: 1 st – 30 th April 2017)
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Date:	08 May 2017
Title:	Impact evaluation of SLM options to achieve land degradation neutrality in Tunisia

A. OBJECTIVES COMPLETED FOR LAST MONTH - OVERVIEW

During the month of April (1st to 30 April 2017), under the supervision of Dr. Quang Bao Le (Systems- and GIS-based Sustainable Land Management – SLM, at ICARDA Amman), Mr. Enrico Bonaiuti (Monitoring, Evaluation and Learning – MEL, ICARDA Amman) and Mr. Victor Kimathi (iMMAP, Jordan Office), different tasks were performed following the objectives below:

During this month (April 2017), focus was given to the following objectives:

1. Map the SLM options by context with their characteristics across Tunisia. The focus was to provide the spatial distribution of 19 SLM options identified for Tunisia so far.
2. Pursue the review the literature on SLM in Tunisia in order to update the database continuously. The database is continuously consolidated and progressively being finalised as the data are gathered and documented.

B. OVERVIEW OF PROGRESS IN GIS-BASED SLM OxC DATA DEVELOPMENT

The table 1 below provides an overview of the SLM being mapped in the two sites (Zaghouan and Medenine).

SLM ID	Technique	References	Socio-Agricultural Ecological Zone (SAEZ) (if the SLM is selected, then write the relevant code in ANNEX 1	Land Use System (LUS) (if the SLM is selected, then write the relevant code in ANNEX 2	Name of documented of the SLM OxC template (syntax: <technique>_<SAEZ code>_<ALUS code>_<short name of documenter>.xslm)	Name of visual file of the SLM OxC (syntax: <technique>_<SAEZ code>_<ALUS code>_<short name of documenter>.zip; zip file includes: 5 files of GIS shape + a Google Earth image of an example site in jpg + 1-2 field photos in jpg + a technical sketch of the technique in jpg)
1. Techniques targeting specifically water and soil conservation						
1.1.	Jessours	Tunisian LADA Report 2010; WOCAT Database	SAEZ8 ZAEZ9	ALUS2 ALUS2	Jessours_BD.xslm (1 st version completed)	Jessours_BD.zip (75% completed)
1.2.	Tabia	Tunisian LADA Report 2010; WOCAT Database	SAEZ8 SAEZ9	ALUS2 ALUS5	Tabias_BD.xslm (1 st version completed)	Tabias_BD.zip (75 % completed)
1.3.	Mechanical bench terraces	Roose E. (2002) Roose E. (2005)	SAEZ2 SAEZ3	ALUS1 ALUS2 ALUS3	Mechanised terraces.xslm (25% completed)	Mechanised terraces.zip (50% completed)
1.4.	Manual bench terraces	Tunisian LADA Report 2010	SAEZ2	ALUS2	Manual terraces_BD.xslm (25% completed)	Manual terraces_BD.zip (100% completed)
1.5.	Stone bund terraces	Tunisian LADA Report 2010	SAEZ2 SAEZ9	ALUS2 ALUS7	Stone bunds_BD.xslm (25% completed)	Stone bunds_BD.zip (100% completed)
1.6.	Gabion check dams	Tunisian LADA Report 2010 WOCAT Database 2017	SAEZ2 SAEZ3 SAEZ8 SAEZ9	ALUS1 ALUS2	Gabions_BD.xslm (1 st version completed)	Gabions_BD.zip (75% completed)
1.7.	Individual micro-catchment		SAEZ2	ALUS2	Micro-catchment_BD.xslm (25% completed)	micro-catchment_BD.zip (75% completed)
2. Techniques for controlling sand dune mobility						
2.1.	Usage of palm leaves for sand	Tunisian LADA Report 2010;	SAEZ8	ALUS1 ALUS3	Palm fences_BD.xslm (75 % 1 st version completed)	Palm fences_BD.zip (1 st version completed)

	dune stabilisation	WOCAT Database 2017				
2.2.	Biological stabilisation of sand dunes	Tunisian LADA Report 2010; WOCAT Database	SAEZ9	ALUS6	Biological fixation dunes x lsm (1 st version completed)	Biological fixation dunes BD.zip (1 st version completed)
3. Techniques for rangelands management and improvement						
3.1.	Rangeland fallow cropping (rangeland resting)	Tunisian LADA Report 2010; WOCAT Database 2017	SAEZ9	ALUS6	Rangeland resting BD.xlsm (1 st version completed)	Rangeland resting BD.zip (1 st version completed)
3.2.	Conservation of degraded rangelands	Tunisian LADA Report 2010;	SAEZ9	ALUS6	Not mapped because an approach for rangeland resting and area enclosure techniques	
3.3.	Area enclosure	Tunisian LADA Report 2010;	SAEZ8	ALUS6	Area enclosure BD.xlsm (75 % 1 st version completed)	Area enclosure BD.zip (50% completed)
4. Agronomic techniques and practices						
4.1.	Deficit irrigation with salted water	Tunisian LADA Report 2010			Deficit irrigation.xlsm (75 % completed)	Deficit_irrigation.zip (pending)
5. Techniques targeting specifically water harvesting						
5.1.	Hill reservoirs (lakes and dams)	Technical reports (DGACTA, 2005)	SAEZ2 SEAZ3 SAEZ5	ALUS1	Hill lake BD.xlsm (50 % 1 st version completed) Hill dam BD.xlsm (50 % 1 st version completed)	Hill lake BD.zip (1 st version completed) Hill dam BD.zip (1 st version completed)
5.2.	Citerns	Tunisian LADA Report 2010	SAEZ8 SAEZ9	ALUS3	Citerns BD.xlsm (75 % 1 st version completed)	Citerns BD.zip (1 st version completed)
5.3.	Wells in desert	Tunisian LADA Report 2010	SAEZ8	ALUS5	Wells in desert BD.xlsm (20 % completed)	Wells in desert BD.zip (1 st version completed)
5.4.	Oasis in desert	Tunisian LADA Report 2010	SAEZ8 SAEZ9	ALUS3 ALUS3	Oasis BD.xlsm (20 % completed)	Oasis BD.zip (1 st version completed)
5.5.	Artesian well		SAEZ	ALUS4	Artesian well BD.xlsm (20 % completed)	Artesian well BD.zip (1 st version completed)
5.6.	Recharge wells	WOCAT database	SAEZ9	ALUS1	Recharge well BD.xlsm (75 % completed)	Recharge well BD.zip (1 st version completed)
6. Tree-based techniques						
6.1.	Reforestation/tree plantation	Tunisian LADA Report 2010	SAEZ3	ALUS4	Tree plantation BD.xlsm (75 % 1 st version completed)	Tree plantation BD.zip (1 st version completed)

C. FURTHER DETAILS IN ASSOCIATED OUTCOMES OF COMPLETED OBJECTIVES

C1. Mapping SLM technologies

For the mapping purpose, focus was given to Zaghouan governorate (Centre-North) and Medenine governorate (South-East Tunisia). Attempts were done to expand the mapping to surrounding governorates of these pilot sites.

The approach used for mapping the SLM technologies is a combination of different data sources:

- (i) **field data** collected during March 2017;
- (ii) **literature-based information** (WOCAT, Technical reports, Evaluation reports, monitoring reports, Scientific publications, etc.);
- (iii) **high resolution images** from Google Earth; and
- (iv) **secondary spatial resources database** from Tunisian organisation (e.g. Soil and Water Conservation Office (CES) of Zaghouan, which provided some SLM GIS database).

The combination of these different data was useful for feature identification through visual interpretation of Google Earth images. In overall, it was possible to identify the most common SLM techniques (largely implemented SLM techniques) at 1/10000 at the landscape level. But for single implementation cases or the SLM requiring much more attention, the scale was increased to 1/5000, even 1/2500, in order to enable identification and digitizing. Based on feature similarity, SLM options were digitised throughout the landscape. Caution was given to ensure accurate feature discrimination since the approach is basically visual object-based analysis. SLM practices were digitized as much as possible in the two selected sites visited during the field works (See Annex 1). Prior comparison, extrapolation was made to other areas not visited. Caution was given to stake into account similar climatic or socio-agro-ecological zones in which the mapped SLM are implemented.

[Twenty-one \(21\) SLM](#) are being mapped for both contexts as shown in Annexes 1 and 2. Even though they occur in different contexts, the following SLM options were identified to be similar: “rangeland resting”, “tree plantation”, and “area enclosure”. “Gabions” were also mapped in both sites. However, these “Gabions” play slightly different roles based on their principles and purposes. In the arid conditions (e.g. Medenine governorate), “Gabions” are built for either runoff splashing runoff water towards crop fields or for storing water to aliment recharge wells through infiltration. In the semi-arid to sub-humid conditions (e.g. Zaghouan governorate), “Gabions” are mostly built for controlling gully erosion in the landscapes.

In Zaghouan governorate, the 8 different SLM techniques visited during the field work (i.e. “manual bench terraces”, “mechanical bench terraces”, “hill lakes”, “hill dams”, “Gabions”, “area enclosure”, “stone bunds”, “semi-circular bunds”) were mapped. The two socio-agro-ecological zones covered by this site are Nord Est Cap Bon and Dorsale-Tell. These sites were predominantly located in mountains and hills, which are favorable to the development of some techniques of water harvesting (lakes and reservoirs).

In the Medenine governorate, the following SLM are identified and mapped: “Jessours”, “Tabias”, “Gabions”, “recharge wells”, “area enclosure”, “cisterns” and “wells”, “artesian well”, “stone bunds”, “palm leave fences”). While the socio-agro-ecological zone (SAEZ) of Dahar-Matmata concentrate mostly the “Jessours”, “cisterns” and the “wells” (water points), Jeffara-Ouara, a coastal SAEZ, is dominated by “Tabias”. This is fundamentally defined by the geomorphological and climatic conditions of the area. Other SLMs are erratically spread in both SAEZ.

The spatial patterns of the mapped SLM in both governorates are provided in Annexes 2, 5, 6, 7, 8, 9, 10 and 11. Single cases of SLM technologies were mapped but not provided in this current reports.

1. C2. Standardised SLM templates are progressively updated

This objective evolved from the works of the previous month since it is a continuous documentation process. Currently, based on data/information availability, the templates of the 21 mapped SLM techniques are filled in at different levels.

Some SLM templates are filled based on available information but are not yet mapped because of the difficulty to geolocate them. These are mainly: “*Cuvettes individuelles*” (or individual micro-catchment), “irrigation with salted water”, “*Meskats*”, “*Mgouds*”, “*Minimum tillage*”, “*rangeland improvement*”, “*plantation of forage species*”. Their detailed mapping could not be achieved yet, despite some relevant information is continuously filled in their respective templates.

C3. Associated Challenges of Completed Monthly Objectives

The important associated challenges are mostly related to the identification of the non-visited sites during the fieldwork. Consequently, some confusion arose during on-screen identification through Google Earth engine. For instance, there is the need to possess prior basic geoinformation/knowledge of the location of hill lakes and hill dams to be able to differentiate them from water supply company reservoirs. This was overcome using literature-based information and the resources provided by the Soil and Water Conservation Office (in French, Conservation des Eaux et Sols -CES) of Zaghuan Governorate. In other cases, even though there were GPS data available, the on-screen feature identification is a tremendous task. This is an acute challenge for SLM techniques that are either single case or merely captured by the satellite images. An example for the latter case is the identification of a recharge well in a Wadis.

There is still a serious challenge related to getting information/data on specific SLM techniques. This requires a sound synthesis to gather data in order to fill in the SLM forms and guide the mapping process. All these challenges make the tasks very time-consuming due to long time search.

D. NARRATIVE & LESSONS LEARNED

Even though there is nothing significant to narrate, it is important to mention that producing database and managing multisource data requires a lot of attention and caution. There is a need of being patient and efficient in order to produce and release reliable data for current use and future database references. In this condition where care is given for producing reliable data, there is always time-related trade-off. It is important to mention the role of georeferenced data from the two pilot sites which were capital in guiding

features identification during on-screen digitizing. So, it is important to make use of reliable data sources for producing and releasing good data to avoid revising or re-producing the data because of errors.

E. OBJECTIVES PROJECTED FOR NEXT MONTH

Given that the objective on mapping SLM is uncompleted during the reported month, the main tasks for May 2017 will be

- (1) finalise the mapping of the SLM technologies across the land use cover types of the two pilot sites and surrounding areas, clean the geodatabase and produce the metadata files;
- (2) write a technical report on the mapping of the SLM practices. Further details will be provided on the mapping method and the interpretation of the outputs;
- (3) upload the mapped SLM technologies into the WebGIS OxC and check for the correct properties of the raster database domain of the WebGIS OxC.

Annex 1. Table 1b. List of Socio-agricultural ecological zones (SAEZ)

Name of SAEZ	CODE of SAEZ	Key characterization	Reference
Mogods and Kroumerie	SAEZ1	Area: 319 518 ha Subdivisions: none Climate: humid; Vegetation/Tree density: Forests/high Land use: important sylvo-pastoral potential Relief: Hills and mountains Governorates: Beja; Jendouba	CNEA/Elaboration d'une étude sur l'état de désertification pour une gestion durable des RN/Avril2007
Nord Est Cap Bon	SAEZ2	Area: 802 395 ha Subdivisions: none Climate: Humid, sub-humid, semi-arid Vegetation/Tree density: Forest/medium Land use: Tree and cereal crops Relief: plains, hills ($\wedge$ 200 m), large valleys, domes ($\wedge$ 637 m) Governorates: Bizerte, Ariana, Beja, Ben Arous, Nabeul, Zaghouan	CNEA/Elaboration d'une étude sur l'état de désertification pour une gestion durable des RN/Avril2007
Dorsale et Tell	SAEZ3	Area: 2 365 584 ha Climate: Sub-humid to semi-arid (Pmm = 500 – 900 mm/yr) Vegetation/Tree density: Forests/ Low (on top hills) Land use: Tree and cereal crops Relief: hills ($>$ 200 m) and mountains (up to 1300 m), vast plains Governorates: Jendouba, Beja, Kef, Bizerte, Kairouan, Siliana, Sousse, Kasserine	CNEA/Elaboration d'une étude sur l'état de désertification pour une gestion durable des RN/Avril2007
Basse steppe	SAEZ4	Area: 1 866 494 ha Sub-divisions: Sidi Mhaddeb; Sousse sahel, Sfax sahel, Basse steppe Climate: Humid to subhumid Vegetation/Tree density: Land use: tree crops, cereal crops, rangelands Relief : Plateaus, plains, domes	CNEA/Elaboration d'une étude sur l'état de désertification pour une gestion durable des RN/Avril2007

		Governorates: Sfax, Gabes, Mhadia, Sousse, Sidi BouZid, Kairouan, Monastir	
Haute steppe	SAEZ5	Area: 1 243 012 ha Subdivisions : Hautes steppes agricoles ; Hautes steppes alfatieres Climate: Semi-arid Vegetation/Tree density: Shrubs & herbaceous/Low Land use: tree crops, cereal crops Relief: plains, Plateaus (700 m), Mountains Governorates: Kasserine, Siliana, Kairouan, Sidi BouZid, Sfax, Gafsa	CNEA/Elaboration d'une étude sur l'état de désertification pour une gestion durable des RN/Avril2007
Chainons atlassiques	SAEZ6	Area: 698 554 ha Subdivisions: none Climate: Arid Vegetation/Tree density: Sparse shrubs/ Low Land use: agriculture Relief: Mountains (400 – 600 m) Governorates: Gafsa, Sidi Bouzid, Kebili, Sfax, Gabes	CNEA/Elaboration d'une étude sur l'état de désertification pour une gestion durable des RN/Avril2007
Chotts	SAEZ7	Area: 1 964 074 ha Sub-divisions: none Climate: arid Vegetation/Tree density: sparse steppe, psammophile Land use: tree and cereal crops in oasis, Rangelands Relief: Plains Governorates: Kebili, Tozeur, Gafsa, Gabes	CNEA/Elaboration d'une étude sur l'état de désertification pour une gestion durable des RN/Avril2007
Dahar et Matmata	SAEZ8	Area: 1 879 603 ha Sub-divisions: none Climate: arid Vegetation/Tree density: Mountain alfa and forest patches, sparse to dense low vegetation Land use: rare crops, rare rangelands Relief: hills, mountains Governorates: Gabes, Kebeli, Medenine, Tatouine	CNEA/Elaboration d'une étude sur l'état de désertification pour une gestion durable des RN/Avril2007

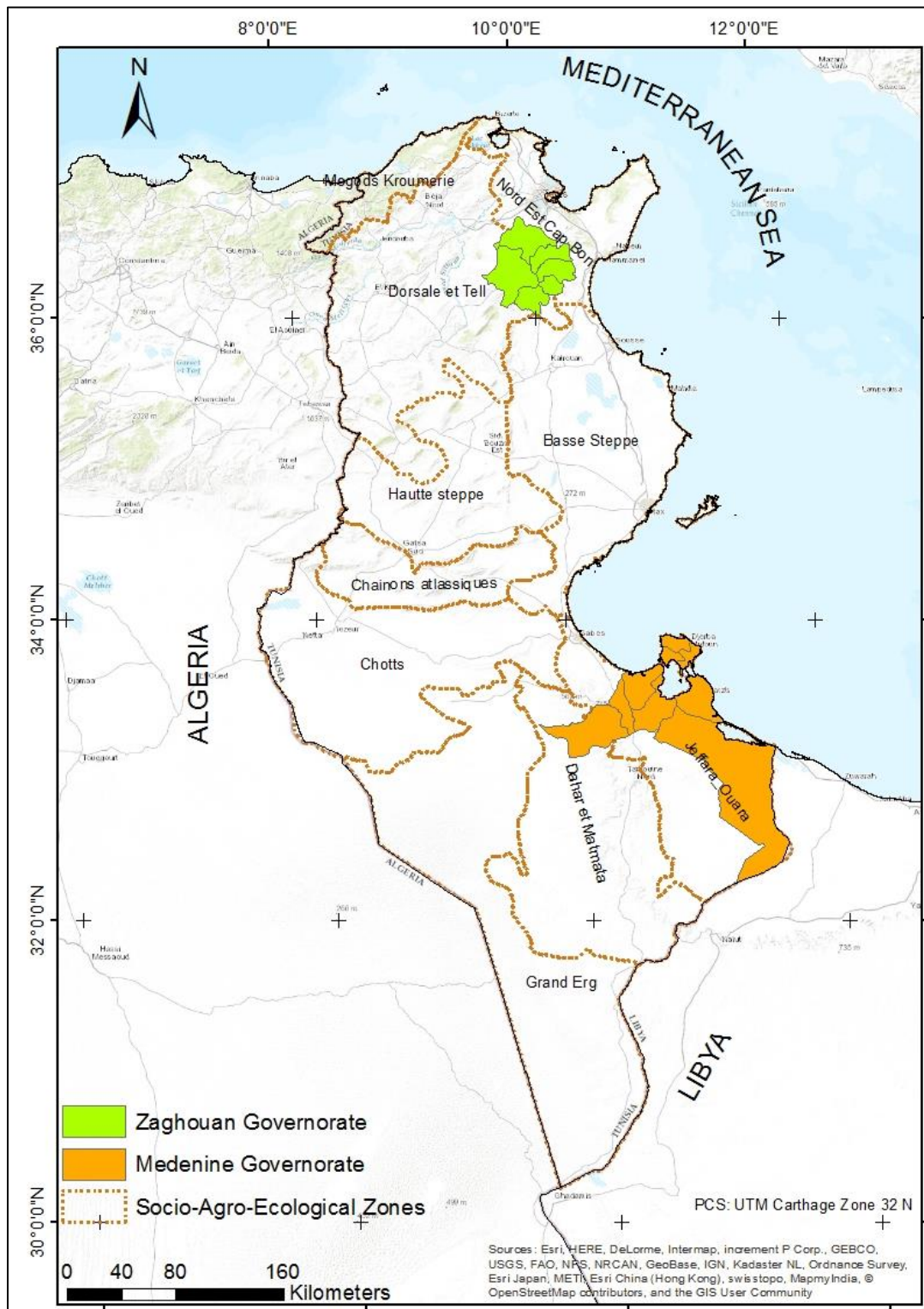
Jeffara- El Ouara	SAEZ9	Area: 1 591 197 ha Sub-divisions: El Ouara, Jeffara Climate: arid (Saharan Mediterranean) Vegetation/Tree density: halophile steppe Land use: Rangelands, tree crops, cereal crops Relief: plains Governorates: Medenine, Tataouine, Gabes	CNEA/Elaboration d'une étude sur l'état de désertification pour une gestion durable des RN/Avril2007
Grand Erg	SAEZ10	Area: 2 761 748 ha Subdivisions: None Climate: arid Vegetation/Tree density: sparse vegetation Land use: rare rangelands, parks and reserves Relief: sand dunes Governorates: Kebili, Gabes, Tataouine	CNEA/Elaboration d'une étude sur l'état de désertification pour une gestion durable des RN/Avril2007

Annex 2. List of Aggregated Land Use Systems (ALUS). Sources: DGACTA- Tunisia (2008)

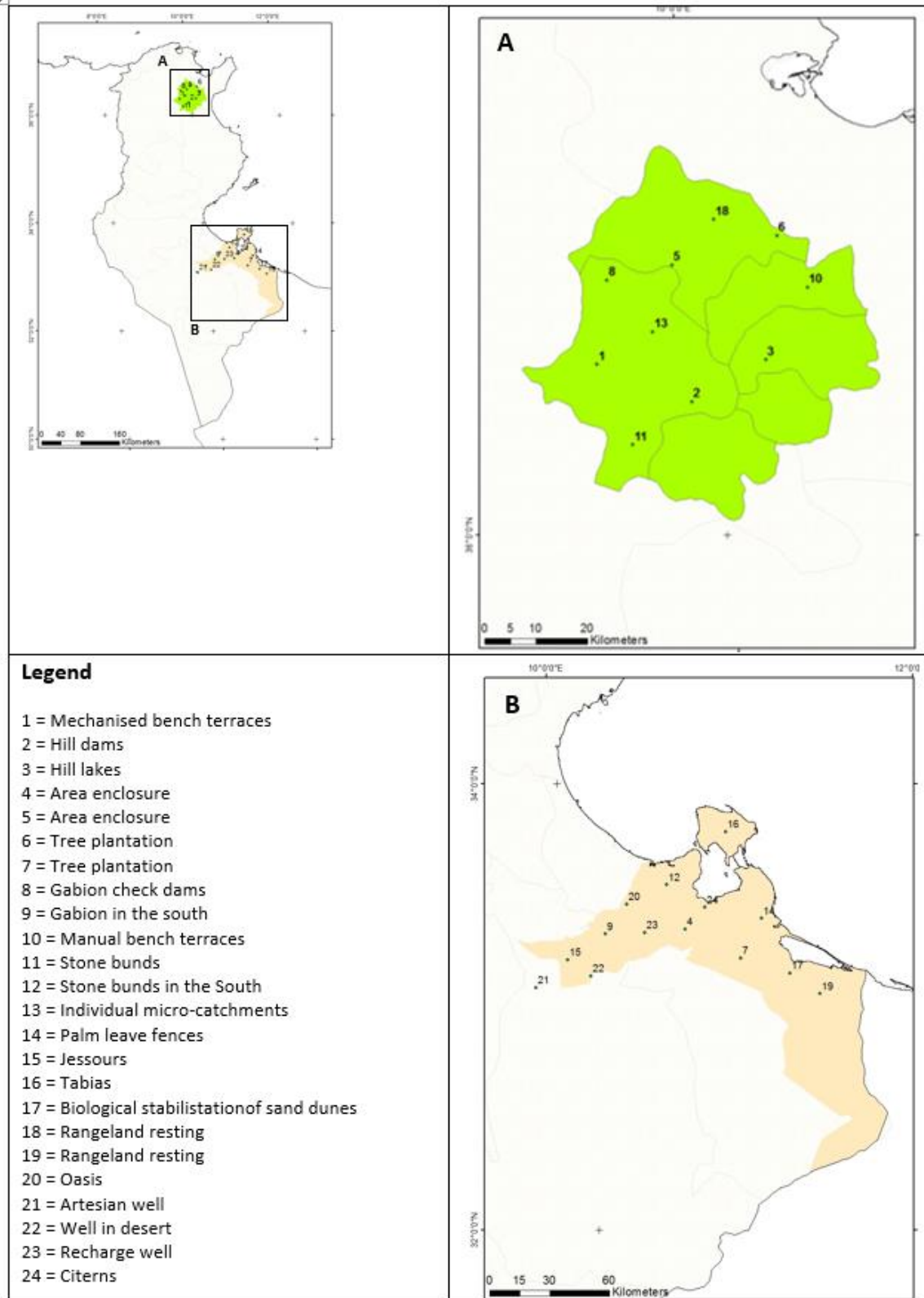
Aggregated LUS (ALUS)	CODE for ALUS	Primary LUS in Tunisian LADA classification (multiple categories should be separated by semicolon)	Code for primary LUS
Irrigated Crops	ALUS1	1. Citrus trees	Cr_irrig_citrus
		2. Tree crops	Cr_irrig_tree
		3. Garden market crops	Cr_irrig_gard
		4. Palm trees	Cr_irrig_palm
		5. Great crops	Cr_irrig_great
Rainfed crops	ALUS2	1. Citrus trees	Cr_rain_citrus
		2. Garden market crops	Cr_rain_gard
		3. Great crops	Cr_rain_great
		4. Olive trees	Cr_rain_oliv
		5. Palm trees	Cr_rain_palm
		6. Orchards	Cr_rain_orch
		7. Vineyard	Cr_rain_vine
Non-irrigated agro-pastoralism	ALUS3	1. Intensive breeding	No_irrig_agro_past_int
		2. Semi-intensive breeding	No_irrig_agro_past_semi
		3. Extensive breeding	No_irrig_agro_past_ext
Irrigated agro-pastoralism	ALUS4	1. Intensive breeding	Irrig_agro_past_int
		2. Semi-intensive breeding	Irrig_agro_past_semi
		3. Extensive breeding	Irrig_agro_past_ext
Pastoralism on bare soils	ALUS5	1. Extensive	Past_bare_ext
		2. Semi-intensive	Past_bare_semi
		3. Intensive	Past_bare_int
Pastoralism on shrub lands	ALUS6	1. Extensive	Past_sh_ext
		2. Semi-intensive	Past_sh_semi

		3. Intensive	Past_sh_int
Natural zones	ALUS7	1. Bare soils	Bare_ar
		2. Water	Water
		3. Forests	Forest
		4. Shrubs- Mosaic of sparse shrubs herbaceous	Sh_h_ar
Urban areas	ALUS8	Excluded	Urb
Parks and natural reserves	ALUS9	Excluded	Protect_1
Ramsar sites	ALUS10	Excluded	Protect_2

Annex 3. Map of the National lands of Tunisia showing the pilot sites in their socio-agro-ecological zones (Source: author mapping).



Annex 4. Distribution of the mapped SLM according to the sites (Source: author mapping).

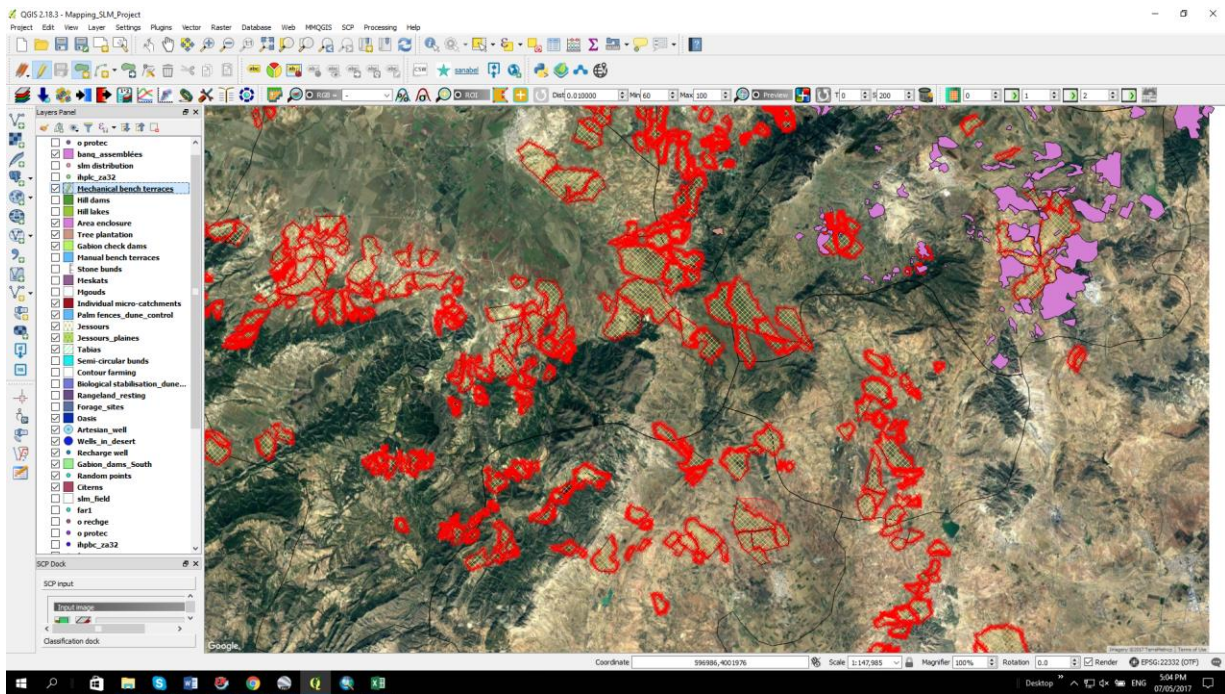


Annex 5. List of SLM OxC TECHNOLOGIES and their status.

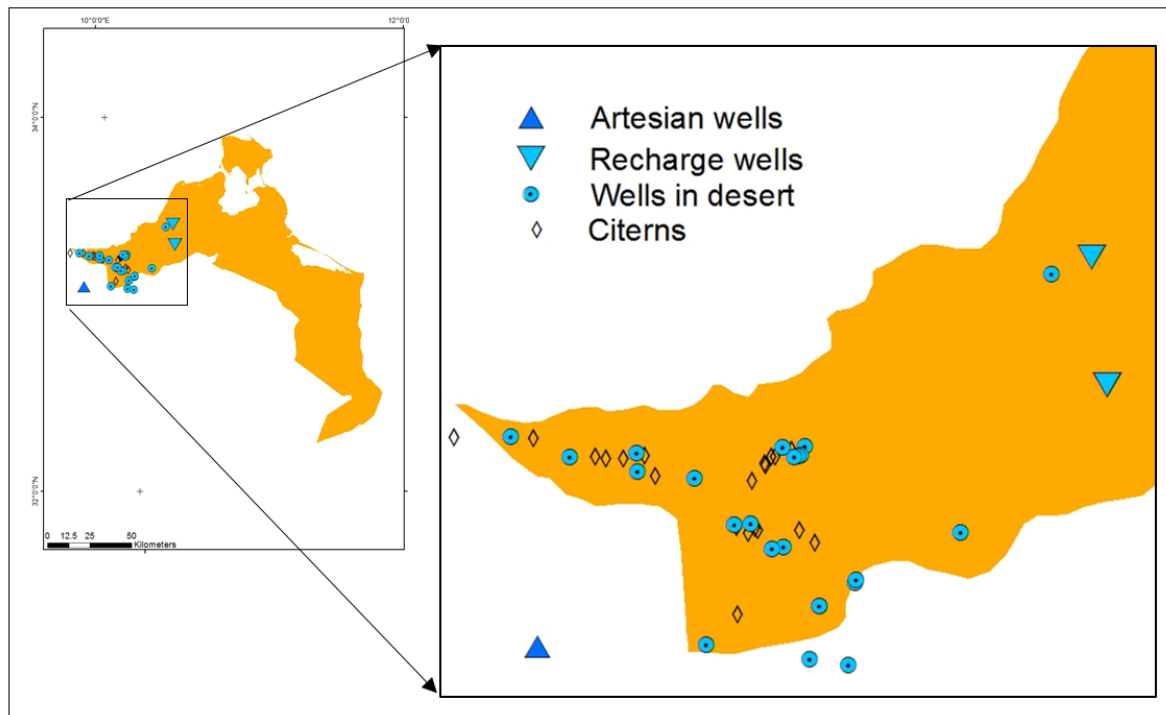
ID	SLM Techniques	Status/reasons
.1	Jessours	Ongoing/ spread over large scale
.2	Tabia	Ongoing/ spread over large scale
.3	Mgouds (Spate control for irrigation)	Not yet mapped/ Not located
.4	Runoff water collection from wadis (Mgouds)	
.5	Mechanical bench terraces	Ongoing/ spread over large scale
.6	Manual bench terraces	Done/Single case
.7	Semi-circular bunds	Not yet mapped/ Not located
.8	Stone bunds	Done/Single case
.9	Contour farming	Not yet mapped/ Not located
.10	(T) Usage of palm leaves for sand dune stabilisation (A) Mechanical stabilisation of sand dune	Done/ identified case
.11	(T) Biological stabilisation of sand dunes	Done/ identified case
.12	(A) Reforestation and biological stabilisation of sand dunes	
.13	(A) Creation of forage sites	Not yet mapped/ Not located
.14	(T) Rangeland fallow cropping (rangeland resting)	Done/ identified case
.15	(A) Conservation of degraded rangelands (Enclosure of degraded pastures)	
.16	(T) Plantation of forage shrub-species	Not yet mapped/ Not located
.17	(T) Replantation of local forage species	Not yet mapped/ Not located
.18	(T) Hill lakes	Done/ identified case
.19	(T) Hill dams	Done/ identified case
.20	(T) Wells in the Regs Plateau (i.e. citerns??)	Done/ identified case
.21	(T) Oasis in desert	Done/ identified case
.22	(T) Reforestation/tree plantation	Done/ identified case
.23	(T) Gabion check dams	Done/ identified case
.24	(T) Artesian wells	Done/ identified

		case
.25	(T) Meskats	Not yet mapped/ Not located
.26	(T) Individual micro-catchments	Not yet mapped/ Not located
.27	(T) Minimum tillage for agricultural conservation (A) Direct sowing of cereal crops on erosion vulnerable areas	Not yet mapped/ Not located
.28	(T) Deficit irrigation	Not yet mapped/ Not located

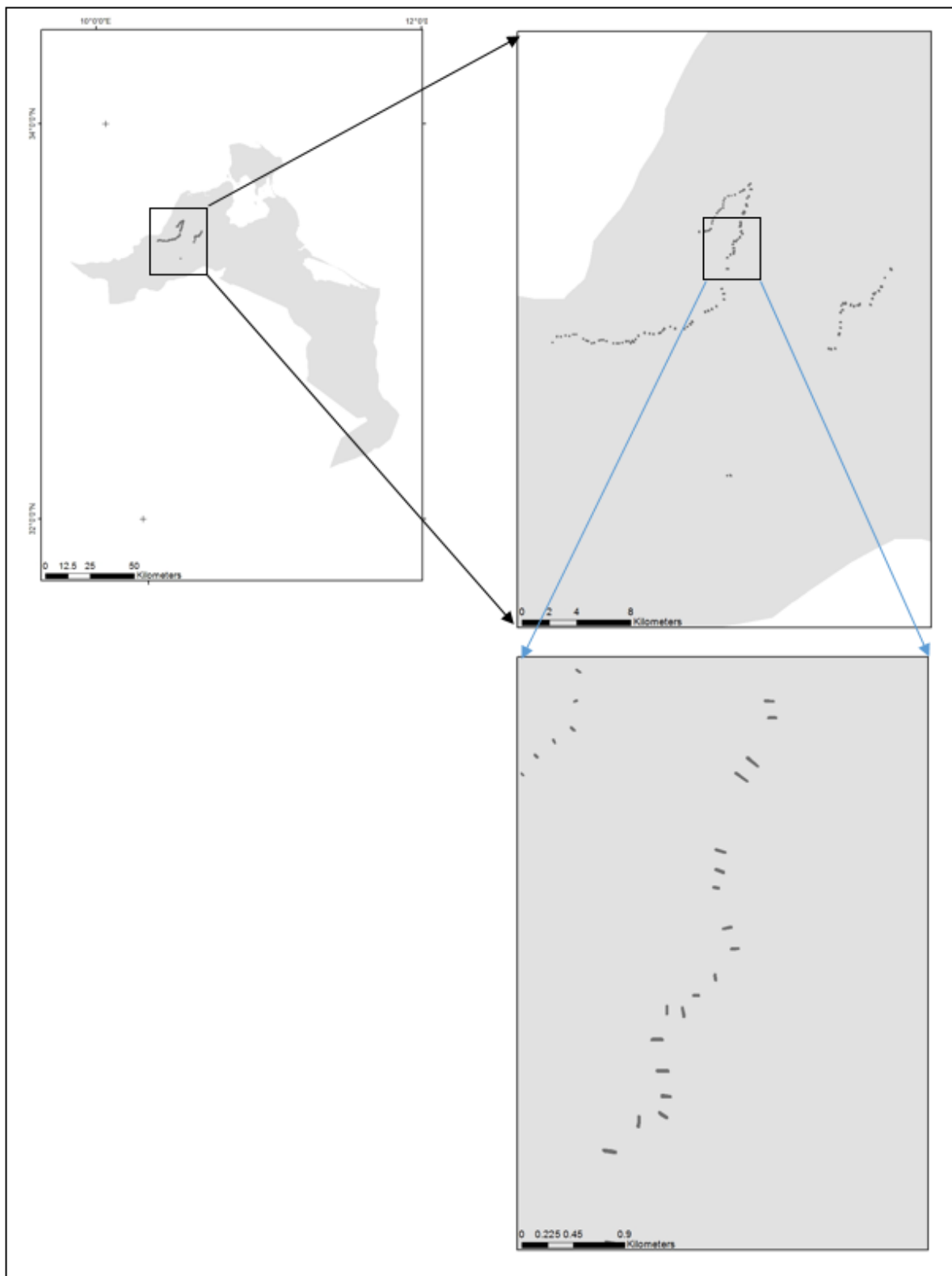
Annex 6. Digitizing process for creating SLM geodatabase (Source: author mapping).



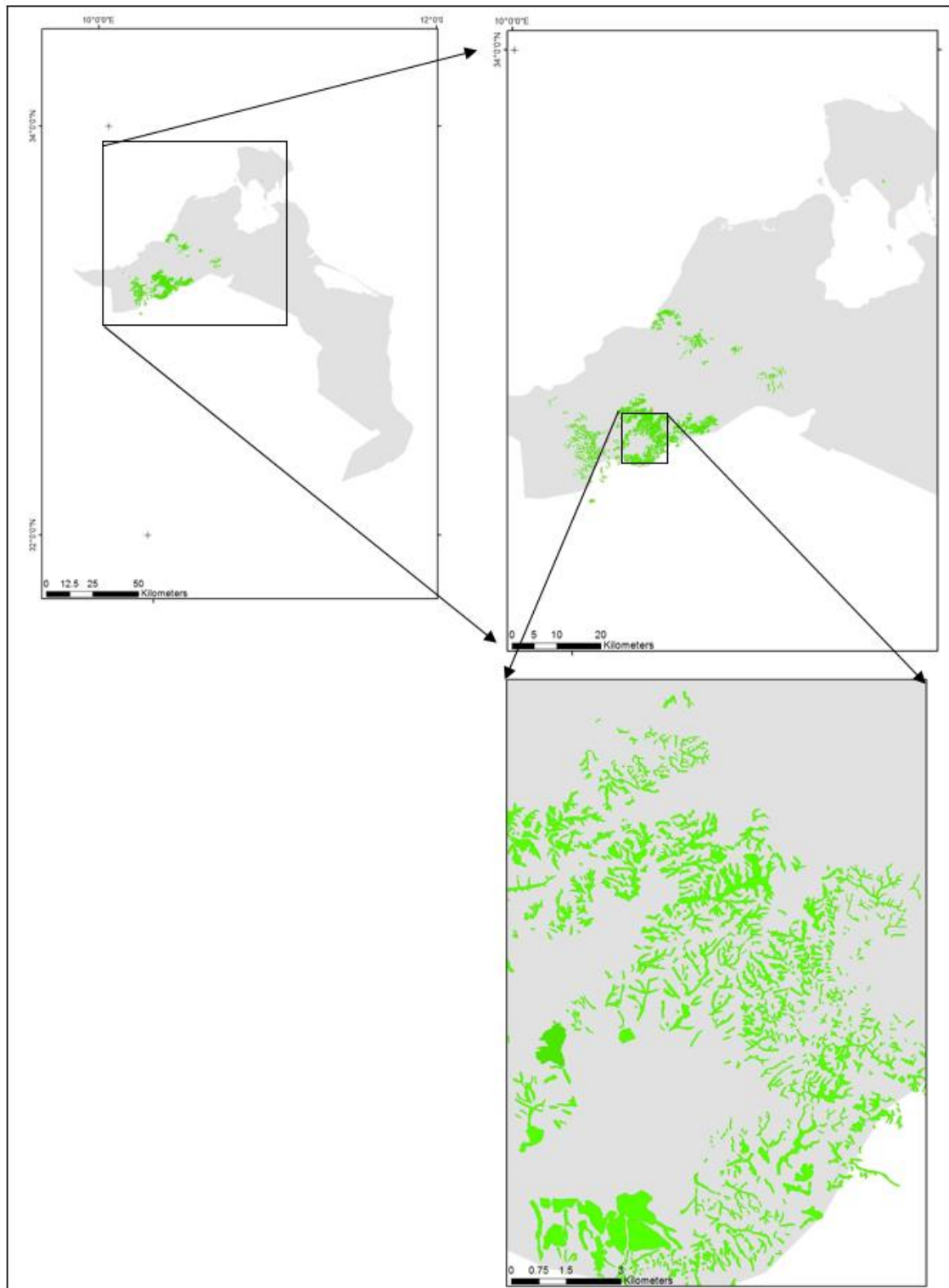
Annex 7. Map of the identified “wells” and “cisterns” in the Medenine Governorate (Source: author mapping).



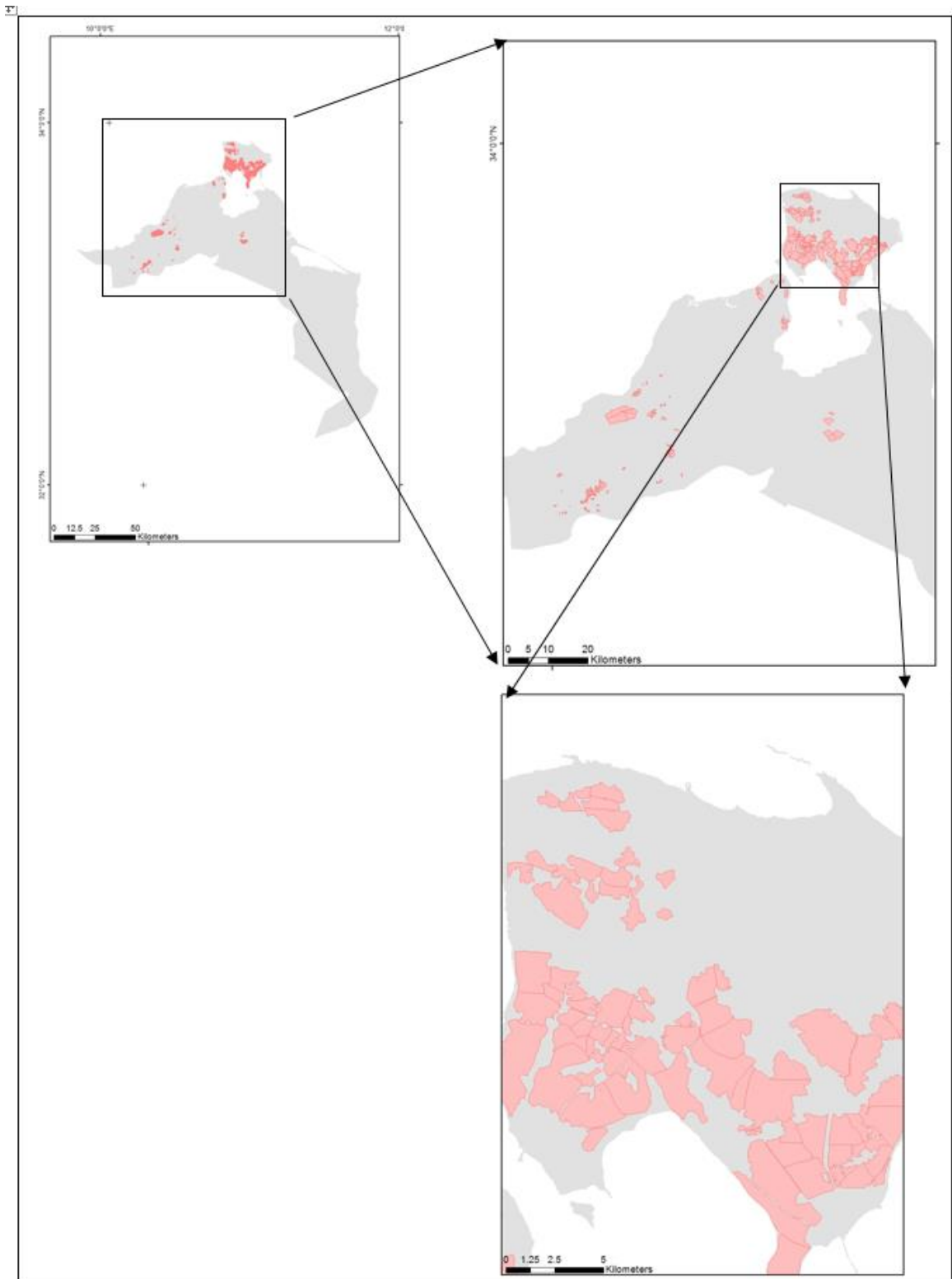
Annex 8. Spatial distribution of the identified “Gabions” in the Medenine governorate (Source: author mapping).



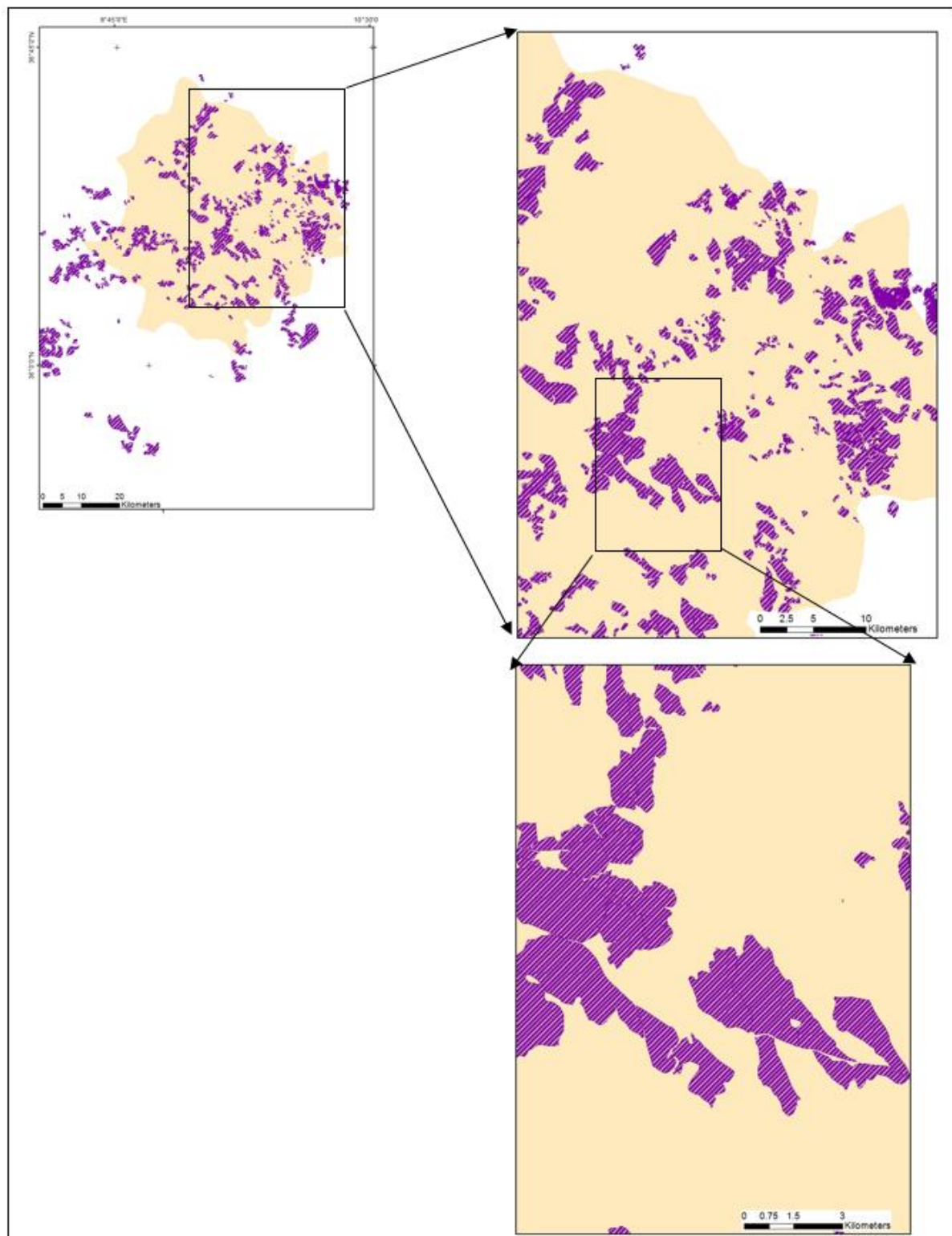
Annex 9. Spatial distribution of the currently mapped “Jessours” in the Medenine governorate (Source: author mapping).



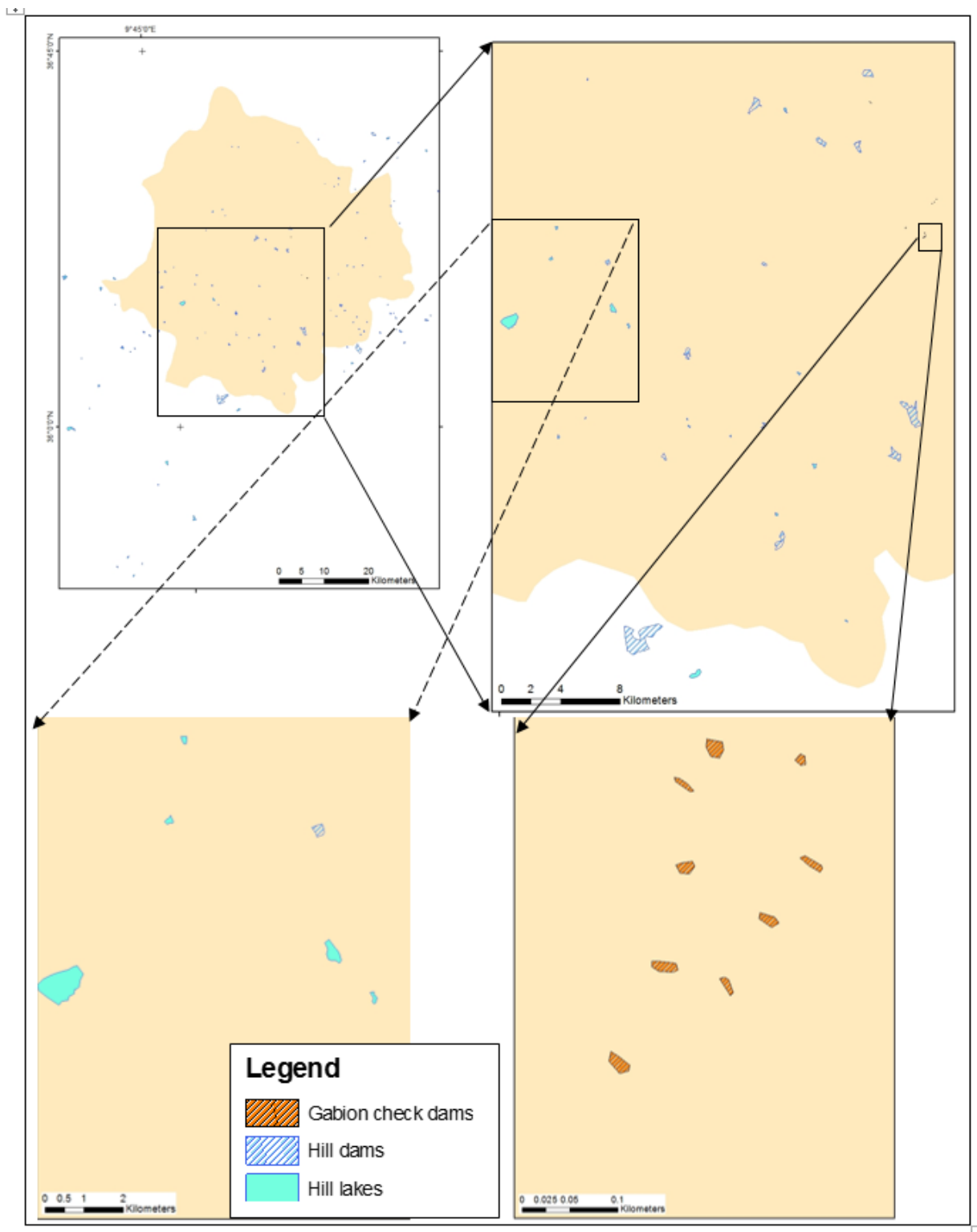
Annex 10. Spatial distribution of the currently mapped “Tabias” in the Medenine governorate (Source: author mapping)..



Annex 11. Spatial distribution of the currently mapped “mechanised bench terraces” in Zaghouan governorate (Source: author mapping).



Annex 12. Spatial distribution of the currently mapped “Gabions”, “hill lakes” and “hill dams” in Zaghouan governorate (Source: author mapping).



Annex 13. Spatial distribution of the currently mapped “stone bunds” areas in Zaghouan governorate (Source: author mapping).

