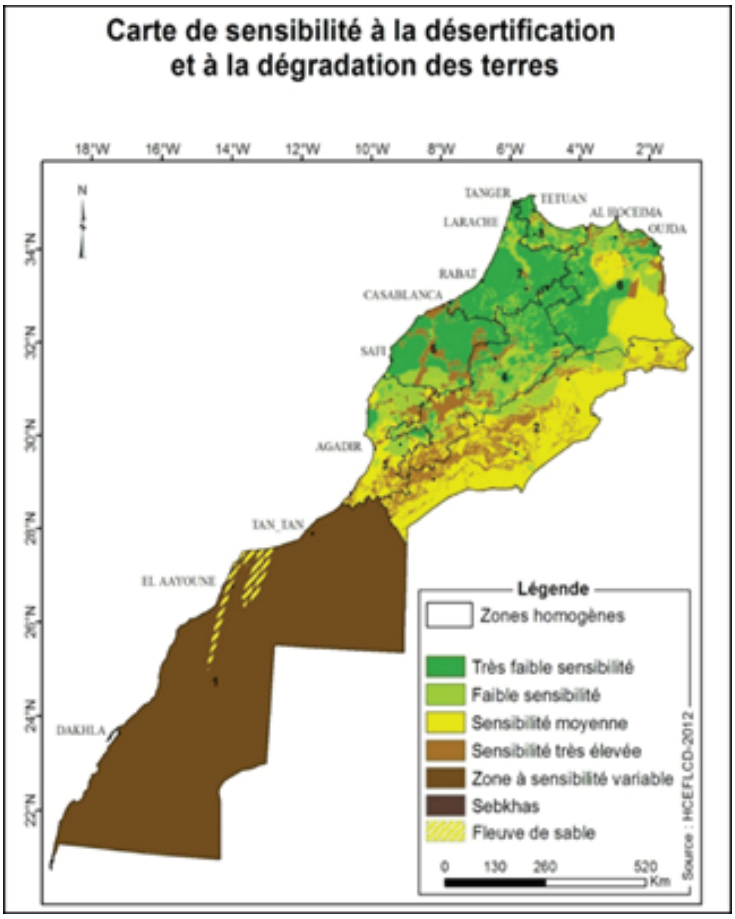
LADA assessment of LD and SLM within and through their land use system: landscape/local level assessment (three sites, Amaskrud, Tamri and Aziar) – Module 4

(Omar Berkat, Rochdi Ouchna, Mouna Touami, using the report from the national experts Mohamed Rouchdi, Mohamed Sabir, Mohamed Qarro) including photos and technical diagrams

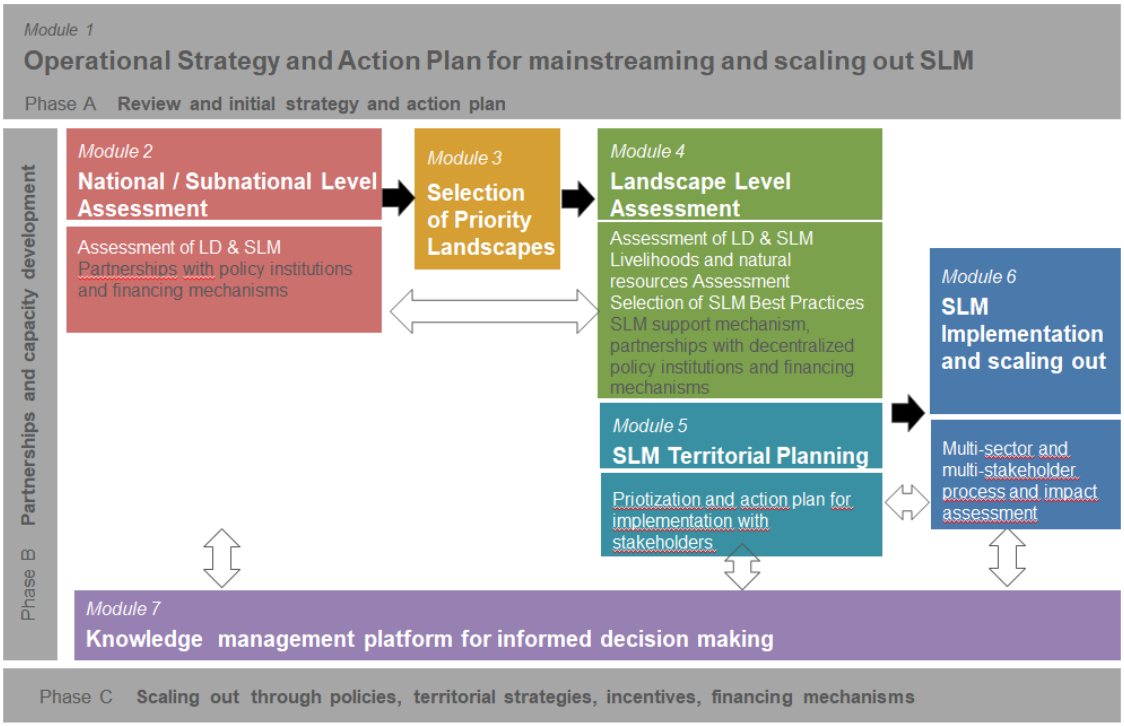
Introduction

It is known that desertification and land degradation are complex phenomena. In addition, the interventions remain insufficient to reverse the trend. Taking these elements into account, the Moroccan National Action Programme for Combating Desertification (NAPCD), which was updated between 2011 and 2013, has developed tools to support decision making in harmony with the implementation strategy of the UNCCD and other Rio conventions. It is expected that these tools will aid answering the issues of where to take action and what are the priorities.



The DS-SLM Project is a global GEF/FAO project that has been initiated to contribute to arresting and reversing current global trends in land degradation by providing complementary tools to support decision-making at the sub-national and national level in order to address such issues as 'how and with what' to intervene to promote sustainable land management. Consequently, this project addresses the local dimension as a pilot case for training and demonstration for testing new LADA-WOCAT tools and selecting SLM practices to be disseminated within comparable environments.

Decision Support Framework for SLM mainstreaming and scaling out



Assessment of land degradation (LD) and sustainable land management (SLM)

The study for assessing LD and SLM at the local level was conducted within the DS-SLM Project which consists of seven modules. The study covered the following elements:

- Assessment of land degradation through capitalizing on existing tools and methods contained within the updated NAPCD ;
- Assessment of land degradation and the good practices of land management using LADA/WOCAT techniques and tools; and
- Identification and assessment of Land Use Systems (LUS).

The study enabled the identification and analysis of different forms and severity of land degradation and thus established a reference. The good practices were evaluated using the LADA/WOCAT tools. The emphasis has been placed on the barriers for using such practices in the project area (see study area).

Methods

Study Area

The study area at the local level is represented by the territories of Amskroud, Aziar, and Tamri communes (fig.).

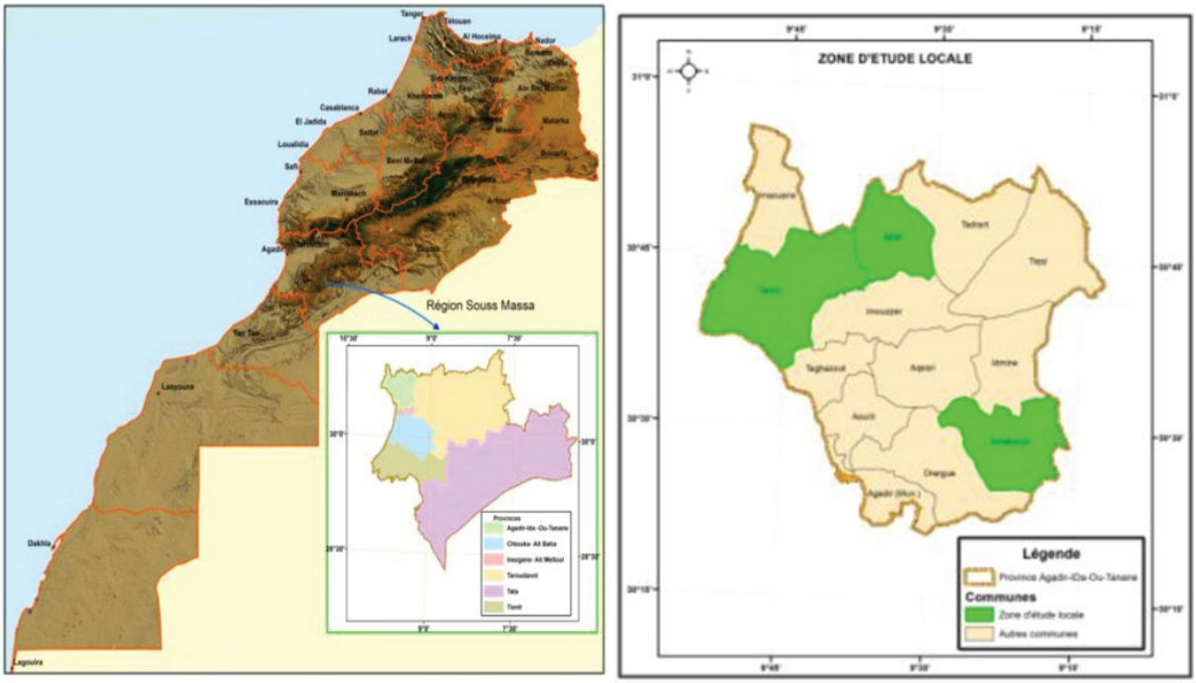


Fig. . Map showing the study area as three communes (green) within the Agadir province

Within these communes, the work started with the selection of transects lines and assessment sites in order to:

1. establish maps of land use types (LUT);
2. establish maps of the community territories (CT);
3. Identify green and degraded spots and establishing the transect lines.

The identification and delineation of the LUT was made using land use map established through satellite images supported by field investigations. Characteristics of LUT were added according to the model developed by WOCAT taking into account the present and potential uses.

The community territories (CT) map was established during participatory workshops where local authorities were present as well local resource persons, including the local forest managers.

The green and degraded spots were identified and delineated following field investigations and verification, capitalizing on knowledge of experts, local resource persons, and local forest managers.

Green Spot

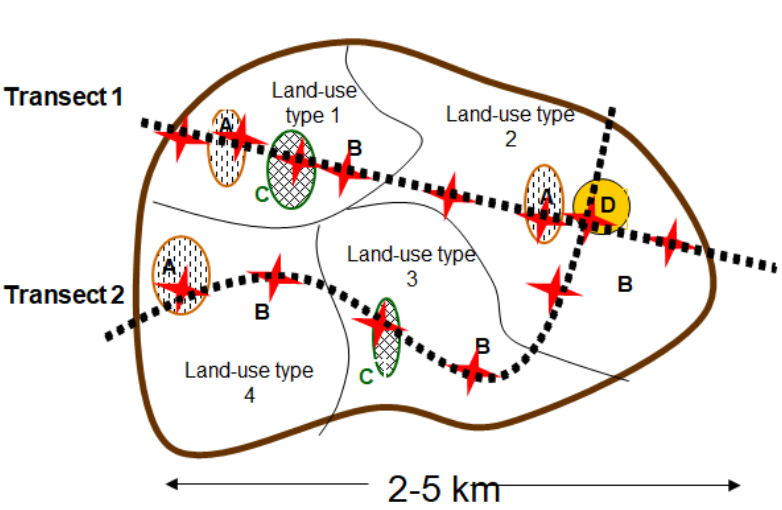
Degraded Spot

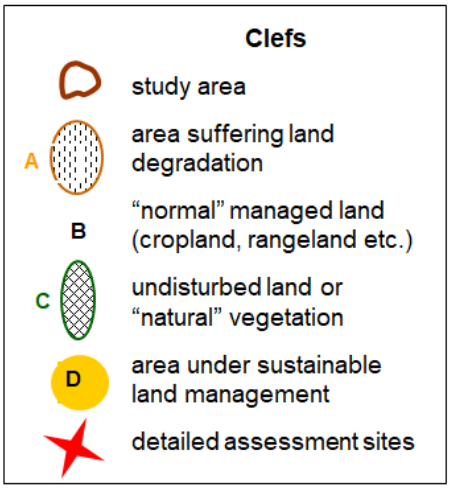
Together, these three parameters were used in the selection of seven transect lines which were located on the maps of the three pilot communes as follows: two for Amskroud, three for Tamri, and two for Aziar. These transect lines were used to identify douars (settlements) where focus groups and socioeconomic investigations were conducted.

Identification and mapping of land use systems (LUS)

Land use systems (LUS) were determined using the finalized LUT map in addition to site evaluations and field investigations.
The LUS were determined and delineated using the following criteria and attributes:

- LUT characteristics: vegetation type and major utilizations;
- Socioeconomic parameters: population density, livestock type;
- Rangeland parameters: livestock pressure on natural ecosystems.

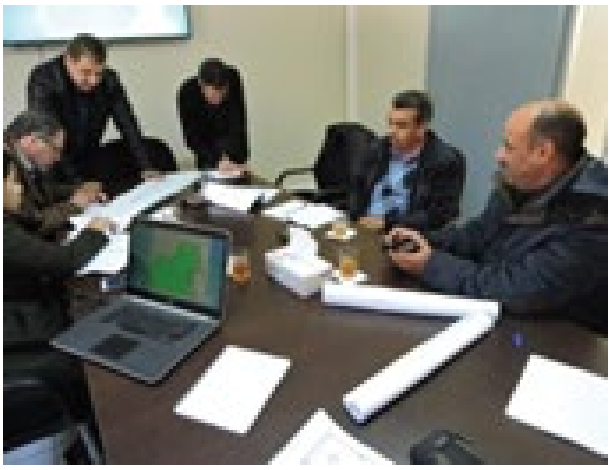




Socieconomic assessment

Socioeconomic conditions were assessed through:

- focus groups within the community territory;
- family surveys;
- Establishment of pentagons of capitals.



Biophysical assessment: soil, water and vegetation cover

The soil, water and vegetation components were assessed as follows:

Assessment of soil conditions and degradation

- Soil characterization
- Assessment of water and wind erosion
- Assessment of soil salinization

Assessment of water resources: focus on quality and quantity

Assessment of vegetation quality and rangelands

- Determination of plant cover
- Determination of density of woody plant species
- Assessment of vegetation quality, condition and trend

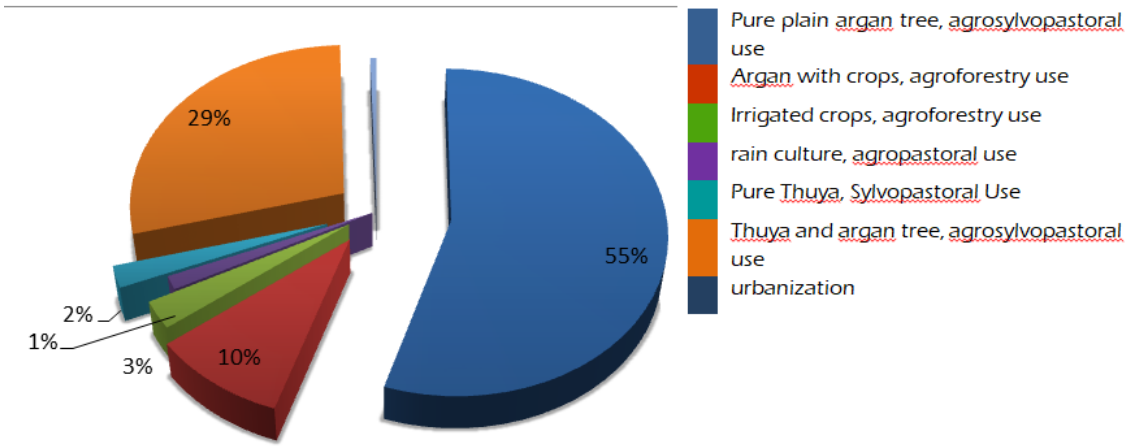
Main results

Amskroud commune

Land use Types (LUT)

The unit of pure argan tree (*Argania spinosa*) located in the Souss plain contributes to 55% of the commune area.

The thuya (*Tetraclinis articulata*) and argan trees unit is found on the mountain zone and covers 29% of the commune territory. This unit has been put to rest since the 2013 forest fire.



Maps of Land use types (LUT) and community territories (CT)

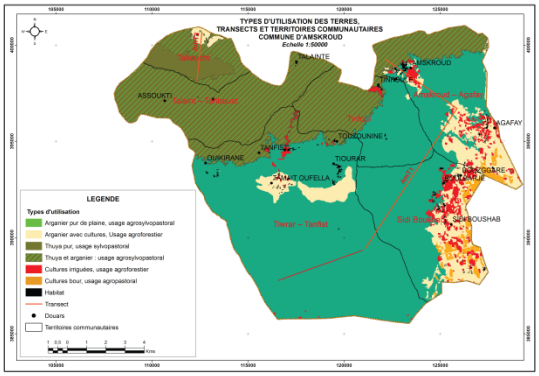
The Souss plain area of the commune is used by the Mesguina Babliyine tribe communities. The plain is subdivided into the four following territories:

- CT1 : Tiwrar – Tanfist ;
- CT2: Sidi Boushab;
- CT3: Amskroud – Agafay;
- CT4: Tinfoul.

The mountainous zone of the commune is used by the Ifasfassen tribe within the two following community territories:

- CT4 : Talaint – Tahboust ;
- CT5 : Takoucht.

It should be noted that CT1, CT2, and CT3 account for 39%, 6% and 16% the commune area, respectively.

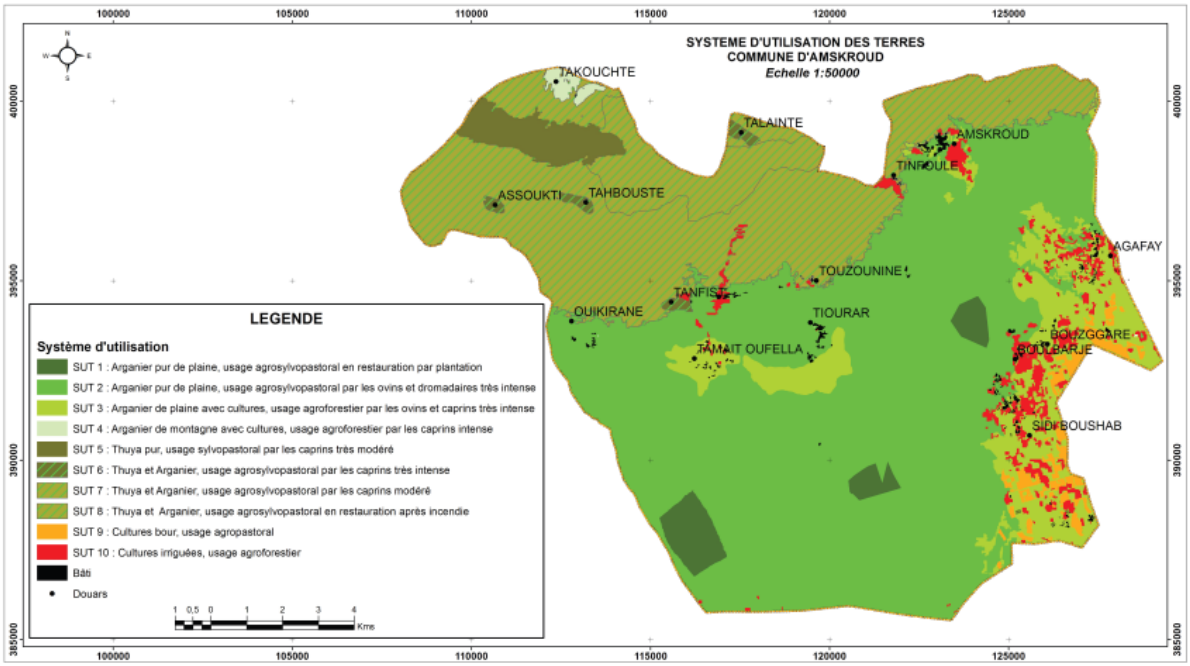


CTs are determined with the local communities and local resource persons

Maps of Land use systems (LUS)

The LUS corresponding to the argan tree stands on the plain intensively used by sheep and camels represents 52% of the commune area. Within this unit, the area of the argan which is cultivated with annual crops covers 9% of the commune area.

In the mountain zone of the commune, the thuya and argan LUS with a moderate agrosylvopastoral use by goats covers 24% of the commune area.



Assessment of socioeconomic conditions

Land degradation (LD) and Sustainable land management (SLM) result directly or indirectly from different types of land use adopted as means of livelihoods and benefits from ecosystem services.

In order to construct the pentagon of capitals, the information concerning living conditions of families was grouped by type of capital. Thus, for each family participating in the survey, a summary was made of the different means of livelihood such as herd size, farm size, and income from the farm activities and from other sources, agricultural equipment, and formal and informal social networks, and means of mobility.

Taking into account the specific local conditions as well as the dominant activities, a score was assigned to each family for each type of indicator within the range of 1 to 10 for each capital. This served as a basis to identify three social categories, namely, poor families, middle class families, and 'better of' families (Table).

Table. . Capitals of the different social classes within Amskroud commune

CSP	Type of capital				
	Financial	Human	Physical	Social	Natural
Poor	2.6	3.4	3.1	4.5	4.7
Middle class	6	5.5	4.5	4	5.75
Comfortable class	6.1	8	7	7	5

Livelihoods range generally from the middle class category to the poor category with a high vulnerability rate. The collected information show deficits in human development, weaknesses in physical and financial assets and insufficient natural and social capitals.

Assessment of water resources

The assessment of water resources included:

- Water from springs;
- Surface water collected by wadis;
- Harvested rain water;
- Underground water from the Souss water table.

Assessment of biodiversity

The H, E and D diversity indices are reported in the following table (table). Maps of the ecological and biodiversity condition are shown in the figures xxxx.

Table. .Diversity indices for the Amskroud commune LUT

LUT N°	Type of utilization	H Index	E Index	D Index
1	Pur Argan tree stand with agrosylvopastoral use	2.31	0.73	0.73
2	Argan with cultivation, agroforestry use	2.21	0.79	0.73
3	Pur Thuya stand, sylvopastoral use	2.67	0.8	0.89
4	Mixed thuya and argan, agrosylvopastoral use	1.91	0.85	0.76

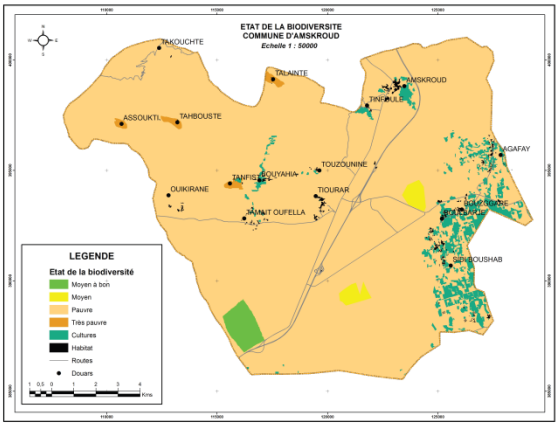


Fig. . Biodiversity condition in the Tamri commune

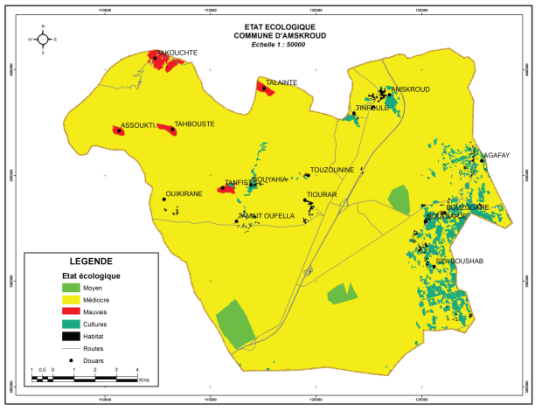


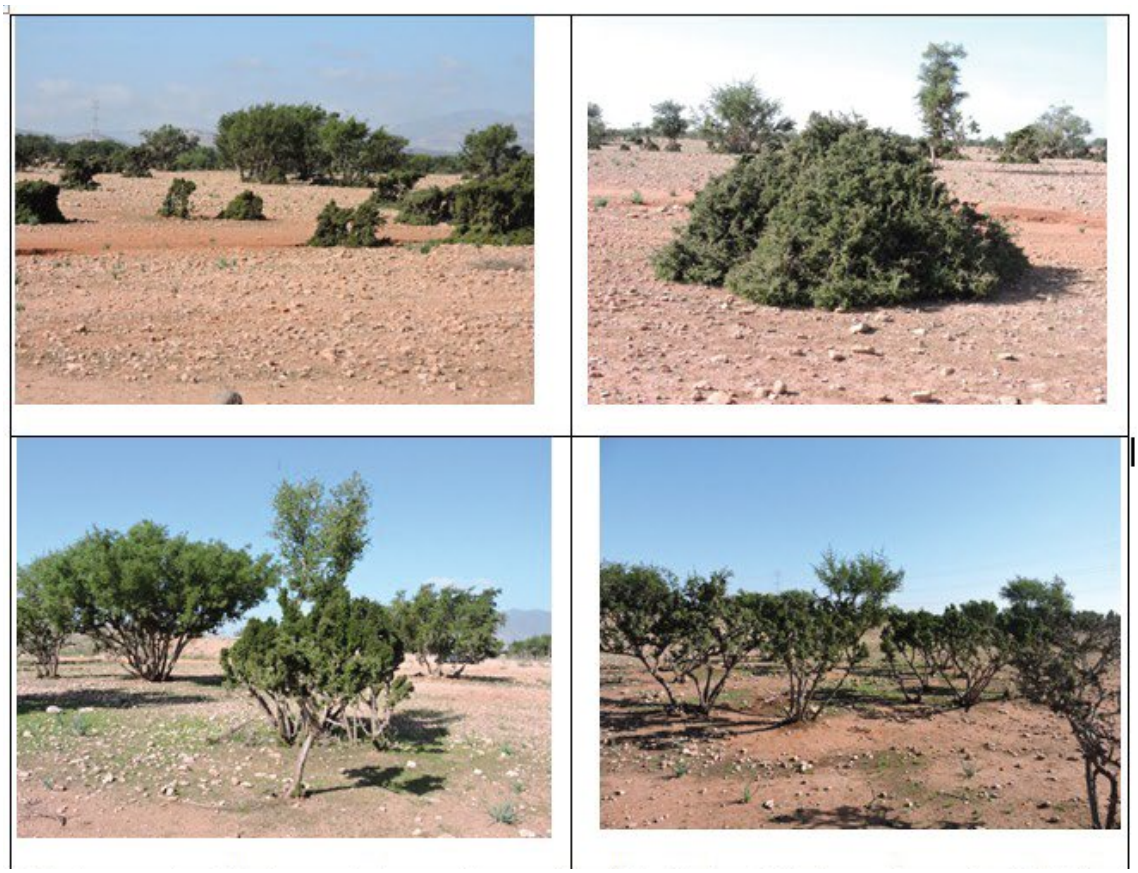
Fig. . Ecological condition within the Tamri commune

Assessment of land degradation and impacts on productivity

Soils packed, stripped and covered with stones in the overgrazed areas of Ameskroud

Intensely cultivated soil having lost all its organic matter in the commune of Ameskroud

1. impact on soil properties 2. Impacts on land productivity



Impacts of overgrazing on the state of vegetation and productivity of rangelands, lowland argan forest, ameskroud

3. Impacts on livelihood means

Table. .

Impacts of LD	%
Agriculture	39.5
Argan trees	26.3
Animal husbandry	34.2
Total	100

Data analysis allowed the identification of the following indirect causes of land degradation dynamics:

- Poverty;
- Migration;
- High demand of firewood;
- High demand of forage resources;
- High domestic and international demand of argan oil.

Direct causes of land degradation are as follows:

- High animal pressure resulting in soil compaction, low infiltration rates, high surface runoff and sheet erosion;
- Reduction of vegetation cover due to overgrazing by camels and goats, cultivation, and cutting of thuya trees. This results in a decrease in soil surface protection against raindrop splash and sheet erosion.

Assessment of rangelands

The assessment of the indicators according to LADA method (table xxxx) shows that rangelands of the study area are in a desertification condition as the value remains lower than 5%.

Table. . Indicators of Rangeland condition within the Tamri commune

Indicator of Rangeland Condition	**Best class**	**Fair**	**Poor**	**Poorest class**
Uncovered soil/vegetation cover	Absent	little	large	dominant
Denuded spots	Absent	little	large	dominant
Litter cover/Surface organic matter	Dense	abundant	little	absent
Vegetation hight, diameter and vigor of perennials	Good	Fair	Poor	very poor
Proportion of perennials to annuals	Dominant	high	low	Absent
Proportion (dominance) of useful species	Dominant	high	low	Absent
Proportion of each vegetation strata	Dominant	high	low	Absent
Plant species decreasing under grazing	Dominant	Abundant	Little	Absent/negligible
Plant species increasing with grazing	Absent/negligible	Little	Abundant	Dominant
Toxic plants	Absent	Little	Abundant	Dominant
Invader species or prolific weeds	Absent	Little	Abundant	Dominant
Damage due to ravagers	Absent/negligible	Little	Abundant	Dominant
Damage due to disease	Absent/negligible	Little	Abundant	Dominant
« Bush/shrub encroachment »	Sparse	Open	Dense	Very dense
Deforestation	Absent/negligible	Little	Fair	Severe
Decrease in biomass	Absent/negligible	Little	Large	Dominant
Assessment of Rangeland Condition	5	3	1	0
Number of points or values	NV1	NV2	NV3	NV4
Intermediate score (Si)	S1=NV1*5	S2=NV2*3	S3=NV3*1	S4=NV4*0
Total Score	ST=S1+S2+S3			
Converted Score in %	Score % = (ST * 100) / Σ NVi			

Score Range in %	100 – 90	71-90	51-70	31-50	0-30
Rangeland condition	Excellent	Good	Fair	Poor	Very poor
Trend	-	Stable	Improving	Degrading	-

Description and mapping of good practices

The DPSIR analysis allowed a synthesis of good practices of sustainable land management as well as the barriers to their development and durability.

Management practices of vegetation and rangelands

- Agdal practice (Rest of Argan type)
- Artificial regeneration through planting
- Rest
- Regulation of Thymus satureoides exploitation

Management practices of water resources

- Matfias (concrete underground water tanks)
- Iferd (earth structure for rainwater harvesting)
- Open tanks for spring water storage
- Rainwater harvesting

Soil Management good practices

- Mediterranean Terrasses
- Use of Organic fertilizers

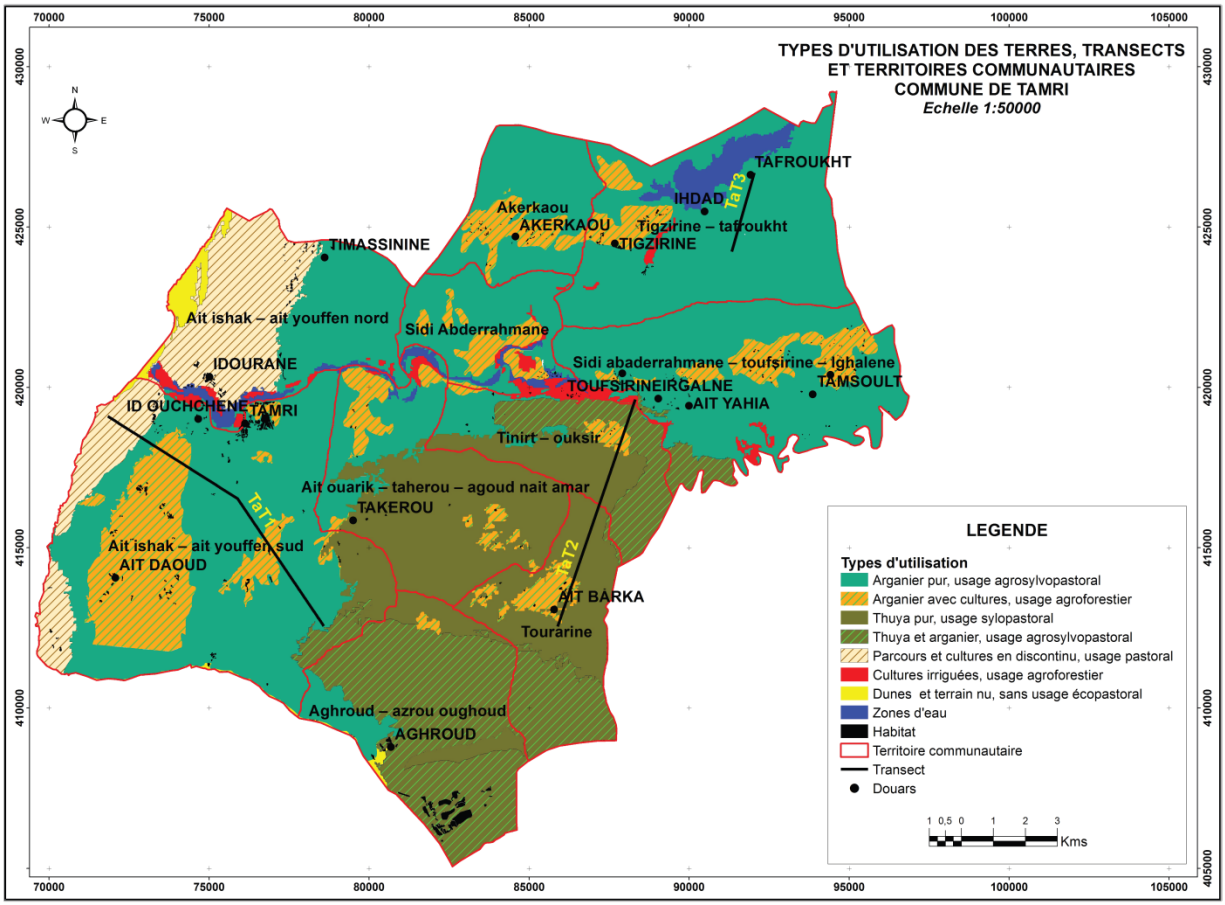
Main Results

Tamri Commune

Maps of Land use Types (LUT)

The Argan stands contribute over 47% to the area of Tamri commune. This LUT is found at low elevations, not exceeding 500 m. This LUT provides multiple goods and services.
At higher elevations, the thuya forms mixed stands with argan and even becomes dominant at altitudes higher than 800 m. This LUT covers 14% of the commune area and provides forage for goats as well as wood.

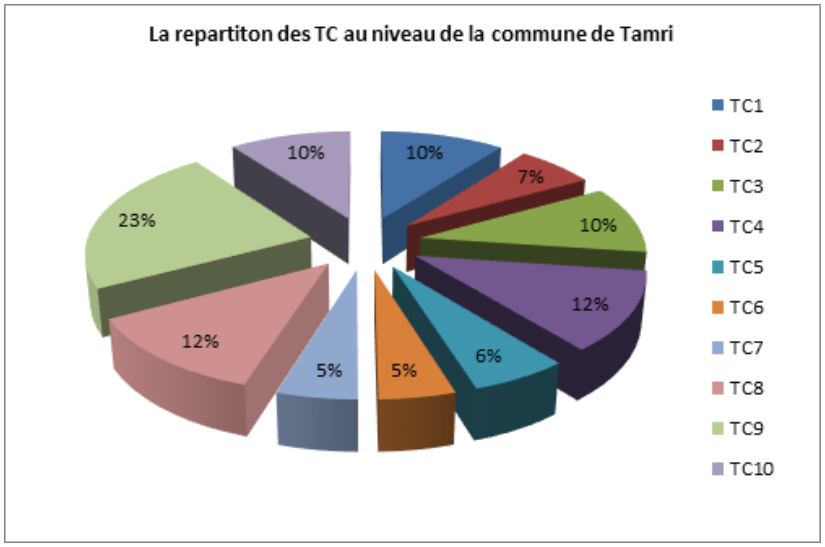
The right to cultivate cereals under trees concerns 12% of the commune area. However, several cases of abandoned fields and terraces were noted during field investigations. The rangelands mixed with cultivated fields on the coastal strip are used by nomads for several months each year.



Maps of the Community Territories (CT)
Maps of the Land Use Systems (LUS)

The results of the participatory workshops with the contribution of local resource persons allowed identifying the following ten community territories:

CT1. Aghroud – Azrou Oughoud;
CT2. Tourarine;
CT3. Ait Ouarik – Taherou – Agoud Nait Amar;
CT4. Sidi Abaderrahmane – Toufsirine – Ighalene;
CT5. Tinirt – Ouksir;
CT6. Sidi Abderrahmane;
CT7. Akerkaou ;
CT8. Tigzirine – Tafroukht ;
CT9. Ait Ishak – Ait Youffen South;
CT10. Ait Ishak – Ait Youffen North.

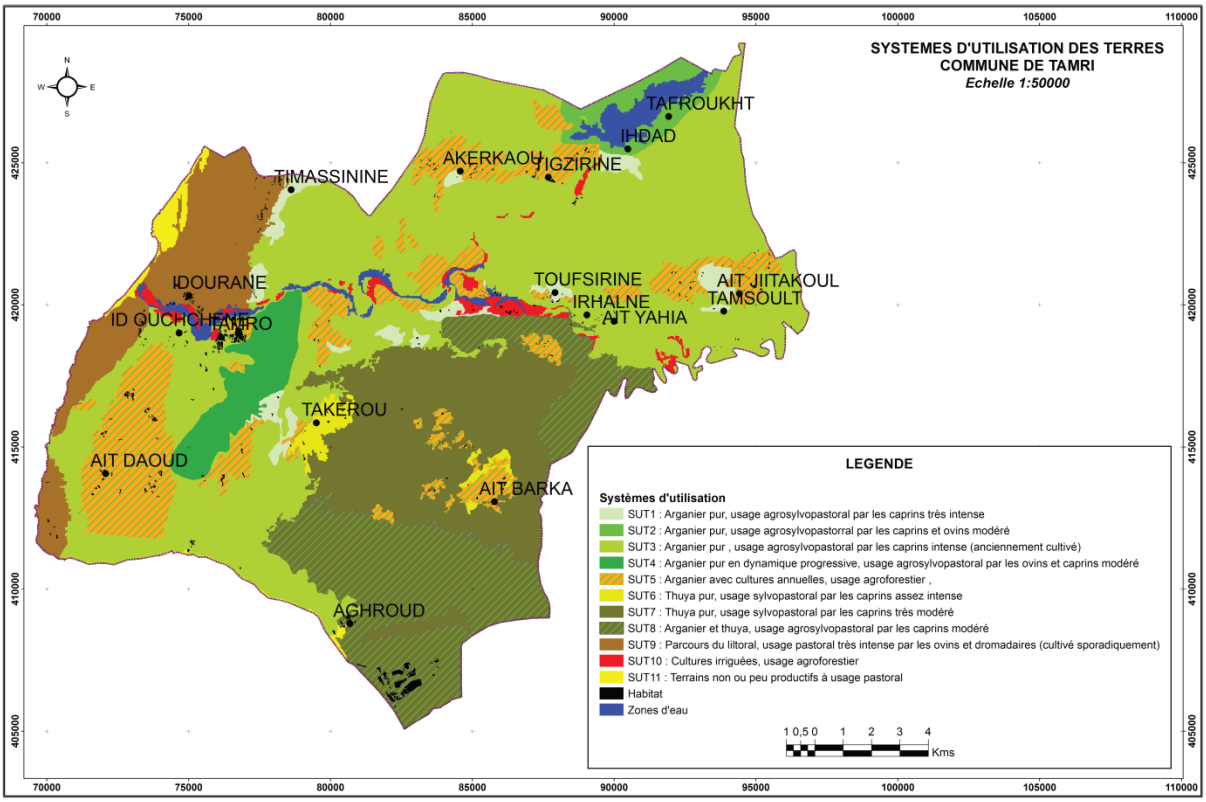


The CT9 of Ait Ishak-Ait Youffen South occupies the largest area in the commune (23% of the area), while CT7, CT6, and CT5 cover the smallest area (4 to 6% of the commune area).

Maps of the Land Use Systems (LUS)

The following LUS cover approximately 40% of the commune area:i) Thuya and argan with an agrosylvopastoral use, grazed moderately by goats; ii) Thuya with a sylvopastoral use, grazed very moderately by goats; iii) Argan with annual crops, thus with an agropastoral use.

It is worth noting that the coastal rangelands cover more than 7% of the commune area.



Assessment of socioeconomic conditions

The survey for assessing socioeconomic conditions found only families of the middle and poor classes (table).

Table. . Social classes in the Tamri commune and their capitals

CSP	Type of capital				
	Financial	Human	Physical	Social	Natural
Poor class	3.3	3.4	2.8	4.0	5.0
Middle class	5.3	5.0	5.0	5.3	6.1

This sociological configuration indicates the high social vulnerability of livelihoods within the Tamri commune, as shown by the pentagons (fig.). All the capitals express a precarious situation which may indicate the magnitude of the public action needed to rehabilitate this territory and thus combat land degradation. Poverty and social and economic vulnerability are, along with the climate, direct causes of land degradation.

Biodiversity assessment

The H, E and D diversity indices are reported in the following table (table). Maps of the ecological and biodiversity condition are shown in the figures xxxx.

The results of the assessment were used to identify the following indirect causes of the land degradation dynamics:

- Poverty;
- Domestic and international demand for argan oil;
- Weakening of the traditional informal institutions such as jmaa;
- Land tenure.

The direct causes of land degradation could be stated as follows:

- Reduction of vegetation cover, litter cover and residues due to animal grazing;
- Inadequate soil conservation;
- Presence and extension of weeds and invader species;
- Inadequate rangeland management (animal species, continuous grazing);
- Reduction of rainfall infiltration and increased runoff.

Table. . Diversity indices for the Tamri commune LUT

LUT N°	Type of utilization	H Index	E Index	D Index
1	Mixed thuya and argan with agrosylvopastoral use	2,69	0,96	0,85
2	Thuya with sylvopastoral use	1,8	0.82	0.71
3	Argan with agrosylvopastoral use	2.7	0.9	0.83
4	Rangeland with grazing use	1.9	0.74	0.81
5	Argan with annual crops, agrosylvopastoral use	2.39	0.75	0.77

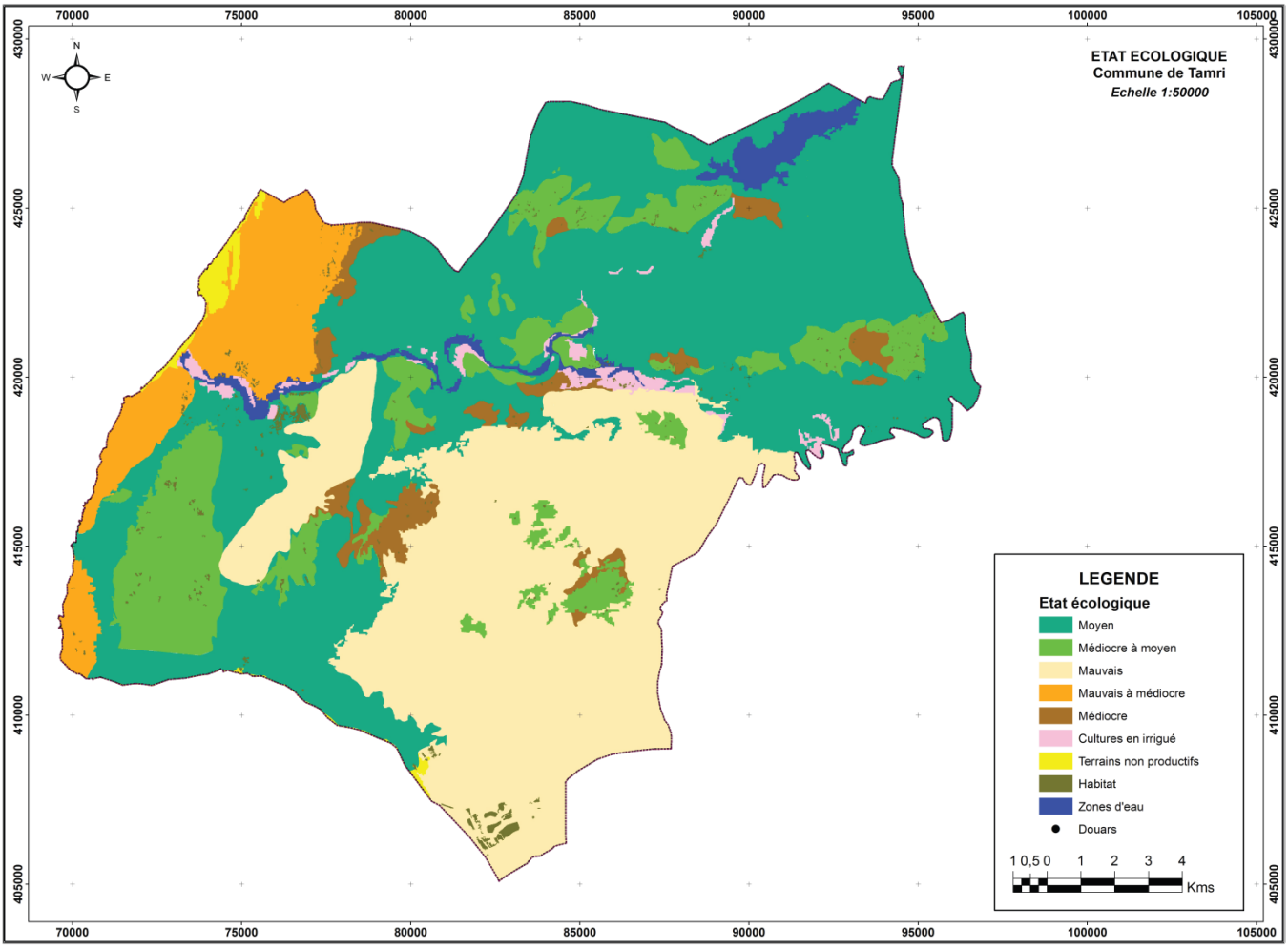


Fig. . Map showing ecological condition of the Tamri commune

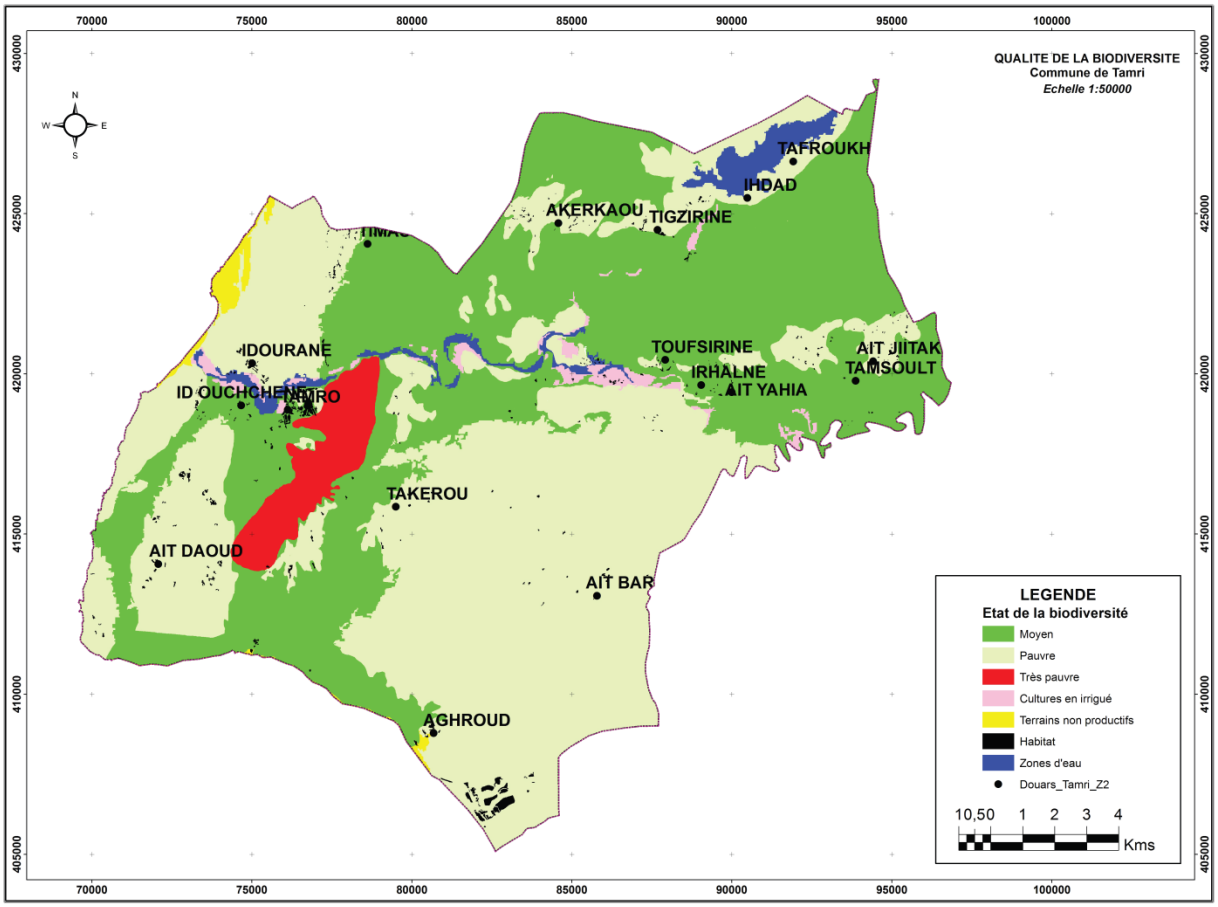


Fig. . Map showing biodiversity condition within the Tamri commune

Surface crust on soil cultivated with cereal crops

Overgrazing and soil surface compaction

Camels belonging to nomads on the coastal rangelands of Tamri commune

Overgrazing impacts on soil and argan trees of rangelands in the proximity of villages

Rangelands assessment

As for Amskroud commune, the assessment of the indicators according to LADA method shows that rangelands of Tamri commune are in a desertification condition as the value remains lower than 5%.

Description and mapping of good practices:

Tamri communities have developed a rich local know how for water mobilization and use and for soil conservation (see boxes).

Good management practices of water resources

- Matfias (concrete underground water tanks)
- Iferd (earth structure for rainwater harvesting)
- Structures for collecting water from springs
- Crescent for water harvesting
- Dirt roadside ditches for runoff collection

Good practices for managing soil resources

- Mediterranean terraces;
- Organic fertilization.

Good practices of vegetation management

- Agdal practice (Rest of Argan type)
- Artificial regeneration through planting
- Rest
- Compensation benefits provided for the population practicing rest
- The population forbids exploitation of Thymus satureoides

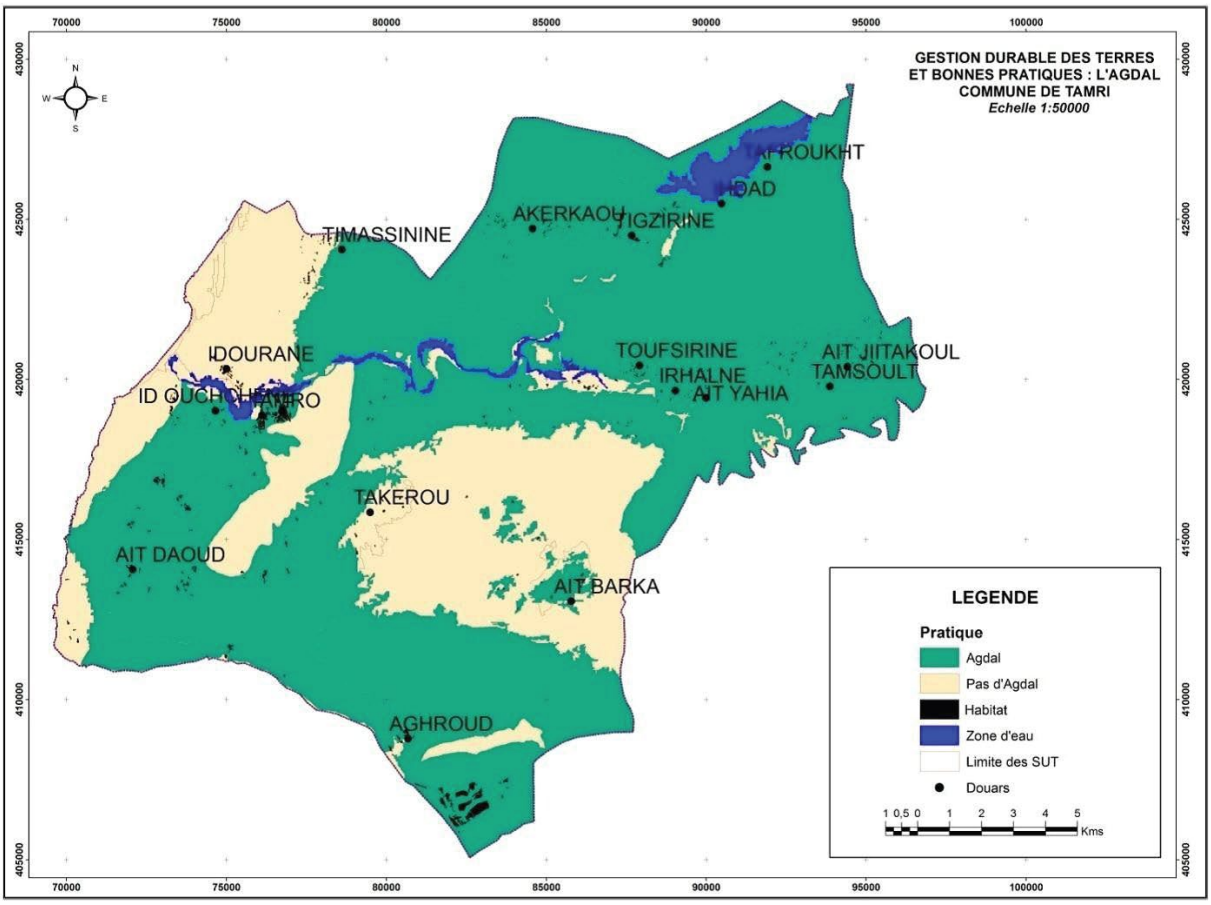


Fig. Map showing the agdal practice in the Tamri commune

Aziar Commune

Maps of Land use types (LUT)

Argan LUT covers about 63% of the area of Aziar commune. As in other communes, argan has multiple uses such as wood, fruit, and forage. However, it should be noted that the production potential of argan stands is lower in Aziar due to less favorable ecological conditions and to a generally degraded condition of the stands.

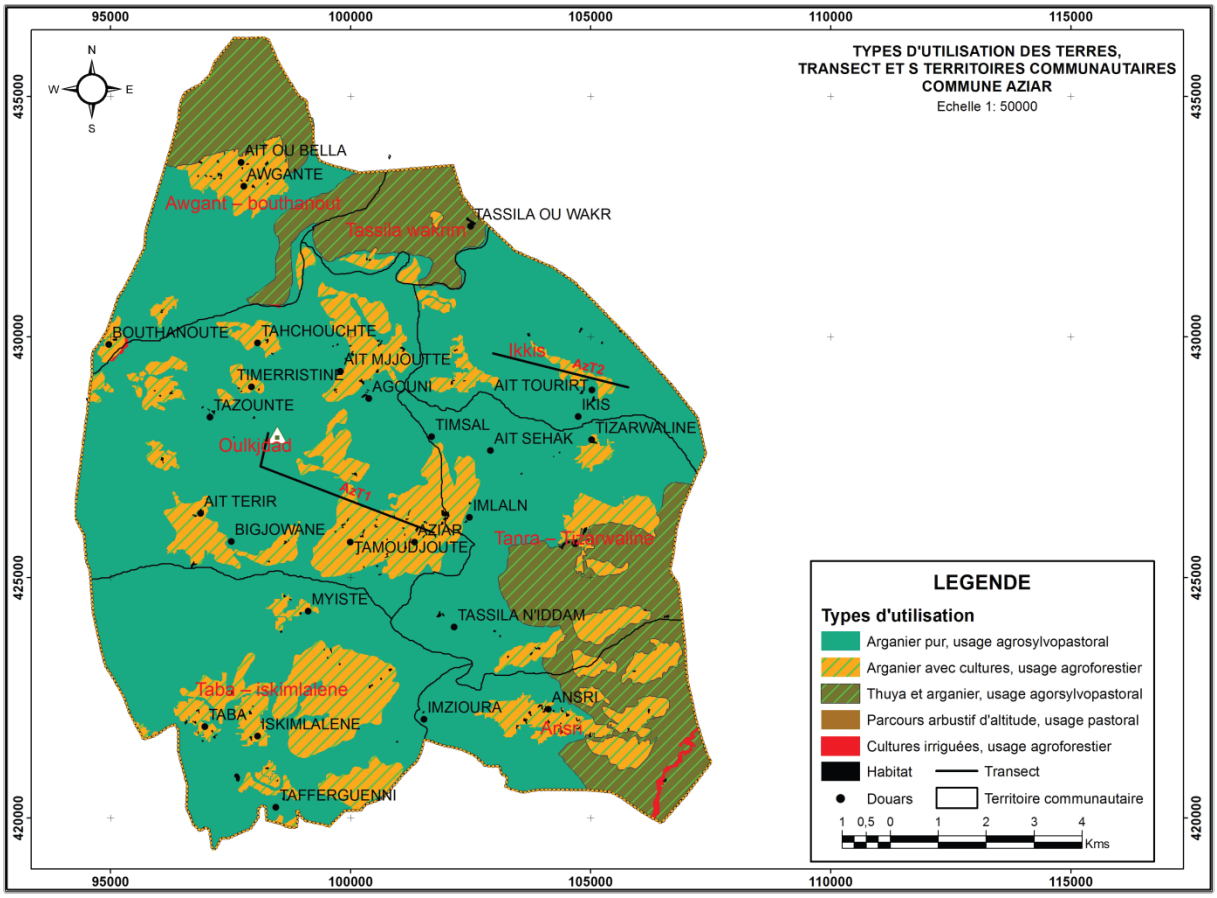


Fig. . Map of the Aziar LUT.

Community Territories (CT)

The results of the participatory workshops with the contribution of local authorities and resource persons allowed identifying the following seven community territories:
CT1. Taba – Iskimlalene;
CT2. Ansri;
CT3. Tanra – Tizarwaline;
CT4. Awlkjdad;
CT5. Ikkis;
CT6. Tassila Wakrim;
CT7. Awgant – Bouthanout.

Data indicate that Awlkjdad CT which is covered up to 73 by argan stands, contributes the most to the area of the commune (27%) (fig.). By contrast, CT6 which is covered up to 81% by mixed stands of thuya and argan, contributes the least (4%) (fig.).

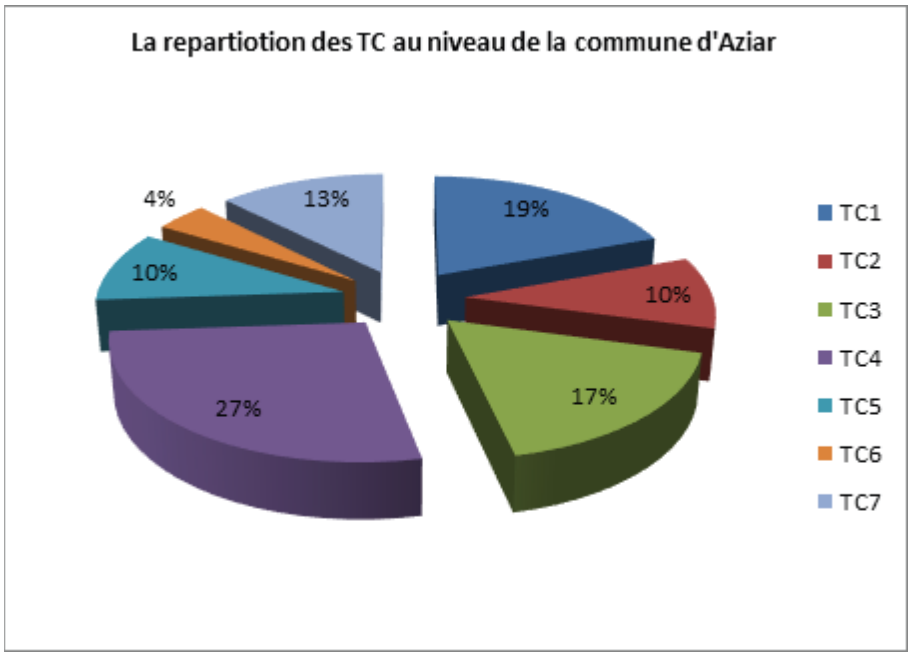


Fig. Contribution (%) of different Community Territories to Aziar commune area.

Maps of Land Use Systems (LUS)

The argan LUS on valleys and plateaus represents 52% of the commune area (fig.). This unit is subject to a strong grazing pressure from sheep and goats. The private argan stands which cover 20% of the commune is also under a very strong grazing pressure.

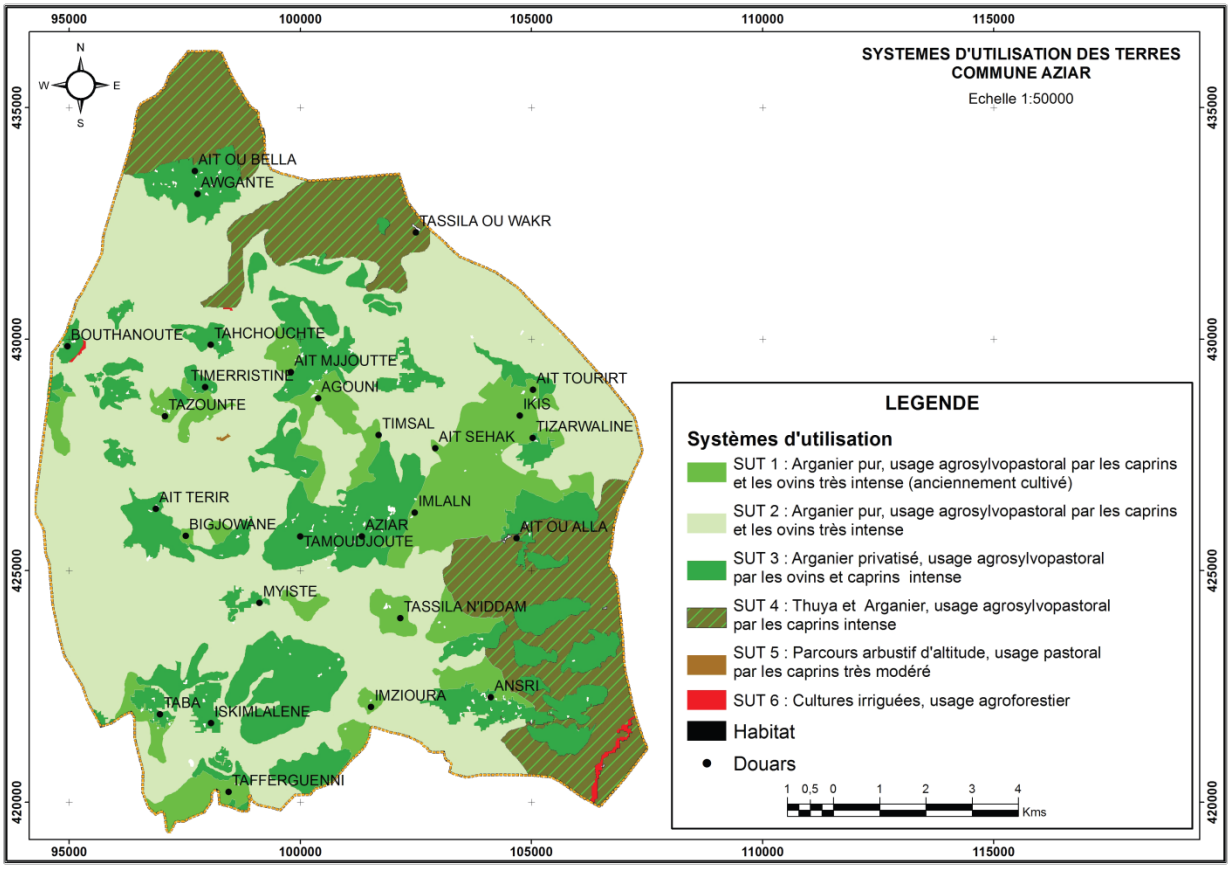


Fig. . Map showing the LUS of Aziar commune

Assessment of socioeconomic conditions

The pentagon shows that all the capitals have deficits thus making the population means of livelihoods fragile and contributing to land degradation.

Poverty and social vulnerability within the commune represent central issues to be addressed by public institutions on the same level as land degradation. The approach should be holistic, taking into account the needs of men and women of the commune and acting with them for them.

Table. . Type of capitals in the Aziar commune

CSP	Type of capital				
	Financial	Human	Physical	Social	Natural
Poor	3.9	3.5	3.8	4.2	4.4

Assessment of water resources

The hydrographic network of Aziar is characterized by the importance of Oued Tamkert (subsidiary of Oued Tamri) and the existence of other subsidiaries and small chaâbas with a torrential flow due to frequent floods. Underground water resources are very limited, being in the form of small dispersed water pockets.

Assessment of biodiversity

The analysis identified the following indirect causes of land degradation:

- Poverty;
- Infrastructures (roads, markets, water points) and farm inputs;
- Low work force availability due to migration.

The direct causes of land degradation could be summarized as follows:

Les causes directes de la dégradation des terres :
• Réduction de la couverture végétale, de la litière, des résidus (alimentation du bétail),
• Surpâturage et piétinement autour des zones d'abreuvement, douars,
• Collecte excessive du bois de chauffe/ de construction, des matériaux de clôture,
• Enlèvement de fourrage (émondage),
• Diminution du taux d'in_ltration /augmentation du ruissellement.
Le seul faciès ayant connu peu de pression anthropique et couvert d'une végétation arbustive se situe en altitude et très limité en super_cie (un spot vert).

Table. . Diversity indices for the three LUT within Aziar commune

LUT N°	Type of utilization	H Index	E Index	D Index
1	Argan with agrosylvopastoral use	0.85 *	0.33*	0.37*
2	Argnan mixed with crops, agroforest use	2.54	0.90	0.84
3	Thuya and argan with agrosylvopastoral use	2.18	0.94	0.80

*Une sous unité de cette TUT est dominée par oléastre.

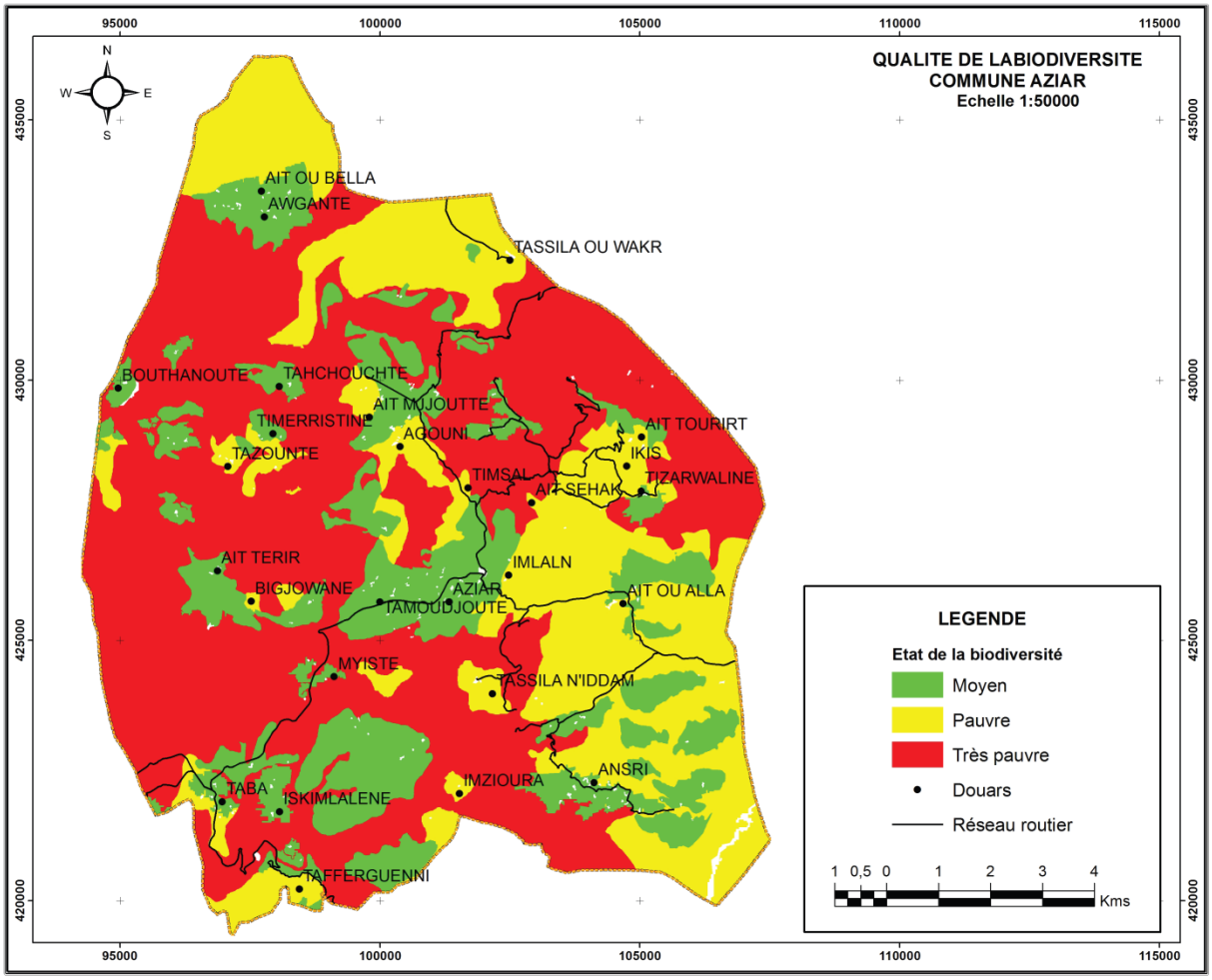


Fig. Map showing the biodiversity condition within Aziar commune.

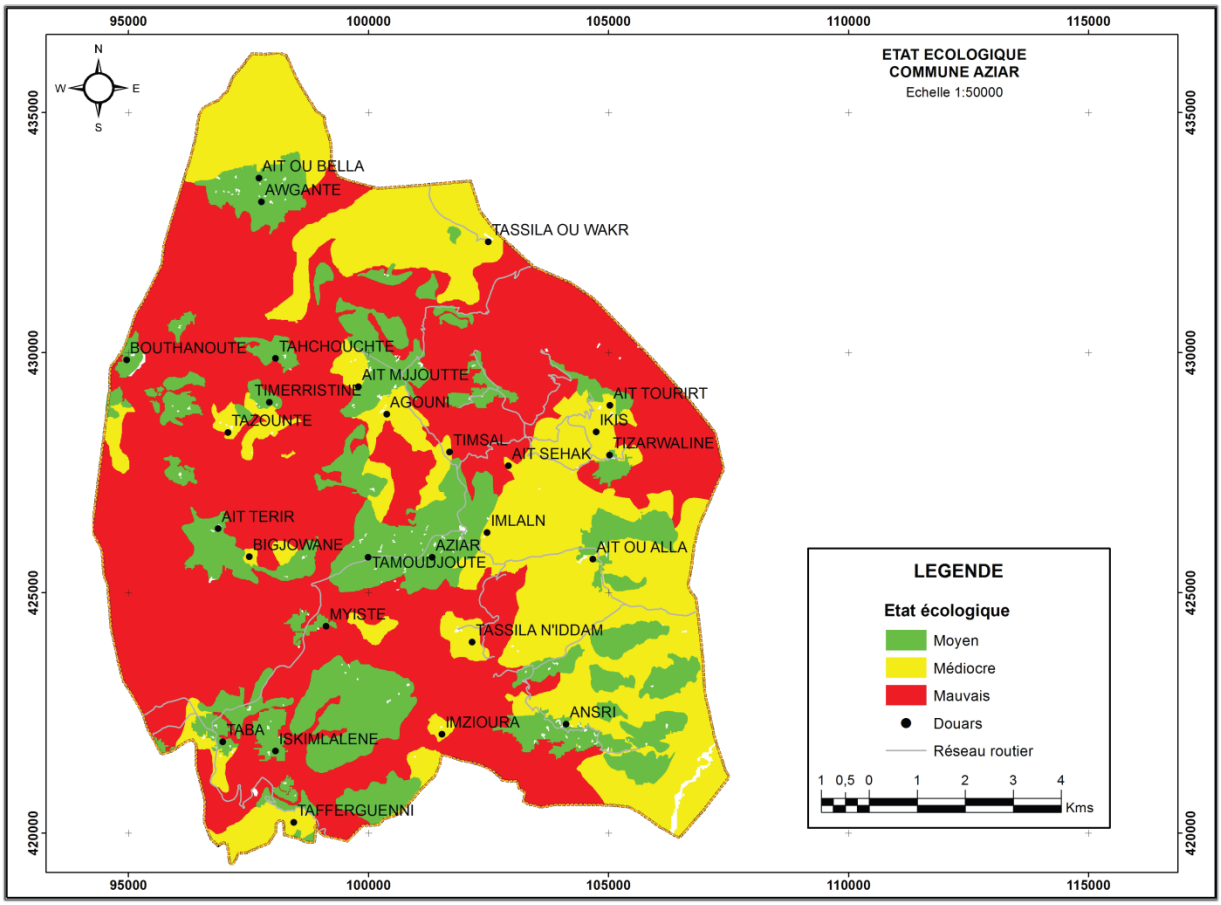
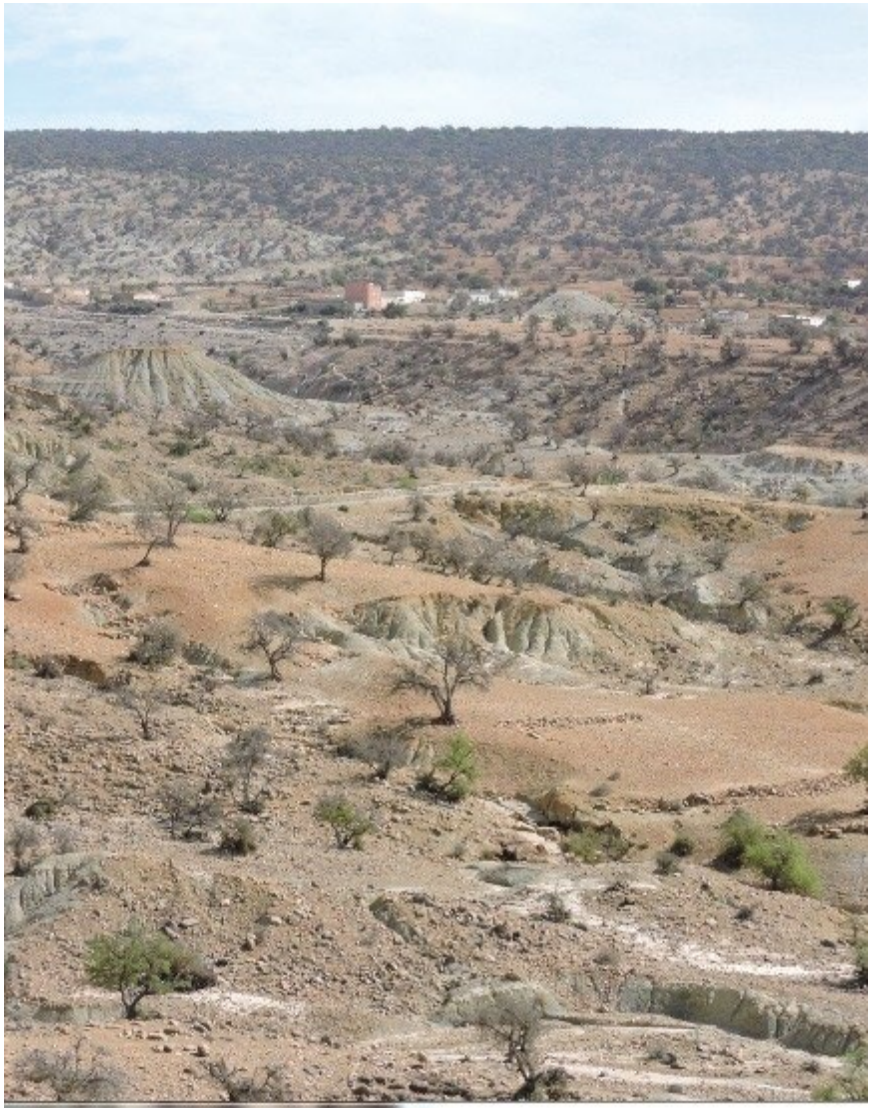


Fig. Map of the ecological condition within Aziar commune

Assessment of Land Degradation and impacts on productivity



Rangelands assessment

As for Amskroud and Tamri communes, the assessment of the indicators according to LADA method shows that rangelands of Aziar commune are in a desertification condition as the value remains lower than 5%.

Description and mapping of good practices

Aziar communities adapted to the scarcity of water by developing a rich local know how for water mobilization and use and for soil conservation (see boxes).

Good management practices of water resources

- Matfias (concrete underground water tanks)
- Iferd (earth structure for rainwater harvesting)
- Structures for collecting water from springs
- Crescent for water harvesting

- Dirt roadside ditches for runoff collection

Good practices for managing soil resources

- Mediterranean terraces;
- Organic fertilization.

Good practices of vegetation management

- Agdal practice (Rest of Argan type)