



DESIRE WB-3 Workshop report

WB3 Workshop 1 report - held in the
Sehoul commune, Rabat region,
Morocco, from June 19-21, 2007

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Rabat, Morocco***

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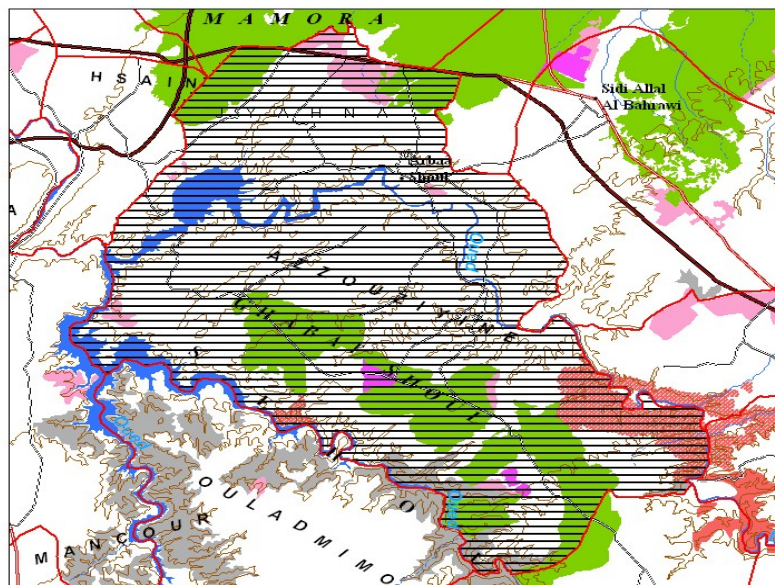


Workshop Report

Stakeholder workshop 1

Land degradation and desertification – existing and potential prevention and conservation strategies

Name of the study site: The Sehoule commune, at about 20 km of Rabat, capital of Morocco.



Date of workshop: Sehoule, Morocco, 19-21 June 2007

Authors : A. Laouina, M. Chaker, R. Nafaa, J. Al Karkouri, M. Aderghal, M. Antari, A. Nouria

I General information

A) Workshop

Workshop venue: The Sehoul commune

Workshop moderator(s): Prof. Miloud Chaker

List of workshop participants:

The stakeholders who participated to the workshop were :

- some farmers representing the diversity of land use,
- 1 representative of the elected municipality council and one administrator of the commune,
- some local and some external stakeholders, engineers and technicians responsible of the services of agriculture and forest.
- Researchers with knowledge of the experimental field
- External experts on WSC
- One moderator of the workshop.

Name	Fonction	Local / Ext
Ben Tounsi	Agriculteur	L
Dabi Hassan	Agriculteur	E
Habidi Mohamed	Agriculteur	L
Khbiza Moussa	Agriculteur	L
Zhiro Miloud	Agriculteur	L
Zhirou Ben Issa	Agriculteur	L
Zhirou Mounir	Agriculteur	L
Zemzam Said	Aménagement, DPA de Rabat-Salé	E
M. Mahdane	Aménagements Fonciers	E
N. El Bazzaz	Aménagements Fonciers	E
Ernst Gabathuler	CDE Berne	E
Hanspeter Liniger	CDE Berne	E
Felicitas Bachmann	CDE Berne	E
Gudrun Schwilch	CDE Berne	E
El Azzouzi A.	Centre de Travaux	L
El Moudmi Ahmed	Centre de Travaux de Salé	L
Sfa Mohamed	Chercheur	E
Aderghal oammed	Chercheur	E
Al Karkouri Jamal	Chercheur	E
Chaker Miloud	Chercheur	E
Laouina Abdellah	Chercheur	E
Nafaa Rachida	Chercheur	E
Nouira Asmae	Chercheur (CNESTEN)	E
Antari Mostafa	Chercheur (FLSH-Rabat)	E
Bouharcha Rachida	Chercheur (Université Mohammed V)	E
Saadi Mohamed	Commune Shoul	L
Aghoutane A.	Eaux et Forêts	E
Kaddouri Mustapha	Ingénieur DPA	E
Fethi Abdelli	IRA de Tunisie	E
Mahdihi N.	IRA de Tunisie	E

B) Background

In the study site Sehoul, Morocco, a Stakeholder Workshop on ‘Land degradation and desertification – existing and potential prevention and mitigation strategies’ was conducted, with the objective of to identify existing and potential strategies for land remediation.

The **objectives** were:

1. To initiate a mutual learning process among local and external participants by sharing experience and jointly reflecting on current and potential problems and solutions regarding land degradation and desertification.
2. To create a common understanding of problems, potentials and opportunities by integrating external and internal perceptions. To foster a common understanding of problems and solutions related to land degradation and desertification.
3. To strengthen trust and collaboration among concerned stakeholders.
4. To identify existing and new strategies to prevent or mitigate land degradation and desertification.
5. To select a set of these identified strategies for further evaluation and documentation with the WOCAT methodology.

With the support of the CDE team (Berne) the workshop had to identify and develop proposals on new opportunities for a strategy of sustainable management of land.

During the 3 days several problems were discussed :

- What are the major reasons of land degradation in the region?
- Which are the more efficient CES techniques adopted by the farmers?
- What are the legal / economic / social circumstances which contribute to land degradation?
- What are the legal / economic / social circumstances which can contribute to a sustainable management of lands?

The stakeholder workshop addressed two target groups:

a) local stakeholders (land users and one representative of local municipality) who live in this specific rural environment

b) external stakeholders, researchers from the University and development professionals working in rural environments.

The duration of the stakeholder workshop was **3 days**. During the 1st and 2nd day the focus was on local perspectives and the local context; only local stakeholders attended the meetings. On the 3rd day, external stakeholders joined the group.

The workshop was carried out in the edifice of the commune at Arjat centre.

Profile of the farmers who contributed to the workshop.

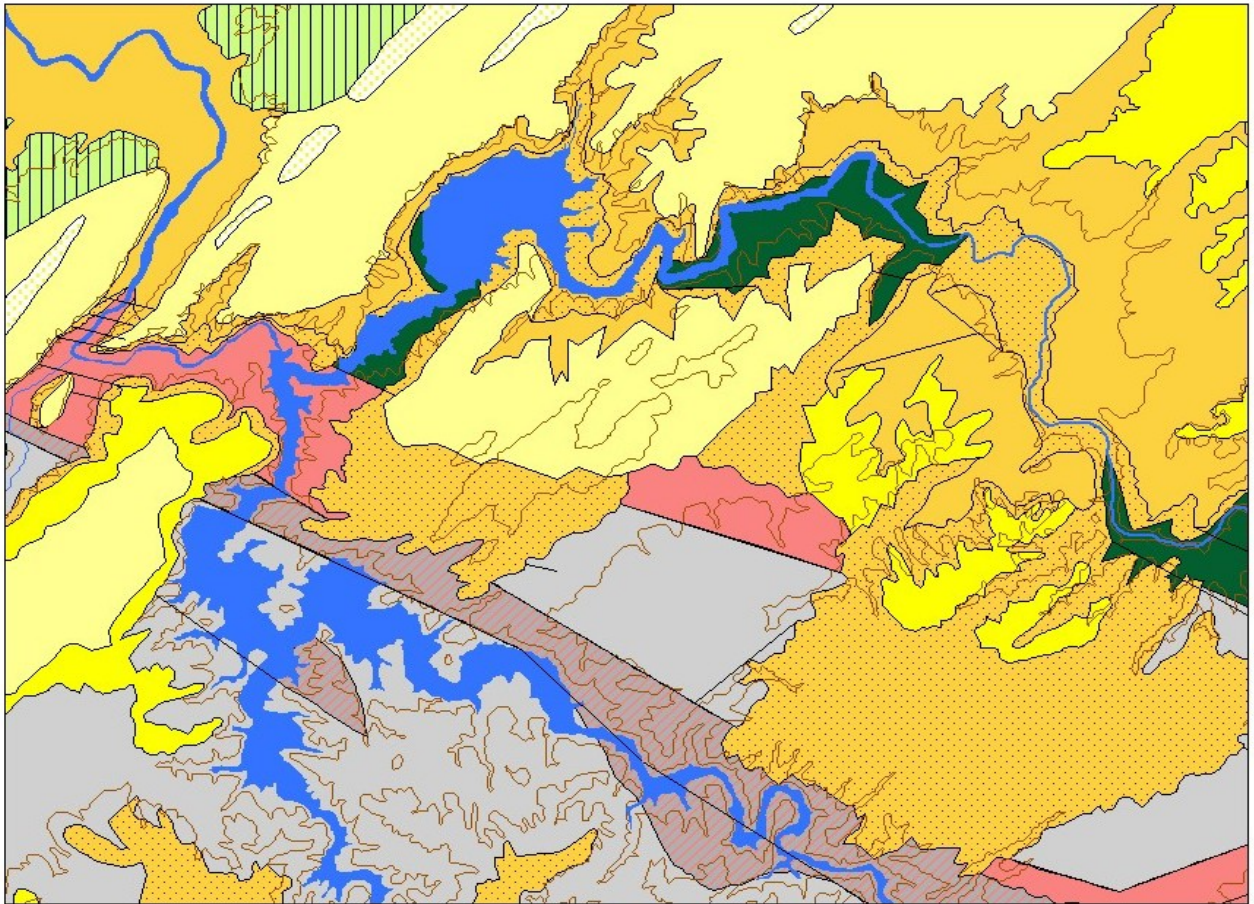
The workshop, organised in June, corresponded to a period of high pressure on time for the farmers, due to the concentration of work in the farms. Their participation to the workshop was not easy and only 6 of the persons we contacted had the ability to participate. This group of stakeholders is composed of farmers between 25 and 53 years (an average age of 40 years). Most of them are illiterate. One of them owns a large farm of 220 ha. All the others are very small and poor farmers (between 2 and 5 ha).

Programme of the Stakeholder Workshop

Steps	Contents
Day 1	•
Introduction	<ul style="list-style-type: none"> • Welcome participants • Brief introduction to the DESIRE programme • Objectives and programme of stakeholder workshop • Rules of the game / working principles / working atmosphere
Picture gallery	<ul style="list-style-type: none"> • Presentation of participants • Own relation to topic
Transect walk	<ul style="list-style-type: none"> • Processes of land degradation and their dynamics in space and time • Current and past strategies for land conservation
Local indicators	<ul style="list-style-type: none"> • Identification of locally used indicators for soil degradation / soil conservation
Day 2	
Problem tree and solutions	<ul style="list-style-type: none"> • Causes and effects of land degradation • Already applied solutions to current problems
Assessment of already applied solutions	<ul style="list-style-type: none"> • A brief assessment of already applied solutions • Selection of most important solutions
Venn Diagram	<ul style="list-style-type: none"> • Stakeholders, roles and responsibilities in land conservation / sustainable land management
Recapitulation	<ul style="list-style-type: none"> • Recapitulation • preparation of presentation for external stakeholders who join on day 3
Day 3	
Introduction for external participants	<ul style="list-style-type: none"> • Welcome external participants • Brief introduction to the DESIRE programme • Objectives and programme of stakeholder workshop • Rules of the game / working principles / working atmosphere
Presentation of intermediate results	<ul style="list-style-type: none"> • Brief external participants on what has been done so far, and on results and conclusions from previous work during the first two days of the workshop
New opportunities and potential solutions	<ul style="list-style-type: none"> • Identify potential new solutions • Briefly assess potential solutions • Selection of solutions to be documented and assessed by WOCAT methodology
Towards an overall strategy	<ul style="list-style-type: none"> • Identification of important elements of an overall strategy • Identify stakeholders and responsibilities
Evaluation	<ul style="list-style-type: none"> • Evaluation of the workshop from the perspective of the participants

Presentation of the area

- The Sehoul plateau receives about 500 mm of rain
- A flat plateau with incised valleys
- Flash floods, namely in Autumn, with a high and massive sediment yield,
- Difference of behaviour between 3 sites:
 - Forests: degradation by overgrazing
 - Upper catchments, changes in agriculture
 - Deep streams : Critical forms of degradation and retreat of Human occupation
- Recent progress of degradation, by gullying in the valley's bottom and on the steep slopes



Geological map of the Sehoule region: the importance of the Miocene marls (in orange colour), over the Paleozoic basement and under the Plateau sandy cover (in yellow), in the NW.

The area is located under sub-humid to semi-arid conditions; it is on the border of a cork oak forest, which means a quite stable environment. But, for many reasons, it is affected by desertification processes:

- the cork oak forest is in a very weak situation, due to overgrazing, wood cutting and forest diseases;



Degradation de la forêt : non
regeneration du chêne, extension
de quelques espèces assez
couvrantes, mais à faible intérêt

Photo of the degraded cork oak forest in the Sehoule plateau, with a very weak density, no case of regeneration and expansion of some secondary species

-the cities' growth and the need for space for activities and transport and the cities influence on rural areas and on agriculture activities, with the investment of money from the city in new forms of agriculture;



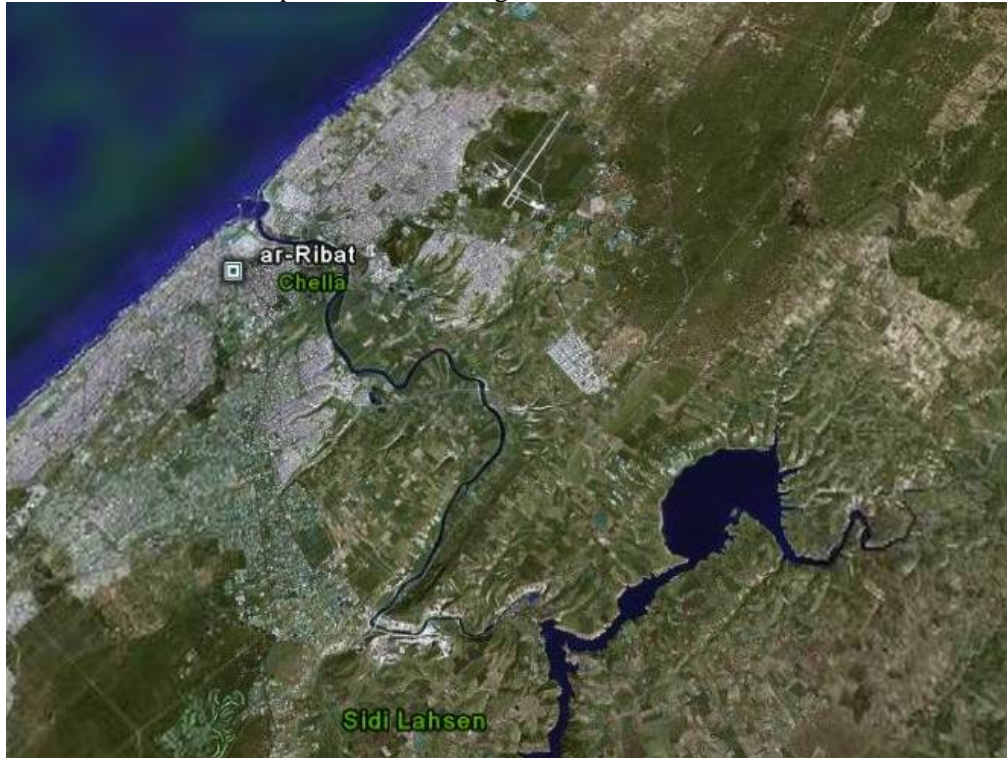
The extension of small irrigated farms on the limits of the Mamora forest and the competition on water (Google earth image)

-the soil is made of a thick sandy leached horizon, which corresponds to old dunes developed in the region during a dry period of the upper Pleistocene; the humid conditions of the Holocene permitted the forest growth and the surface stabilisation; the current retreat of the forest creates again conditions for desertification, with the apparition of local dunes in the spaces affected.



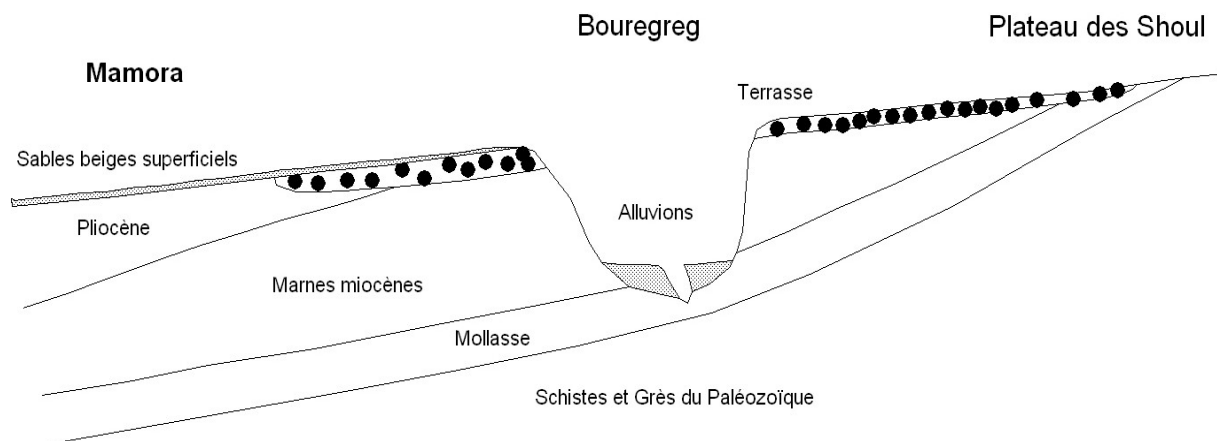
The leached sandy soil of the Mamora and the importance of the organic layer for the forest conservation

-the deficit of water and the competition between agriculture, urbanization and tourism, on this resource.



The competition between the cities and agriculture on the Bouregreg reservoir (Google-earth image)

The main regional groundwater system sits in the Pliocene calcrete (the Mamora aquifer). Due to the dipping of the Sehoul Plateau to the north, the calcrete thin out in the south, and the volume of the aquifer is less important. A second groundwater system is contained in the Miocene molasses formation, on top of the Palaeozoic substrate (the Miocene aquifer). The recharge of local groundwater systems depends solely on precipitation.

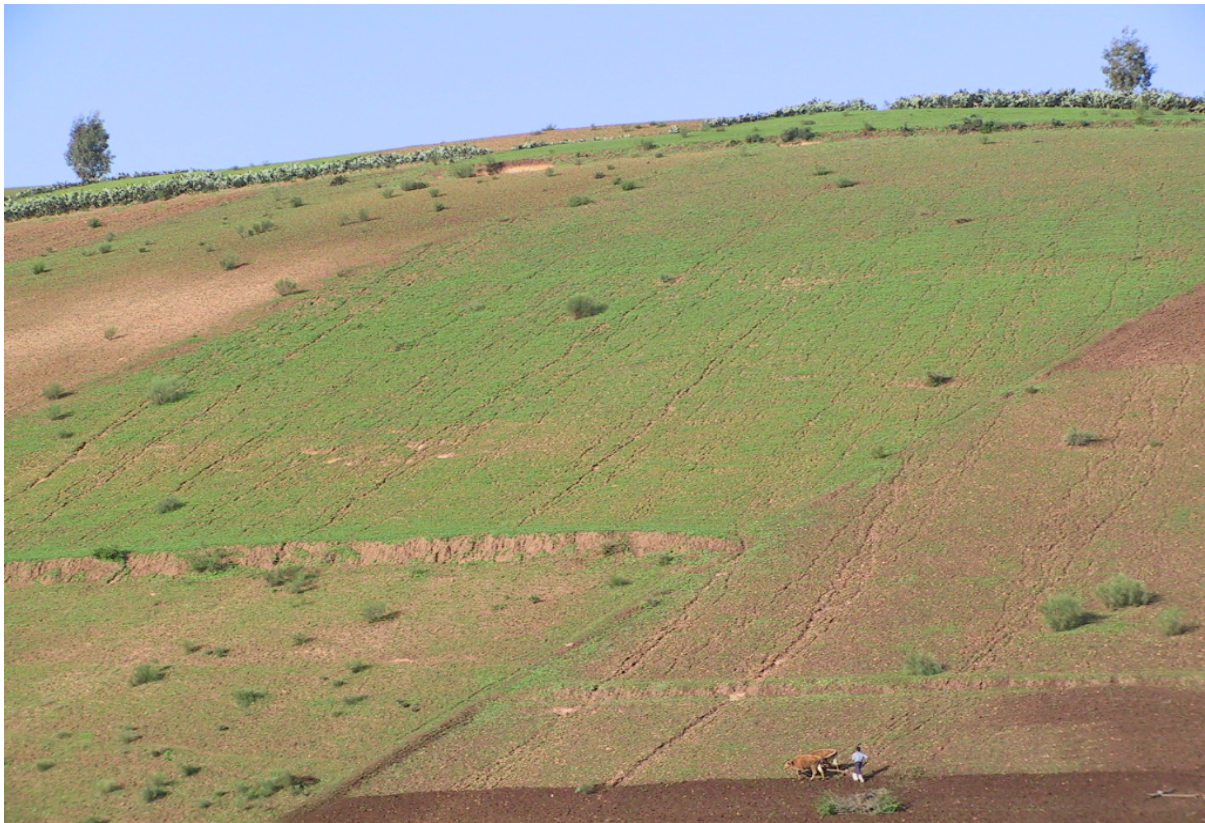


Geological profile with a superficial water table in the Pliocene and the old alluvial terraces and a deeper water table in the Miocene mollasse, on top of the Paleozoic basement

The main problems are the weakness of the sandy soil and the rapid retreat and clearing of the vegetation cover, inside the forest limits. In the cultivated area, the problems are more related to technics of land use, not adapted to the climate (concentration of rain), to the weak soils and to the slopes in the hills surrounding the deep Bouregreg or Grou valleys.



The recent development of gullies on the slopes of the Grou river, instead of an old stability with small terrasses and creep process on the slopes



Rill erosion on slopes export a large amount of soil, but a simple limit of farm is able to stop the development of these rills downstream

Sheet erosion and gullies, on the slopes and eolian remobilisation of the sand on the plateau surface are the main aspects of desertification.

II Results and conclusions from sequences / exercises

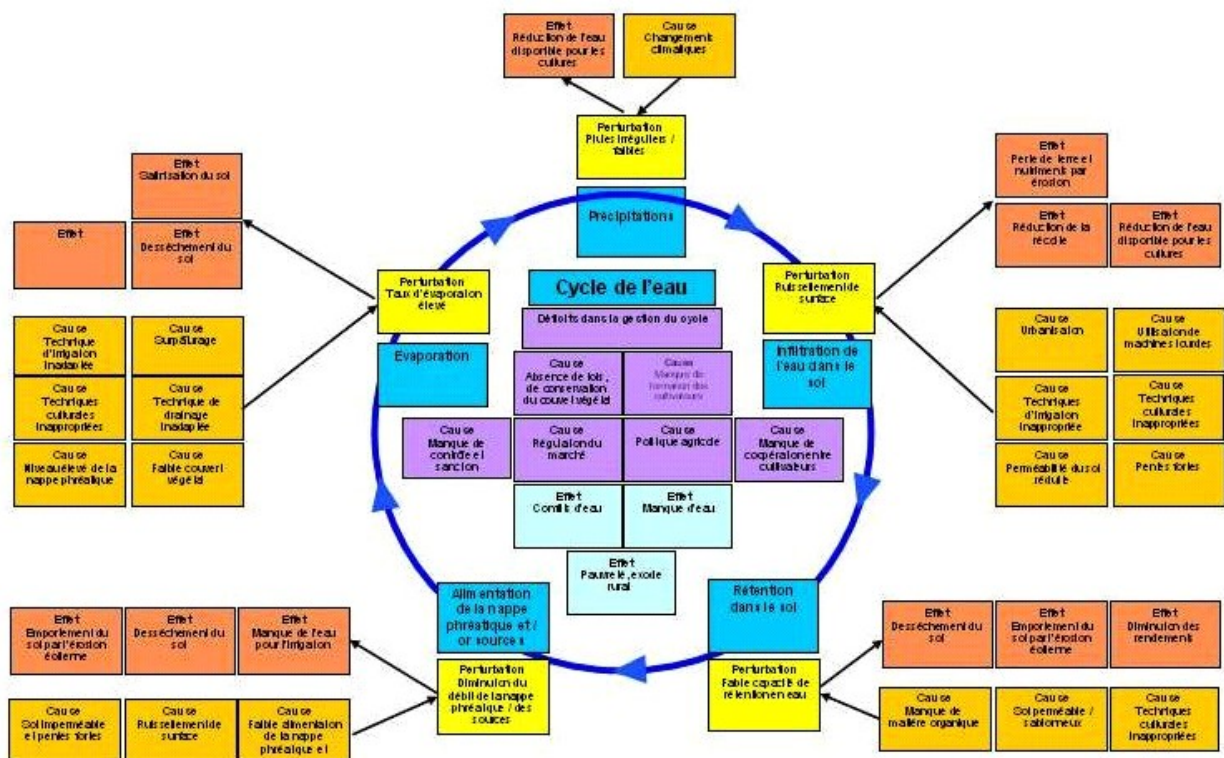
1) Impact chains – chains that link causes and effects of land degradation (→ results form the water and biomass cycles)



First construction of the biomass cycle in the field



Biomass Cycle with photos selected by the farmers



The water cycle as conceived by the research team (J. Al Karkouri)

A. Perturbations identified in the water and biomass cycles

A1 – water cycle

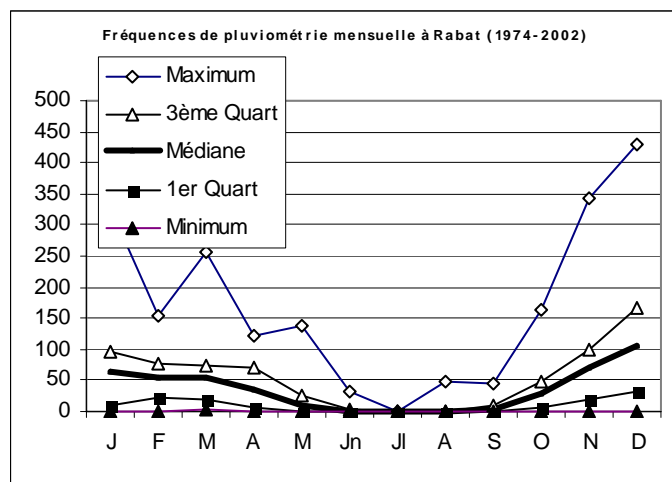
The normal water cycle consists in Precipitation (about 500 mm in this region). A large part of this rain evaporates from vegetation and from earth surface. The other part infiltrates and forms the water table. The part which does not infiltrate, streams and joins the rivers (Bou Regreg, Grou) and then the sea. Inside the soil, a part is consumed by the vegetation roots and restored to the atmosphere by evapo-transpiration.

A.1-1- Precipitations

In the Sehoul region, rain has a deep signification for the peasants. It constitutes a fundamental factor of production. The populations has a sacred vision of water, which constitutes a "gift from God", essential for animal and human life and for plants growth.

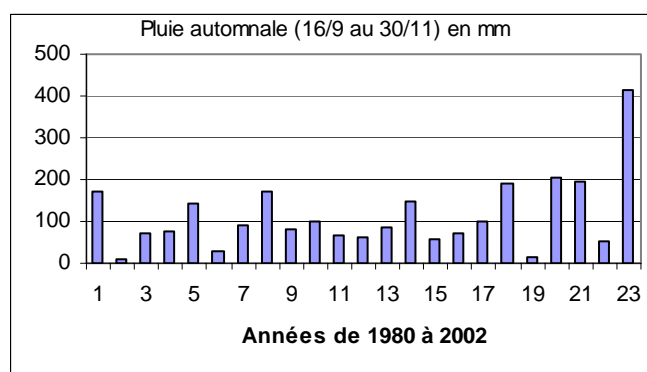
With an average of 519 mm, a good and rainy year is both a year which receives enough water, well distributed on the fundamental phases of plants growth (October, the middle of winter and spring). During this rainy year, the yield for barley reaches 28q / ha and 40q / ha for wheat.

But precipitations in this region are very irregular at the two scales inter-annual and inter-seasons. The deviation from the average can reach more than 100%. The trend from the 1980s is for an important decrease of the annual amount; but with some exceptions which represent some very humid years. At the season's level, winter represents the rainiest period. From May to October or November, climate is totally dry.



Frequencies of monthly rain during the period 1974-2002

The main perturbation recorded is the decrease of water, due to the late precipitations in autumn, or the early stop of rain in spring. This leads to a reduction of the grain yield and of the vegetation cover and represents an important factor of crisis, both for agriculture and livestock. The farmers must buy food and fodder. Another perturbation is the concentration, in some years of special events during autumn, at a moment when the land is still completely bare. These heavy rains produce very important soil erosion.



Autumn rain (from September 16 to November 30) during the years 1980-2002

A-1-2- Infiltration

Most of the soils of the Sehoul slopes have a weak permeability, while the soils of the plateau are sandy and absorb water rapidly. On the steep slopes, the red soils, with a high content of pebbles, are impermeable. Only the vertic soils downstream present an important average of permeability. Runoff is so, constant on slopes. The vegetation factor accelerates this situation, because most of the slopes are deforested and present a bare surface at the end of summer. In the pastures, the soils compaction constitutes another factor of impermeability. And the high rate of silt, compared to clay, explains the rapid destruction of the soil structure and closing of porosity.

Many Perturbations of the infiltration dynamics can be found :

- the spread of the surfaces affected by runoff and by sheet erosion risks;



Rills on the slopes of Matlaq catchment

- the increase of flood risk, mainly in autumn with the very poor vegetation cover. The watersheds response to rain is very rapid (some minutes after the record of the maximum of rain intensity).



The accumulation of sediments during a flood behind the catchment V-Noch

- The development of visible signs of erosion, with the constitution of rills in the ploughed fields,

- an important soil loss, which can reach the amount of 150 g/m^2 in fersiallitic and ploughed fields.



The importance of soil loss in the fragile soils recently ploughed slope

A-1-3- Water retention in the soil

The weak amount of organic matter and clay in the soils explain the weak retention of water, and only the vertic soils of some foot slopes retain humidity. During summer, the soil humidity, measured by TDR is less than 10% in all the positions; on the slopes exposed to the south, this value is close to 0. During this period, the occurrence of wind exaggerates the dryness of the soils and can transport silts and fine sands.

A-1-4- The water table supply

In the context of marls structure of the region covered by an important layer of calcarenite, the water table is quite important upstream on the plateau and inside the alluvial terraces, formed by pebble, clay and sand deposits. On marl slopes, there is a very weak water level inside the weathered horizon, which dries rapidly after the rainy season. In some favourable sites, with a real water table, the last years showed an important decrease of the piezometric level, due to over exploitation of wells and to the increase of runoff in the fields.

A-1-5– Evaporation

The average of evaporation represents about 92% of the amount of precipitation. The current perturbation consists in the increase of evaporation due to global warming and the occurrence of dry winds in spring and summer.

A2 – The biomass cycle.

A2 – 1 – Plant regeneration

The perturbations which occurred in the Sehoul region are first the reduction of the vegetal diversity. The peasants of the region note the decrease of the species and in particular of those which represent a rich fodder for animals. In many fields, only the "Doum" and some prickly species are present.



Only some fields conserve remnants of the natural vegetation of the Sehoul region (some *chamaerops humilis*)

A2-2- The plants growth

The plants growth, in the lands in fallow as well as in the ploughed ones, shows a decrease of its importance. The density of vegetation and the biomass cover are also weak. In the ploughed fields, the peasants note an important differentiation in term of cereals yield between the upper part of the slopes and their downstream.



The vegetation cover during a rainy year, with a differentiation upstream / downstream

A.2 – 3 – Plants maturity

The peasants note the reduction of the cereals yield, related to the deficiency in term of their maturity.

A.2 – 4 – Plants withering

This phase seems to occur more early, in relation with the lack of water in spring.



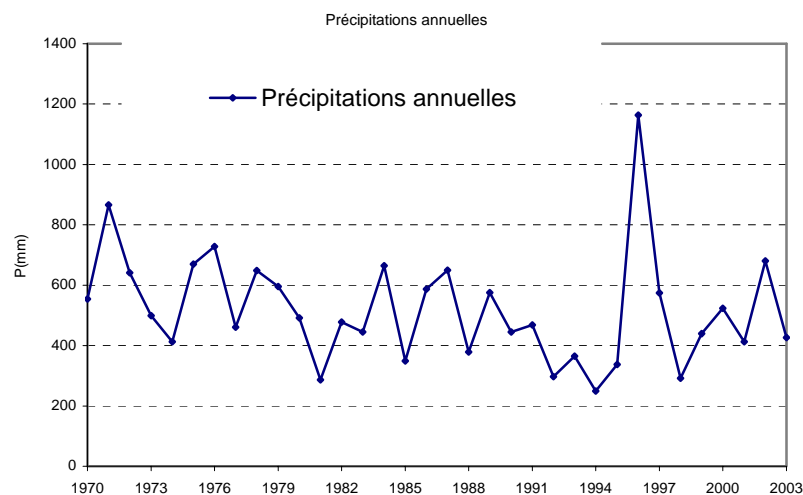
Early dry cereals upstream

A.2 – 5 – Décomposition and minéralisation

Due to the dryness of the soils, decomposition of the plants debris and the production of organic matters becomes less active.

B. Causes and effects of land degradation (→ impact chains)

The succession of dry years, the irregularity of rain and the occurrence of some intensive events are considered as the main physical factors of land degradation in the region. The inter-annual variability is very high and the deviation to the average can overcome 100%, with a real trend for diminution of the annual precipitation.



The annual rain from 1970 to 2003

The effects are, less water for the plants growth and a reduction of the biomass and of the grain yield, and as a consequence of the vegetation protection of the soil. The constitution of crusts at the soil surface, in relation with the intensity of some rainy events, with the weak stability of the soil structure (weak organic matter content) and with the compaction by the high density of the cattle explain the reduction of the infiltration and the excess of overland flow. The effects are the increase of the risks of floods and of erosion on slopes. The response of watersheds to special events is very rapid and the signs of incision on slopes (rills and gullies) become more and more

apparent. Some fields, in which occurred a too important soil loss, are abandoned. The land is condemned to more soil loss and to the continuation of rills expansion and deep.



Erosion, pebble accumulation, fields crusting, constitution of rills and land abandon

The soils affected by erosion, with less organic matter and less width of the profile are more rapidly dried in spring by evaporation; their yield becomes less; the winds of summer and autumn are responsible of their transport.

The reduction of the plants diversity is explained first by the more frequent occurrence of dry years but also by the overgrazing and the wood cutting. The effects of such dynamics are the reduction of soil stability (less organic matter) and of soil fertility.

The reduction of the plants growth is explained by the irregularity of rain. But the soil degradation is also perceived as a factor of this reduction. The difference between the upper part of the slopes and their downstream in term of plant density and yield is explained by the occurrence of more evaporation upstream (exposition to the sun and to the winds). But, the water circulation inside the soil, along the slope is not perceived by the peasants.

The weak maturity of the cereals is first explained by the weak rains in spring. In the lands in fallow, it's the overgrazing which is perceived as responsible of the consumption of plants before maturity and of the excess of non palatable plants in the fields. The hydric stress is also responsible of the plants withering. It explains also the weak development of organic matter. The soil is degraded after its loss of stability. It is then more affected by overland flow and erosion.

C. Socio-economic constraints

- The multiplicity of ownership statutes, at the two levels of property and exploitation. In the region we find both, very poor owners with less than 2 ha, in a very weak situation, incapable to make any investment and affected by land degradation, and a few very great owners, coming from the cities, with high possibilities of investment and the ability to profit from the state projects of agriculture development, as plantations or technique transformations.
- The importance of social needs for most of the peasants of the region explains the current trade for abandon and migration.
- The vision of the national and local authorities is no more oriented for the development of agriculture in this marginal region; their vision is more oriented for new activities as leisure and tourism.
- The absence of associations of owners and the very weak role of local institutions.

D. Already applied solutions at the local level

From the historical point of view, the Sehoul plateau was inhabited at the beginning of the 20th century by pastors. The arrival of farmers from France during the Colonisation period led to stabilisation of the population and their fixation, with transformation of their lifestyle to agriculture. But their ignorance of techniques made them adopt uniform style of agriculture, with generalisation of cereal culture, but with the conservation of an important sector of cattle breeding (sheep and goats) with a frequent use of the neighbour forests. Degradation is then a result of both overgrazing and cultivation on slopes, without techniques of protection.

Some new techniques were adopted during the last decades of the 20th century :

- plantation of eucalyptus trees in some deep gullies and along the streams in which incision is in progress;



The two big gullies of the Matlaq catchment and the plantation of eucalyptus in their incision

- The ploughing of some fields along the contours to prevent rill incision of the slopes and to erase the existing rills



Fields ploughed along the contours

- building some terraces and fertilization of some rare fields devoted for the production of vegetables for own consumption, and in some cases for the market
- plantation of fruit trees in some fields, and of *Cactus opuntia* on the limits of there fields.



Fruit trees plantations and cactus opuntia fences

2) List of local indicators for land degradation and conservation

(→ results form exercise xy)

Indicator	Used by (stake holder group)
Indicators of degradation	
Multiplication and increase of the rills in the fields	Peasants group Researches and Technicians group
Loss of colour of the soils and constitution of white spaces at the upper part of the fields	Peasants group
Reduction of the yield of some fields even during rainy years	Peasants group
Degree of water retention in the soils (measured by content of humidity)	Researches and Technicians group
Increase of overland flow on the soils (measured downstream)	Researchers and technicians group
Indicators of conservation	
Rapid growth of plants after the first rains	Peasants group
Easiness of soil ploughing	Peasants group
Stability of the yield	Peasants group

3) List of stakeholders and their roles in regard to land conservation in the study site (→ results from Venn-Diagramm)

Stakeholder group	Roles, responsibilities
Peasants, shepherds	Main responsible of soil use and of forms of degradation. Weak role for conservation
Big Owners of land living in the cities	Investments in transformation and conservation. Introduction of imported techniques.
Commune council (elected)	Absence of any role in land conservation
Local Technical services of Agriculture	Assistance and support for peasants and shepherds But very weak support for small owners
Local Technical services of forests	Protection of the forests
National Department of Agriculture	Conception of plans and programs of development, but absence of follow-up
Researchers	Experimentation of techniques Discussion with peasants

4- Selection and appreciation of locally applied technologies and approaches (→ results from Ex. ...)

Please fill in the following table for different stakeholders:

4.1. Assessment made by **local stakeholders**:

Technology / approach	Already applied or potential solution?	On land use type (e.g. crop land / grazing land, etc.)	Labour required (initial and maintenance)	Costs (initial and maintenance)	Impact / Effectiveness						Limiting factors / constraints	Overall assessment of the potential for the local context
					economic		ecological		socio-cult.			
					ST	LT	ST	LT	ST	LT		
Fodder cultivation	PS	GL	low	low	+++	+++	+++	+++	+++	+++	Consumption of space normally devoted for grain production	Adapted to the context
Fruit Plantation	AP	Crop Land	high	Very high	++	++	++	++	--	--	Cost, stop of breeding on the planted fields	Requires a high context and much efforts
Terraces	PS	Crop land	Very high	Very high	+	+++	+	+++	+	+	Cost, stop of breeding on the terraced fields	Non adapted to the context due to the lack of water
Medicinal plants	PS	GL	medium	medium	+	+++	++	+++	++	++	Protection of the pastures	Promising

Legend:

ST = short-term LT = long-term

Labour and costs: very low, low, medium, high, very high

Impact / effectiveness: +++ (very positive), ++ (positive), + (rather positive), 0 (medium),
- (rather negative), -- (negative), --- (very negative)

4.2. Assessment made by **external stakeholders**:

Technology / approach	Already applied or potential solution?	On land use type (e.g. crop land / grazing land, etc.)	Labour required (initial and maintenance)	Costs (initial and maintenance)	Impact / Effectiveness						Limiting factors / constraints	Overall assessment of the potential for the local context
					economic		ecological		socio-cult.			
					ST	LT	ST	LT	ST	LT		
Pastures improvement e.g. plantation of Atriplex	PS	GL	Low	Low	+++	++	+++	+++	+++	+++	Space consumed	Well adapted for conservation
Small check dams	PS	GL and CL	Medium	Medium	++	++	++	++	--	--	Population resistance	Very efficient to conserve fields and pastures
Plantations	AP	Crop Land	High	High	+	+++	-	+	++	++	Cost	Difficult to adapt for peasants with weak tradition for agriculture
Big check dams	PS	GL and CL	Very high	Very high	+	+	++	+++	+	+	Cost	Efficiency for the big dam on the Bouregreg river

Legend: ST = short-term LT = long-term

Labour and costs: very low, low, medium, high, very high

Impact / effectiveness: +++ (very positive), ++ (positive), + (rather positive), 0 (medium),

- (rather negative), -- (negative), --- (very negative)

4.3 List of technologies / approaches to be evaluated by WOCAT methodology

Please list those technologies / approaches that will be documented and evaluated (after the workshop) with the WOCAT questionnaires

- 1- Olive plantations along the contours, separated by strips of cereals; this technique was introduced by the local project of rural development.
- 2- Eucalyptus plantations with a high density for wood production; this technique was adopted by some big farmers on degraded pastures
- 3- Eucalyptus plantation as a technique for gullies remediation and alluvial terraces protection against fluvial erosion

III Evaluation of the workshop

Evaluation of contents and methodology of the workshop:

- By participants (local and external)
 - Local farmers: These stakeholders participated to the workshop for two reasons; the first is their total confidence in the team who made contacts, in relation with the solid and good relations we had with them; the second was the allowance they received against the working time in their fields they “lost” during the 3 days. But they didn’t express a real enthusiasm for the work methods we had with them. They say that there was too much time for not very useful discussions. Until now, they say that they don’t see the interest of such exercise.
 - Technicians of Agriculture and forests : These stakeholders appreciated very much the day they spent with us in the workshop. They learnt a lot of things. And they had a real opportunity to discuss deeply with the farmers.
 - The researchers also appreciated the workshop, as they had a real opportunity to organise in the right way their ideas and to control their knowledge with the one of the farmers and the technicians.
- By the moderator

The moderator was criticised for what was perceived as a non successful way of driving the process. But his good knowledge of the field site and of rural behaviour had some very important impacts on the discussions. His proposal is to adapt the techniques of communication adopted for learning to the context of very weak literacy, by the use of more exercises in the field.

IV Other information

Difficulties encountered:

The main difficulty was to convince the farmers to participate

Changes made concerning the procedure suggested in the workshop guidelines:

Many changes in the procedure, in relation with the difficulty of dialogue with the farmers

How was the interest and participation of the different stakeholder groups in the workshop?

Recommendations:

Comments: