CARACTERISATION ET MISE EN VALEUR AGRICOLE DES SOLS DU BASSIN VERSANT DE L´OUED BOU MOUSSA , HAUTE CHAOUIA ,Settat, MAROC.

CHARACTERIZATION AND DEVELOPMENT OF AGRICULTURAL LAND THE WATERSHED TheOuedBouMoussa, HIGH CHAOUIA, Settat, MOROCCO

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RESUME

Le bassin versant de l'oued Bous Moussa (haute Chaouia, Meseta, Maroc) est caractérisé par un climat subméditerranéen. Des pluies irrégulières, combinées à une mécanisation agricole importante, provoquent une érosion sévère. Les sols sont de plus en plus dégradés

L'intégration des résultats des analyses physicochimiques dans le Système d'information géographique (SIGMapinfo) a permis de produire des cartes pour l'exploitation agricole de sols étudiescaractérisant la répartition des sols agricoles dans le bassin versant de l' oued Bou Moussa .cette étude s'avère un outil de décision incontournable, l'analyses des échantillons du sol repartis sur l'étendu étudie a favorisé la caractérisation et la mise en valeurdes terres arables, dans l'optique d'un aménagement rationnel et durable .

Ce travail peut être utilisé pour aménager les solsd'autres bassins similaires au niveau des plaines et plateaux qui connaissentune dégradation pédologiqueremarquable.

Mots clés : BouMoussa, SIG, caractérisation, pédologie.

ABSTRACT

The catchment area ofOuedBouMoussa (high Chaouia, Meseta, Morocco) is characterized by a sub-Mediterranean climate. Erratic rainfall, combined with a significant agricultural mechanization, cause severe erosion. Soils are increasingly degraded.

The integration of the results of physicochemical analyzes in geographic information system (GIS MapInfo) has produced maps for agricultural land use are studying characterizing the distribution of agricultural soils in the watershed of the river BouMoussa .

this study is an essential decision tool, the analysis of soil samples distributed over the extended study favored the characterization and development of arable land, from the perspective of a rational and sustainable management.

This can be used to develop soil similar basins in the plains and plateaus experiencing remarkable soil degradation.

Keywords: BouMoussa, GIS, characterization, soil science.....

INTRODUCTION

Upper Chaouia area is a predominantly brittle lithologies such as marl, marly limestone and clays, population pressure manifested by an agricultural exploitation by supporting agricultural machinery, soil is degraded and significant regression water erosion. Risk assessment studies of erosion and soil loss quantification in Chaouia were limited á LowerChaouia (H.ANYS et al. 1993). [1] The catchment basin of the OuedBouMoussa, has a very accelerated soil erosion due to rainfall patterns and slope [2]. This study aims to capitalize knowledge of soils and value through a spatial analysis tool MapInfo GIS risk of soil erosion in the watershed using a mapping study of soils, soil profiles detailed observation , Based on the survey to the auger. These observations are accompanied sampling and physico-chemical analysis in the laboratory.

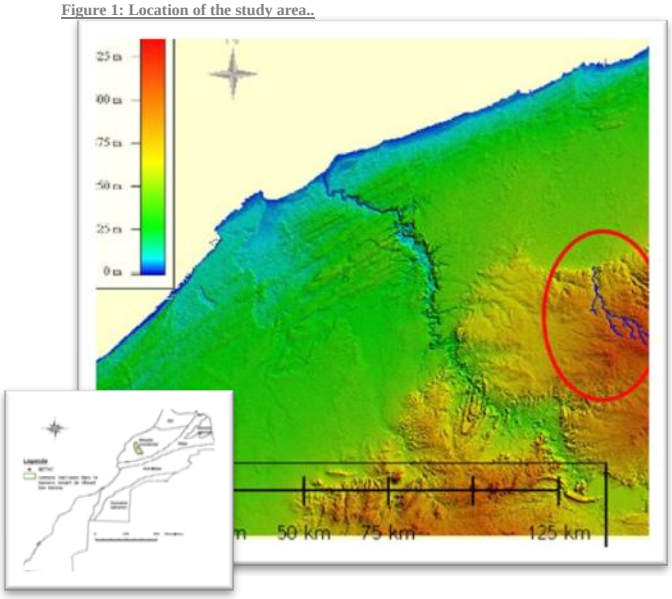
The objective of this study and manage an information system on soils of the watershed, with respect to their spatial distribution, their properties and evolution

their qualities. This information system on soil realistic deadline must meet local needs in the context of sustainable development and environmental protection.

STUDY AREA

The catchment area of the river BouMoussa, is located on the road Casablanca - Marrakech 72 km south of Casablanca, is characterized by its agricultural and an important industrial development. this plateau is characterized by a succession of marly limestone surfaces marked by rocky outcrops. Map (fig 1) shows the location of the study area.

Figure 1: Location of the study area..



METHODOLOGY

The methodologyadoptedis the analysis of a samplingtwentyrepresentativesamples in eachwatershed area distributed in the field of a random four field missions wereorganized in the period April-September 2014 avoid the influence of moisture, the location of sampling points using a GPS like Garmin metricresolution, ismade in such a way to sample the differentgeological formations. Samples samples are taken with an auger, the sampling depth is between 0 and 50cm.les analysis results are then introduced into a graphics platform MapInfo GIS georeferenced for each sample analytical results during these surveys are stored in a digital database in order to make thematic analysis and modeled the study area.The database is built. the organizational model of DONESOL informationit allows the storage of data points (the described soil profiles) and surface data (the contours of soil mapping units). Thesemappingunits are composed of soil types, self-described as a succession of strata.

I-Geological context:

The OuedBouMoussa watershed is part of the Moroccan Meseta, It is a massive Hercynianpeneplain, covered basins upper Cretaceous-Eocene rich in phosphates; these are somewhat distorted by the Alpine phases.

This tray does not have a uniform tabular morphology, but is a set of nested platforms, dissected by erosion, each of which corresponds to the most resistant limestone levels of the sedimentary series, the map shows the different types of rock present in the basin, it extends from the Cretaceous to Eocene, these trays amount to 450 m in the southern basin region.

The lithological analysis using MapInfo samples helps us to produce the map of mother rocks Watershed

OuedBouMoussa

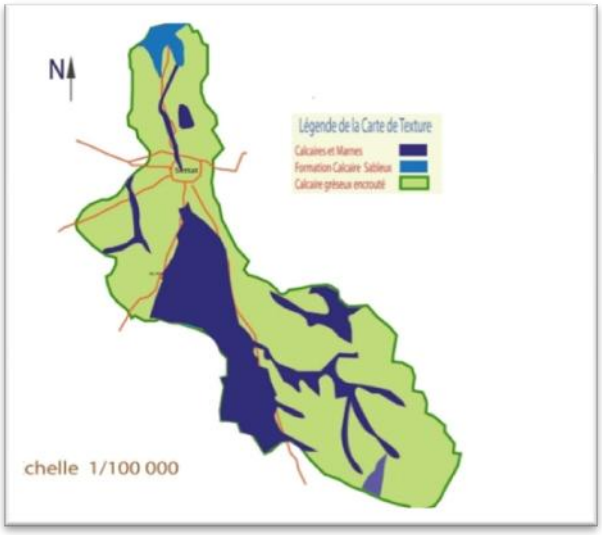


Figure 2: map of the rocks of the watershed of OuedBouMoussa.

Results and Discutions

The results of sample analysis are introduced in the georeferenced map Watershed form of data tables,Thematic analysis of the data allows us to produce the following cards characterizing soil Watershed.

2-1- Particle size

The texture is a summary of the size distribution of the constituent elements of the solid mineral soil (relative content of clays, silts and sands). The particle size is interesting to know because it brings us information about the physical properties and soil texture. This is a particularly interesting feature in our context it is extremely variable. To determine the texture of the soil, the sample undergoes two phases of analyzes: a mechanical sieving wet using a series of sieves and a classification phase by laser diffraction.

The analysis of particle size by laser diffraction used to separate the different soil particles up to 1 micron in size which is not possible by sieving.

Particle size analysis involves drying the samples at 105 ° C for 24 h, and then proceeds to quartering the sample which aims the sample homogenization (Figure 1, photo 2). This analysis consists in a first stage size separation by sieving liquid path

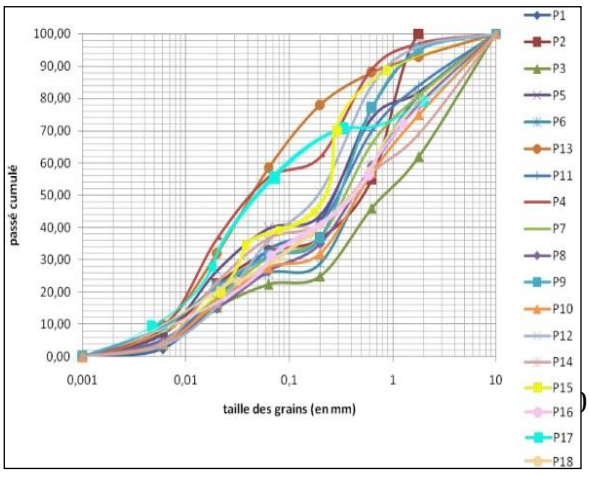
a - Sieving liquid process

Sieving is one of the oldest methods of particle size analysis, and also one of the most widely used because it is inexpensive. Its basic principle is to divide a powder material by passing through one (or more) sieves whose characteristics are known by using water. The series of sieves used is as follows (2 mm, 630 microns, 200 microns, 63 microns) (Figure 1, photo 1). These diameters are the boundaries between soil particles (clay, silt, sand).

It weighs approximately 10 g of sample and are added to the water. The solution containing the sample is passed through the Sieve Series cited above. Passing a sieve to the other is done using a regular injection of water at the end of this operation all suffered sieve drying and measuring the mass of the sample used in each screen. This methodallows a size separation up to 63 microns.

Figure 3: The gradation soilsamples

The resulting grading curve presents the results of particle size analysis by sieving liquid process (up to 63µm fraction) The shape of the size distribution curve (fig5) allows to specify the degree of spreading of the size or uniformity; This uniformity is expressed by the uniformity coefficient or coefficient Hazen.



sample	position	d10	d30	d60	Cu	Cc	sand(%)	silt (%)	Clay (%)	SoilTypel	water(%)	M.O en %
1	N32 59 08.6 W7 37 25	0.01	0.05	0.38	31.67	0.55	58.00	33.10	8.90	sandyloam	2,68	8.07
2	N32 58 30.0 W7 37 37	0.008	0.045	0.7	87.50	0.36	63.31	32.52	4.17	sandyloam	5,92	9.75
3	N32 58 30.1 W7 37 37	0.01	0.3	1.8	180.00	5.00	75.04	22.45	2.51	Sable limoneux	2,64	1.68
4	N32 57 41.3 W7 37 44	0.007	0.015	0.18	25.71	0.18	38.05	55.38	6.57	fine silt	2,9	0.00
5	N32 56 34.2 W7 37 22	0.0018	0.028	0.38	211.11	1.15	56.05	39.70	4.25	sandyloam	5,15	4.37
6	N32 57 01.9 W7 37 37	0.01	0.22	0.7	70.00	6.91	71.07	25.84	3.09	sandyloam	7,03	1.53
7	N32 58 30.9 W7 37 36	0.012	0.06	0.5	41.67	0.60	63.00	30.78	6.22	sandyloam	6,48	2.36
10	N32 57 46.9 W7 36 06	0.012	0.12	0.65	54.17	1.85	65.00	26.56	8.44	sandyloam	5,06	1.34
11	N32 57 25.2 W7 36 05	0.007	0.06	0.04	5.71	12.86	63.23	31.22	5.55	sandyloam	2,6	6.05
12	N32 56 58.3 W7 35 50	0.012	0.2	0.7	58.33	4.76	68.00	27.59	4.41	sandyloam	5,53	4.56
13	N32 56 31.4 W7 35 38	0.01	0.05	0.4	40.00	0.63	59.04	33.13	7.83	sandyloam	3,38	5.38
14	N32 56 40.3 W7 35 35	0.015	0.05	0.3	20.00	0.56	49.00	35.88	15.12	silt	2,75	3.16
15	N32 57 09.1 W7 35 58	0.006	0.02	0.06	10.00	1.11	22.00	58.34	19.66	fine silt	4,87	0.67
16	N32 57 34.6 W7 36 06	0.01	0.033	0.8	80.00	0.14	59.00	36.56	4.44	sandyloam	4,77	2.69
17	N32 58 59.7 W7 36 29	0.005	0.02	0.05	67.00	1.56	57.05	37.93	5.02	sandyloam	5,66	6.33
18	N32 59 06.6 W7 36 35	0.01	0.24	0.09	75.00	5.40	61.01	35.45	3.54	sandyloam	1,12	4.23

Table 2:size analysis of soils of the studied area

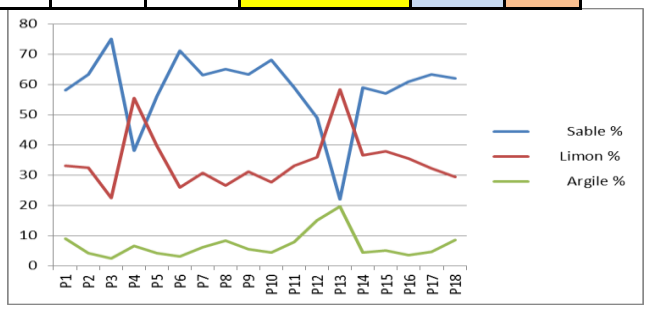


Figure 4: Diagramme des pourcentages des types de sol.

From Table 1, which **shows the results of calculation of coefficient of Hazen and curvature soil samples can be drawn as follows:**

All samples represent a spread size, all samples represent a graduated particle size except the sample P5, P13, P8 and P15.

The results of particle size analysis allowed to have a textural classification of all soil samples, the percentage of the different fractions of the soil (clay, silt, sand) is presented in Table 2. The standard used for classification is the German standard that determines the upper limits of fractions as follows: the sands with a size between 0.063 and 2 mm, silts have a size between 0.002 and 0.063mm and clays are less than 0.002mm.

After having the particle size analysis of soils basin studied was incorporated the results into the GIS [3] to achieve a texture map on the watershed.

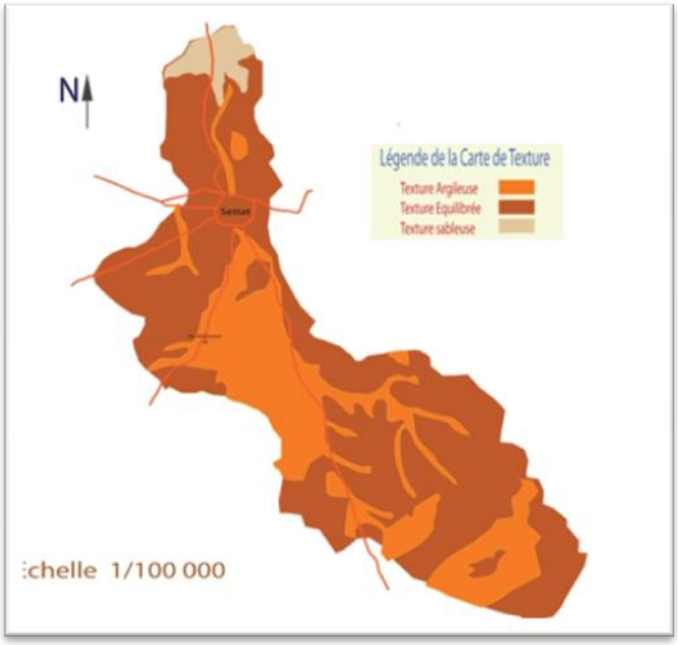
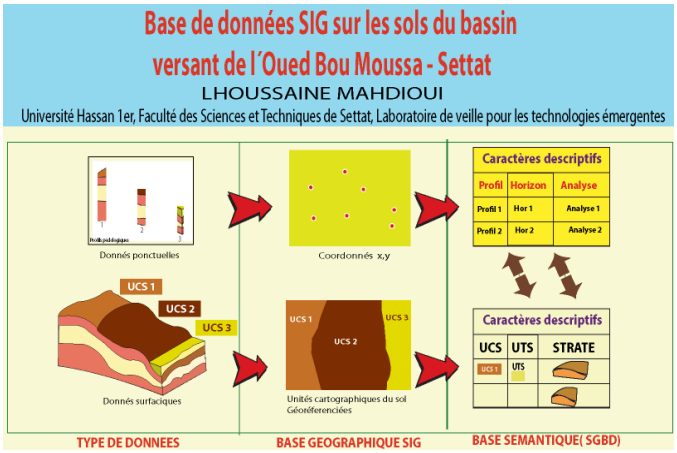


Figure 5: texture map of the watershed BouMoussa

The map shows the different textures in the main field are:

- A Clayey texture: very dominant in the central area and in the southern part of the basin.
- A Sand texture: represents the northern part of the basin.



(fig 6) .base soil GIS data OuedBouMoussa watershed

4-2- water content

The results of the analysis of the water content are shown in table5. The water content of the soil samples varied from 1.12% as a minimum and 7.03% as a maximum, the average water content was 4.26%.

4-3-organic matter

The results of the analysis of organic matter (Table 4) show grades between 0% and 9.75%, the average content of 3.67%. The high values of organic matter are related to agricultural activity, such as P1 and P2 samples taken in cultivated fields. Generally there is low values of organic matter in the BouMoussa basin, this can be explained by the degradation of the watershed caused by erosion. [4]

The diagram below groups the percentages of organic matter and water content in order to have an idea about Erodibility
soil

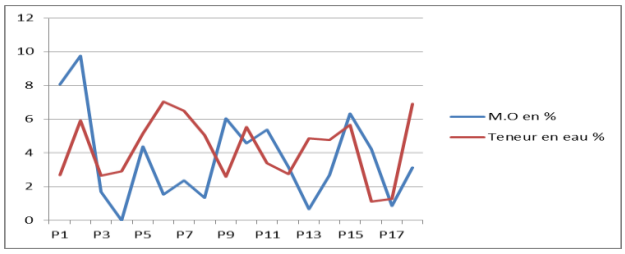


Figure7 : Diagram of organic matter and water content percentages.

The contribution in OM after the microbial activity in the root zone improves soil structure and cohesion and hence reduces the risk of erosion; it is very remarkable on the chart that the samples containing a percentage of the material I have high organic water.

By interpolation technique, it was possible delimit the different map units of soil, [2]. This inventory of soil brought out seven soil classes according to French soil classification (CPCS, 1967). These are the raw mineral soils, poorly developed soils, vertisols, calcimagnesic of soil, isohumic floors, fersiallitic hydromorphic soils and soils (Fig. 4). The soil characteristic of the area is the dominance of sedimentary rock limestone dominance.

Nine soil units have been distinguished by thisstudy in the watershed .itisessentiallyunsophisticatedsoilerosion or Alluvial Minerals contribution to Gross, the calcimagnesic and soilsont généralementpeuprofonds(with the exception of intake Alluvial soils), having a stony high and low average organic matter.

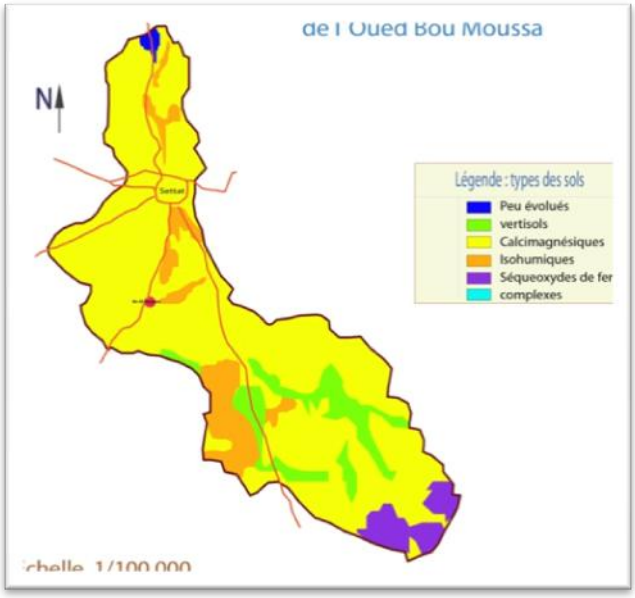


Figure 8: Soil Map of the watershed of the river BouMoussa

The establishment of soil units maps and their characteristics CUT involves the identification of land mapping units to be able to diagnose problems. These units correspond to soil series and soil associations of the soil map at scale 1 / 100.000.

The mapping unit of land is the basis for determining the agricultural land use. Each unit is defined by the characteristics and / or qualities such as: soil depth, pH, salinity, texture, slope, erosion risk, water availability, availability of nutrients, temperature, precipitation, etc.. (Figure 8)

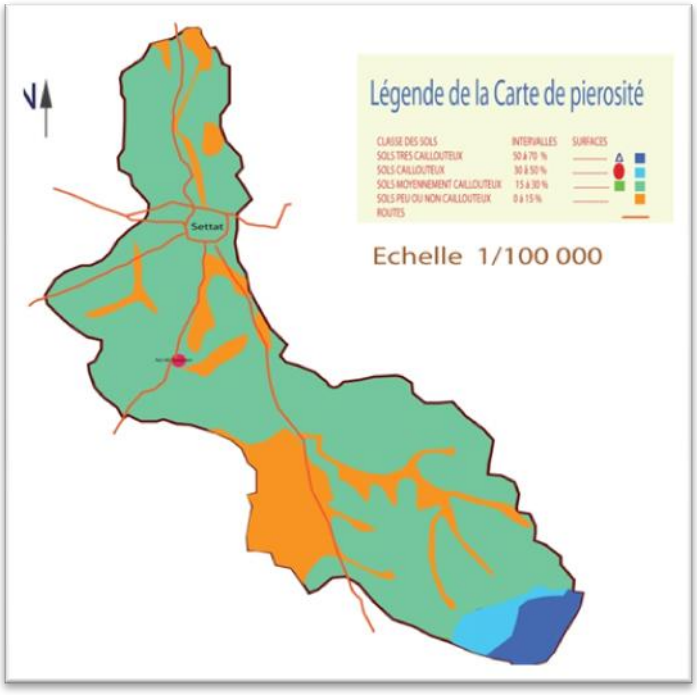


Figure 9: Soil pierosité Card Watershed of the OuedBouMoussa.

The soils in this watershed upstream of minor constraints, with a particular maintains needs, This is moderately deep soils with limestone or shale bedrock [5], land management requires the plowing curves level,

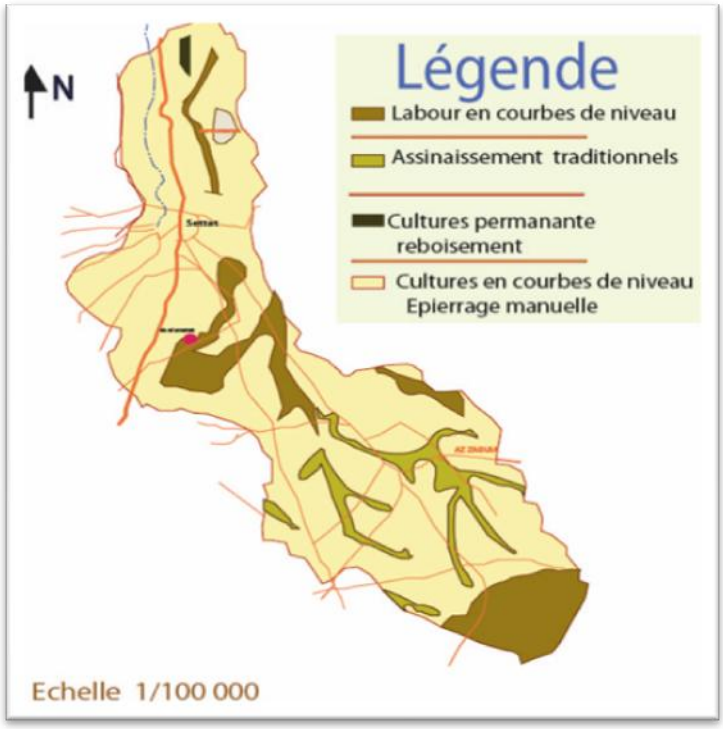
On both sides of the valley of the OuedBouMoussa deep soil gently sloping requires alternating strip cropping and an annual cleaning with traditional means,

The bulk soil (80%) presented major constraints to overcome, especially with a need to maintain the soil slightly to moderately deep with the limestone fillers piereusecultures contour are required.

In the end, the land downstream of the watershed has major constraints.

it is very shallow soils degraded their development requires the use of permanently fixed cultures, reboisementet, the fight against erosion

andassinaissement with traditional means.



CONCLUSION

The development of a geographic information system (GIS) on the soil will allow thematic maps have become an essential tool for the development of agricultural land. In this perspective the database of the watershed of OuedBouMoussa used to store information about the

distribution of soils in space and point data such as soil pits descriptions. Coupled with a geographic information system (GIS), it allows the combination of knowledge of soils with multiple other data (land use, topography, hydrology, climate ...) to answer questions related to the environment, land use and agricultural production.

Figure 10: Planning map of the watershed of OuedBouMoussa

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