Mapping Of Land by Vegetation from Satellite Data in the Region of Chetaibi (Algeria)

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ABSTRACT

The aim of this study is to map the land cover by vegetation in the region of Chetaïbi (Annaba, Algeria) from satellite data, in our study, we utilized satellite images taken in 2000 by the ETM + Satellite LAND SAT 7. The region is part of Chetaïbi Mountains of Edough north-eastern Algeria, the bioclimatic study indicates that Chetaibi lies between the sub-humid bioclimatic soft and damp soft. After performing the various treatments on satellite images of the study area, and choosing the best color process, a supervised classification of the color process is initiated by the software mapping and remote sensing ENVI4.5. The results of this classification is used to develop a map of land cover by vegetation in the region Chetaïbi (Training cork oak, dense scrub, maquis clear, cultivated soils, bare soils and urban area). Thus the digital terrain model obtained after processing the SRTM data, helped to develop the slope map, the map shows the map and altitudes of the study area.

Keywords: Land use map, Vegetation, LAND SAT ETM Satellite images, Chetaibi

1. Introduction

Landscape analysis is an important geographical theme. Its dynamics can be evaluated as a geoecological characteristic that defines changes in the structure and functionality of a landscape in a particular time scale. This characteristic gains great importance as it shows the landscape as a historical product; in other words, a product of the time which regulates the occurrence of new arrangements of the biotic, non-biotic, and human elements and functions that this landscape takes in the face of new structures (Huggett, 1995). The analysis of this characteristic is important because it shows, within a period of time, the behavior of the changes if the landscape, which can be used to generate predictions of the structure of that landscape and, consequently, its functionality (Turner, 1989; Forman, 1995).

The Region of Chetaibi belongs to the Mountainous chain of Edough, which is characterized by a dense and diverse species richness compared to the western part of the country; it has been studied by several authors including (Toubal, 1986 ; Aoudi, 1989).

The management of this species richness requires a thorough knowledge of the current state of vegetation. This knowledge requires the selection of analytical methods. Currently, the traditional mapping of soils has been criticized for being time consuming and costly. In response to these criticisms, new approaches have been proposed and developed to improve the mapping of soils and their attributes (McBratney, 2000 and 2003). Among these methods were digital mapping, which is a very useful tool for in-depth knowledge of natural resources; the implementation of a land use map by vegetation on the basis of satellite images and the use of geographic information system (GIS), allows us to have the results of large values of the scientific and economic viewpoint.

In this paper, we applied geostatistical and geographical information system (GIS) to generate land cover mapping for Chetaibi (North-Eastern Algeria).

2. Materiel and methods

2.1. Characteristics of the Study Area

The area selected to carry out this study was the Chetaibi region, which it covers an area of 13 506 ha. It is fits the following geographical coordinates (Figure 1): (X: latitude, Y: longitude) $X_1 = 37° 17'20.34''$, $Y_1 = 7° 51'54.67''$ and $X_2 = 37° 20'31.04''$, $Y_2 = 7° 42'54.96''$.
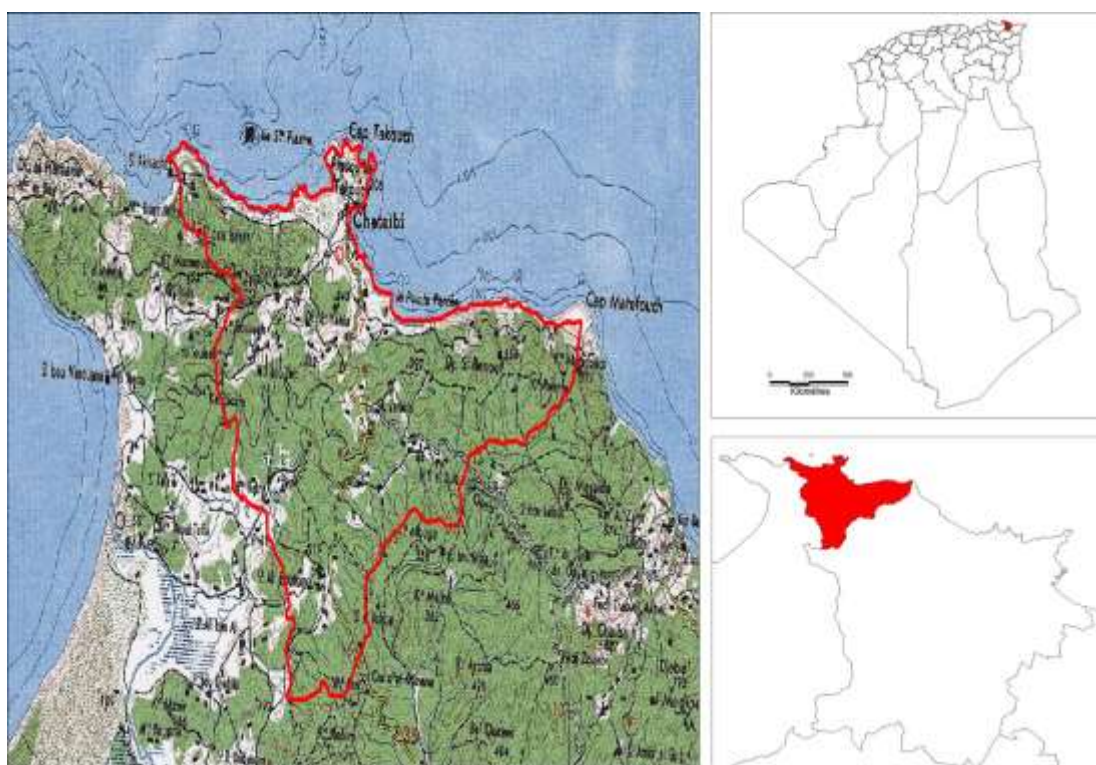
Figure 1. Location of study area

The morph structural framework is defined by the solid crystalline of Edough. This unit is known to be the only crystalline solid across the Maghreb. It is a morpho- structural unit, highly integrated its tectonic and lithological zone in metamorphic massifs of the small Kabylie characteristics. Its mountainous setting "the current relief" was modeled during the Pyrenean Alpine period by the intensity of orogenic movement's Cretaceous time "Ezoique". Orogenic movements which continued until the late Eocene and Oligocene "Cenozoic" profoundly changed the Cretaceous materials, which explain the current lithological diversity.

The northern part of the region is characterized by the emergence of intrusive rocks, dating from the Tertiary, represented by microgranites, andesites and diorites. These rocks of very hard consistency are affected by a great change and form flat surfaces. Near the city of Chetaibi, golf marine quaternary appear, they are materialized by mid sands broken "alteration of magmatic rocks" and fine sands. The uneven relief and the hardness of the rock had opposing the establishment of groundwater reserves. Despite the importance of rainfall "almost 1000 mm", the geomorphology of the northern part and its forest cover, are all favorable factors for rapid drainage of rainwater in the pelvis (Cape Coastal Iron).

The southern part of the territory of Chetaibi (major part) is covered training recent geological; it is represented by Oligocene outcrops of sandy clays, clay marl and limestone benches, and a flap of the marine Pliocene, or conglomerates, marls, flabby, sandstones encountered and sand formations. This alterable lithology is mainly located on a terrain of high and low foothills and the mountain; given the importance of rainfall and the configuration of the terrain, water seepage in sedimentary rocks are low compared to runoff that feed the Owed El Kebir West.

The location of the common of Chetaibi in the northern slopes of the Edough allows it to receive an average annual rainfall equal to 888.11 mm, with a maximum of 157.05 mm in December and a minimum of 2.89 mm in July.

Temperatures in the area range from 30.74°C (100 m) to 27.52°C (560m) for the warmest month (August); while the minimum temperature of the coldest month is recorded in January and it varies from 6.58°C (100m) to 4.74° C (560m).

2.2. Methods

The methodological procedures used in the mapping process are presented in Figure 2.
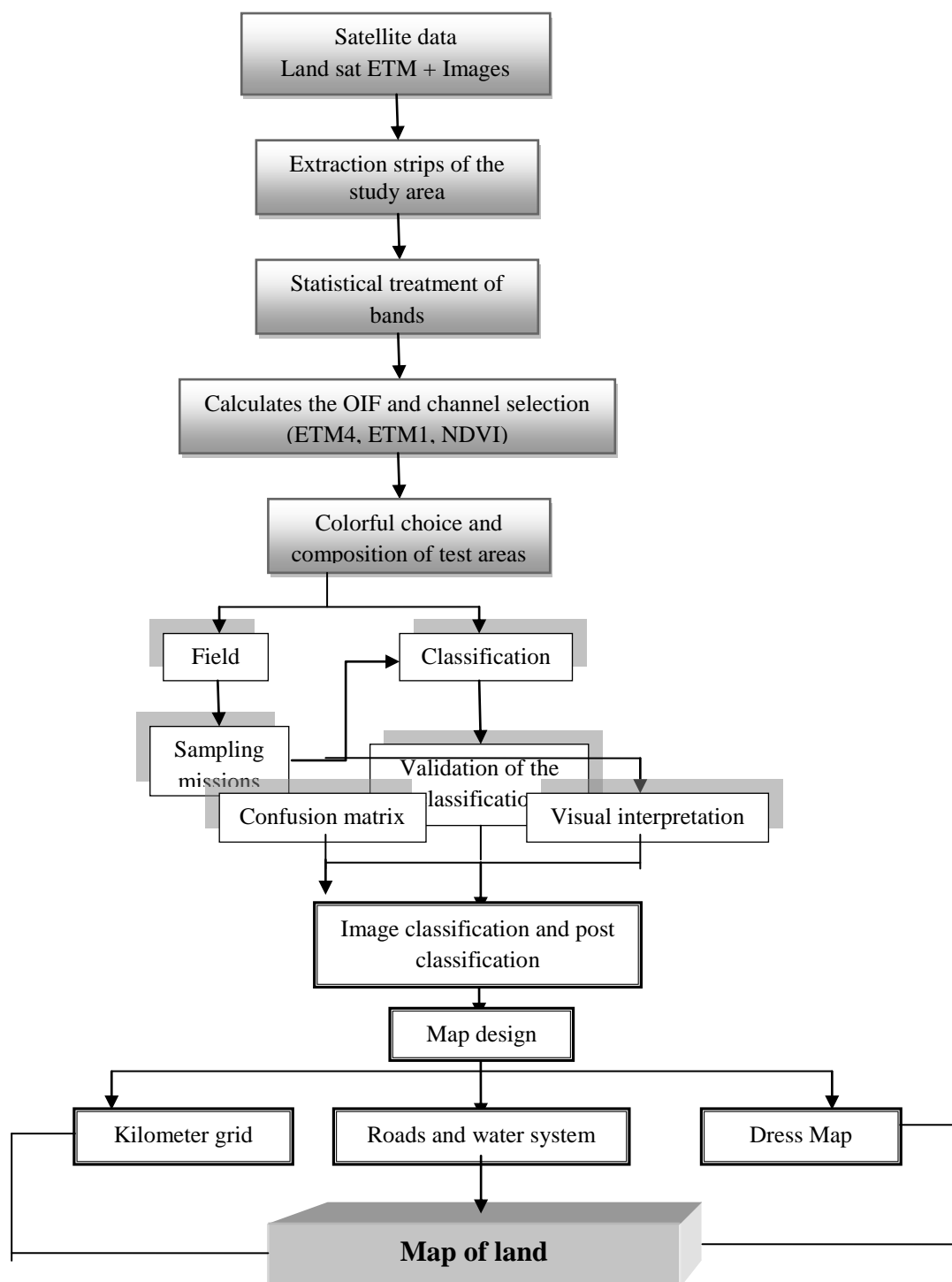
Figure 2. Procedures carried out for development of the use soil map of Chetaibi.

3. Results and discussion

The confusion matrix is used to evaluate the statistical quality of areas learning developed; the objective is to quantify the number of pixels of a reference class that is found in the same class assignment (= correctly classified pixels).

The values on the diagonal of the matrix represent the correctly classified pixels (expressed as absolute value or %). Different accuracy indicators are proposed: overall accuracy, Kappa coefficient, confusion matrix, surpluses and deficits errors, accuracy and precision for the user to the director. The evaluation of the accuracy of the classification will be based on an assessment visual followed by statistical evaluation by calculating a matrix of confusion made between the ground truth and classification established. From this matrix, we compute the statistical parameter "Kappa" (Congalton, 1991), which is an indicator of the overall classification accuracy.

Analysis of the confusion matrix provides information about the confusion between classes; values of the overall accuracy and Kappa coefficient are good since they exceed 90%. Lacombe (Reitberg *and al.*, 2008; Guo *and al.*, 2011) shows the result of supervised classification and post-processing set on colorful composition of the study area. The previously developed map shows the major land units, but it does not have others that are bruised with large units for this and add these units we have exported map in vector format to mapping software Mapinfo order to make changes. The units that we have added to the map are: training Zeen Oak, joint training of cork oak and Zeen oak, training of Kermes Oak, Riverine, Reforestation with Eucalyptus and Olive Grove. We also added roads, drainage system, names of some localities and some hypsometric points. The final outcome of the map is presented in Figure 3.

After drawing the map, a statistical treatment has been established for the different areas of land in the study area units (Figure 4).

From the map, it is noted that the area of Chetaibi is characterized by the presence of several land units, this area is characterized by:

- The dominance of dense formations Bruyere and Myrtle (6615 ha).

- The presence of training Cork oak (3311 ha), Oak Zeen (48.65 ha), Joint training cork oak and oak Zeen (301.8 ha) in wadi Enkouch and the training Kermes Oak (65.18 ha). - The presence of riparian vegetation (39.2 ha) in wadi Enkouch which is characterized by the presence of Zeen Oak.
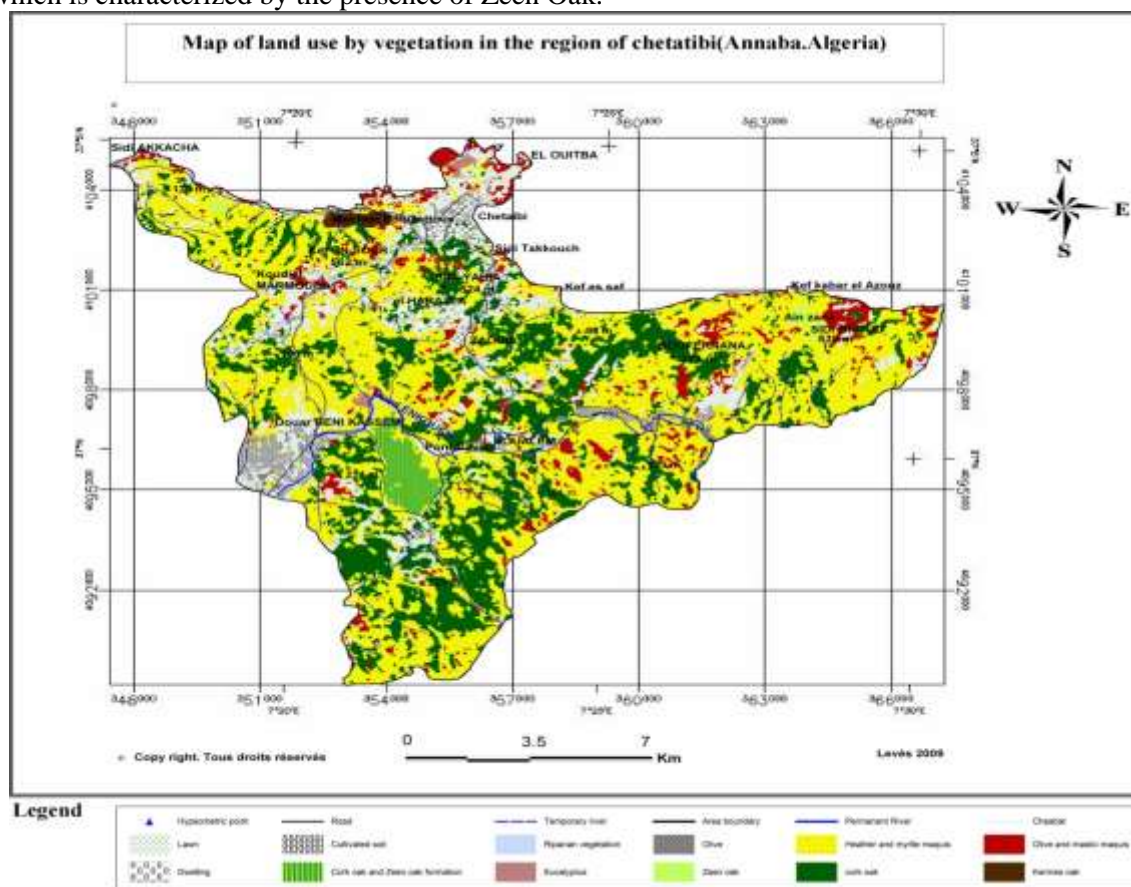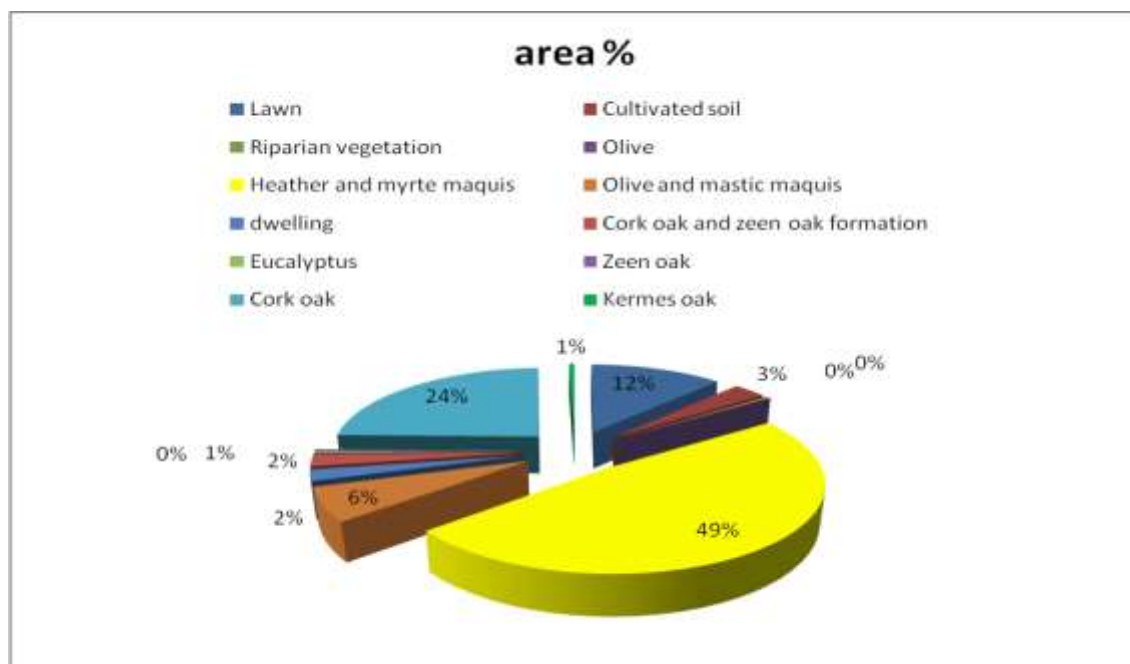

Figure 3. Map of land use in the study area

Figure 4. Proportion of land by different units.

4. Conclusion

The techniques of geographic information system GIS and remote sensing for the treatment of Landsat ETM + satellite images of the area taken in 2000 Chetaibi, supplemented with data from the field have resulted in a land use map by the vegetation of the region Chetaibi . This region is characterized by almost all vegetation which occupies area is formed mainly by group's cork oak and zen oak which localize mainly in the eastern region of the zone. There are also dense maquis of oil-based mastic and other shrubs such as hawthorn, myrtle, arbutus, the Calycotome. The clear formations are characterized by a very dense vegetation cover which is represented by cleared maquis and by plantations. Besides the land- units mentioned above, we could also locate lawns, cultivated land and inhabited areas.

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