Mapping Study of the soil occupation by vegetation in Filfila region (North-east-Algeria)

Author's Details: [(1)]**Merniz N.,** [(2)]**Hadef A.,** [(3)]**Rached-Kanouni M.,** [(4)]**Alatou D.**
Laboratory of development and valorization of plant genetic resources. Department of Biology and Vegetal Ecology, Faculty of Natural sciences and Life, Mentouri brothers University, Constantine.
Corresponding auteur: Rached-Kanouni M.

Abstract
The aim of our work is to map land cover by vegetation in the Filfila region (Skikda, north-east Algeria); in our study, we used aerial photos by ETM + satellite LAND SAT7. The results were used to develop a physiognomic vegetation map of the region (cork oak and zeen oak training, olive tree, dense scrub, clear scrub, culture and urban). The digital terrain model obtained after processing SETM data has established the slope map, 3D presentation, the map displays and map elevations of the study area.
Key words: Vegetation, GIS, Satellite Imagery, Landsat ETM + Land use, Aerial photos

INTRODUCTION

The region of Filfila, is part of the mountains of North-east of Algeria which is characterized by a dense rich and diverse flora from the western part of the country. The management of this rich flora requires a thorough knowledge of the current state of the vegetation, degradation factors and ongoing monitoring of the various long-term ecological changes. This knowledge and these inventories require the choice of analytical methods. Among these methods, the digital mapping is a useful way for in-depth knowledge of the natural resources of the region. The development of a physiognomic vegetation map of the region through the use of geographic information system (GIS) allows us to have the results of large values of the scientific and economic point of view. This study is to implement digital mapping techniques for the treatment of aerial photographs to the geographic information system for the development of a physiognomic vegetation map in the region.

MATERIALS AND METHODS

The Study Area

The region of Filfila is part of a set of mountainous communes of Skikda, it covers an area of 11170 ha. She enrolled the following geographical coordinates: (X: latitude, Y: longitude)

X_1= 7° 11' 30", Y_1 = 36° 55' 30", X_2 = 7° 10' 30", Y_2 = 36° 49' 30" (Figure 1). The climate is typically Mediterranean. The region of Skikda is one of the rainiest of Algeria (800 mm/year); the prevailing winds are from the NW which induces maximum rainfall in NW facing slopes. Its bioclimatic is sub humid, average annual temperature of the region is 12.48°C with an average of the warmest month is above 22.52°C and the coldest month is between 3-7°C. Geomorphology is one of the most valuable elements of the cartographic analysis in the recognition of studies (Tricart, 1978); this is the science that aims to describe and explain the terrestrial relief, continental and submarine. According to Cornet (2002), landforms are never fixed; three factors govern and shape the relief: tectonics, erosion and lithology. He also explains that these forms often evolve imperceptibly (uplift, subsidence, some forms of erosion), but sometimes brutally (earthquakes generate fault scarps, some erosion processes such as landslides). The relief is quite marked with neighboring average altitude peaks of 400 to 500 m, the highest peak of Jebel Filfila itself reaches 630 m.

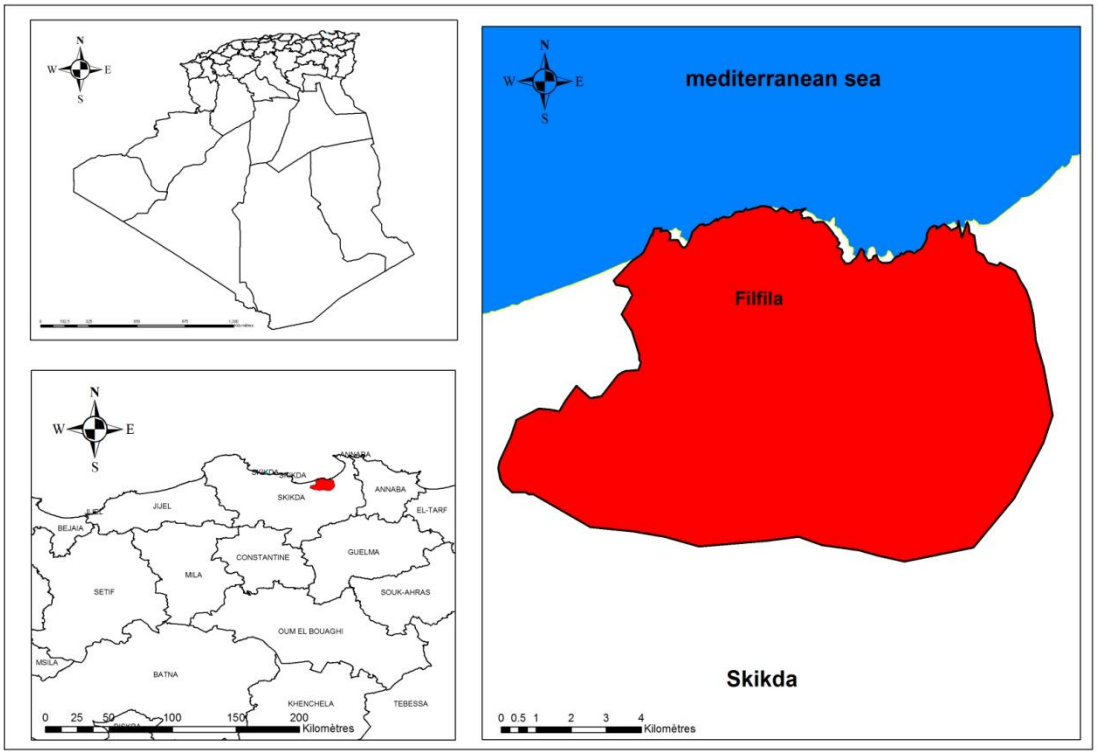

Figure 1: Location of the study area

Data processing

The method used in this study was inspired by the project CORINE Land Cover Europe (CGDD, 2011). A geographic information system (GIS) is a system for the acquisition, storage analysis, and display of geographic data (Polidoro *and al*., 2010; Heshmati *and al*., 2013; Madad *and al*., 2013;). These practices cover the geomantic processing activities and dissemination of geographical information. Representation is generally in two-dimensional (2D), but a 3D rendering or animations showing temporal variations in a territory are possible. For the establishment of our maps, we have integrated in the GIS topographic map data, aerial photos and field data (Madad *and al*., 2013; Hadef *and al*., 2014).

In this study, our approach has four objectives:

- Map the physiognomic units of vegetation (habitats) of Filfila from digital processing of aerial photos;
- Characterize the surface conditions present in the physiognomic units of the study area and determine the cases studied through the processes and factors of evolution of these environments;
- Determine the forms of degradation that affect the landscape based on a reading of the colored compositions;
- Allow greater efficiency on the mapping and monitoring of changes in the natural environment. The cards will be useful to decision makers, such average disposed of accurate and timely information for the management and protection of natural resources.

All the steps followed for carrying out two cards of this work are shown in Figure 2.

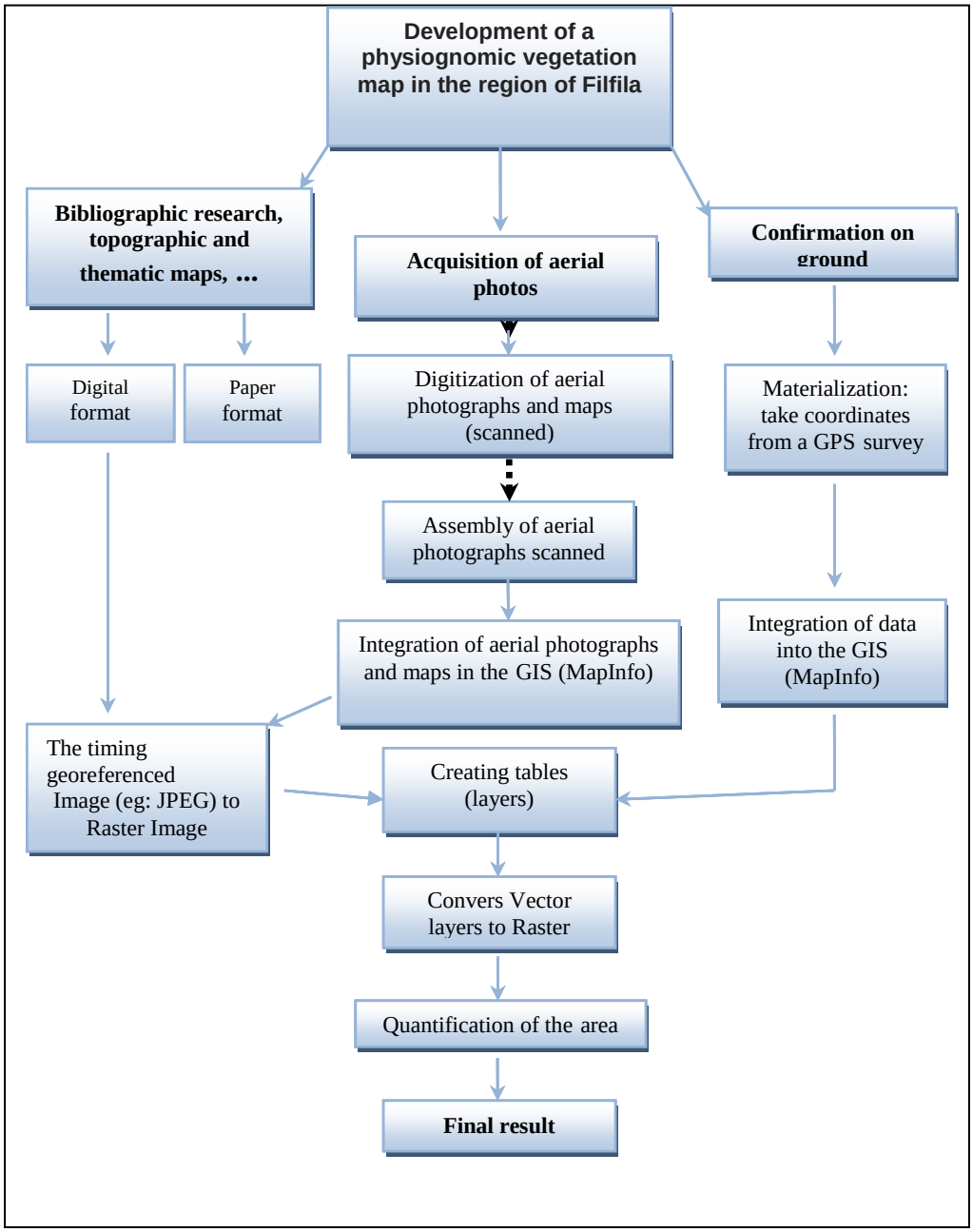

Figure 2: Flow chart of steps for processing land use maps.

RESULTS AND DISCUSSION

According to the map, we note that the Filfila region is characterized by the presence of several land use units (Figure 3):
- Nearly two quarters represented by scrub oak and heath (2781 ha) and the oak forest (2379 ha).
- 20% are represented by the fire area (2177 ha).
- 518.6 ha are occupied by dense scrub, 48.2 ha by degraded scrub, 294.5 ha by cork oak, 173 ha oak zeen and 228.9 ha by cork oak bouquet.
- About 14% are occupied by other recoveries (Olive tree, Reforestation ...).

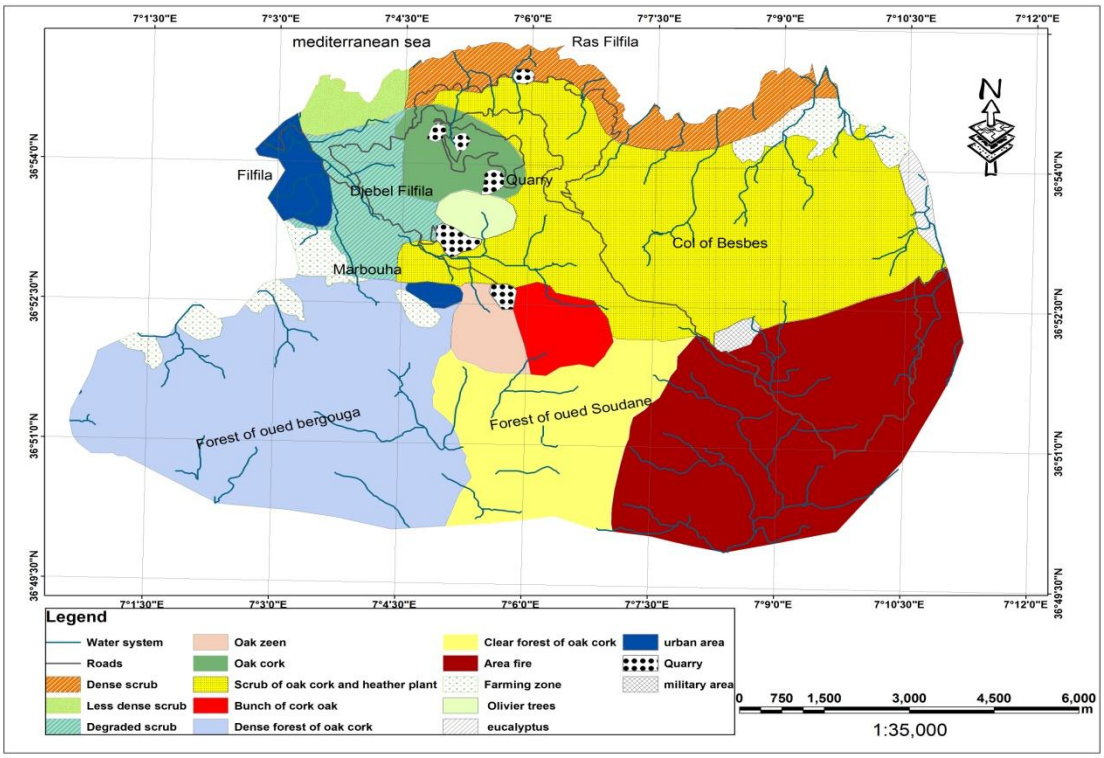

Figure 3: The land use map by vegetation in the Filfila region.

The Digital Terrain Models are necessary data in many application domains covering Planning, Environment, Hydrology, Telecommunications, Defense, and Communication. For reasons of availability, our choice was focused on the SRTM (Shuttle Radar Topography Mission). This mission provides, Models of Digital free and accessible from the Internet field. Data provided by NASA are raw data and have not benefited from the correction treatments that are a necessary step in the creation of maps derived from the DTM, for that we will make a SRTM data processing to achieve useful MNT drawing maps. A presentation in 3D dimensional (3D view) of the study area is made in addition to already developed cards; this approach is by draping the satellite image of the study area on the digital terrain model, this step is done by the ArcGIS software via the module "Topographic". Also a Spatio-map of Filfila of the region was conducted in this study.

The Filfila region consists of heterogeneous topographic units (Figure 4), ribs vary more or less depending on whether one is plain (90 to 190m), the foothills (460m vicinity) or in the mountains. The maximum altitude reached up to 659 m (river forest of Bergouga), 586m (Djbel Filfila) and 467 to 543m (Wadi Forest Soudane). The distribution of vegetation is conditioned by altitude; so the cork oak forests are between 90 and 600m underground and low altitude.

Map of slopes of the Filfila region has identified the different classes of the slopes in the study area (Figure 5). The terrain is a mix of value inclinations to characterize the different classes of the slopes; it plays a role in defining the potential and constraints of the physical environment. According to Stewart (1974), the slope is very important for its stiffness, it determines the stability of the soil and water retention. Lepoutre (1963) indicates that the slope facilitates runoff and soil erosion, and accumulation of deposits in the funds and can play a key role in soil formation; also Polunin (1967) notes the importance of its influence on water and temperature conditions. Note that a broad band covering the northern part of the area, with slopes greater than 50%. By cons in the Southeast part of the slopes are between 13% and 25%. The class between 0% and 4.5% is low; it is in the southwest of the area. Map of Filfila exhibition allows us to know the different exposure to the area; the exposure of slopes determines the distribution of vegetation (Figure 6). Development of a Spatiomap of the study area provides a map that shows the actual state of the soil surface with natural colors. The development of a 3D presentation of the study area allows us to see the different geomorphological landforms study and interpret the distribution of vegetation (Figure 7).

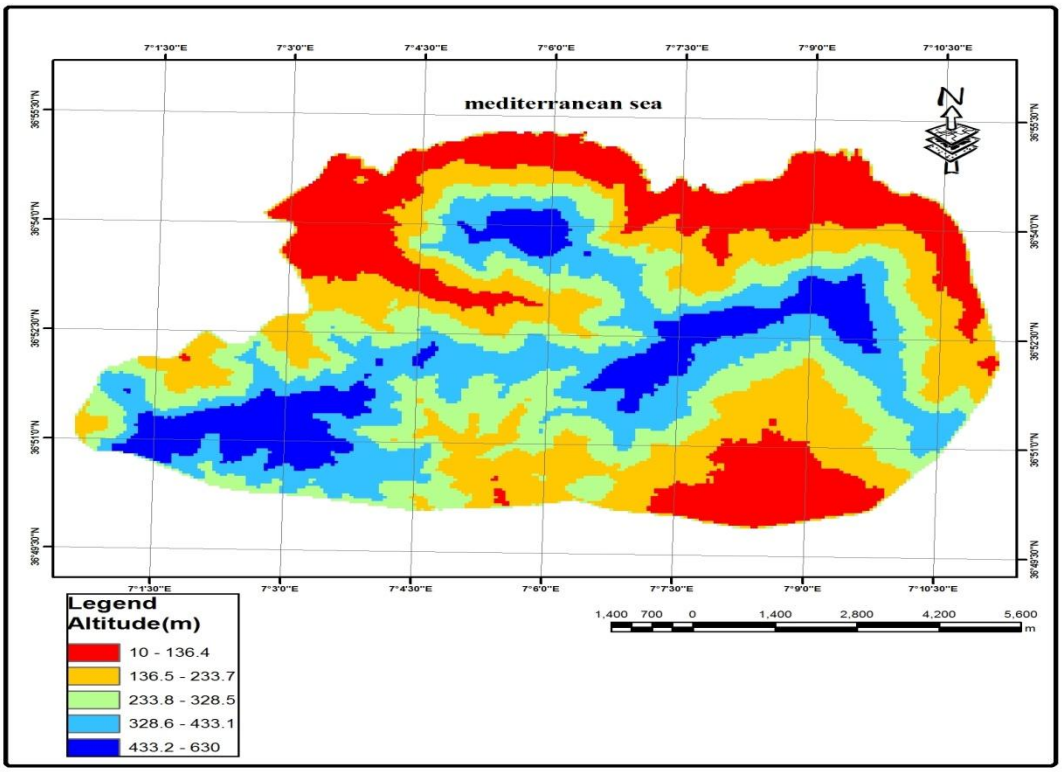

Figure 4: Altitudes Map

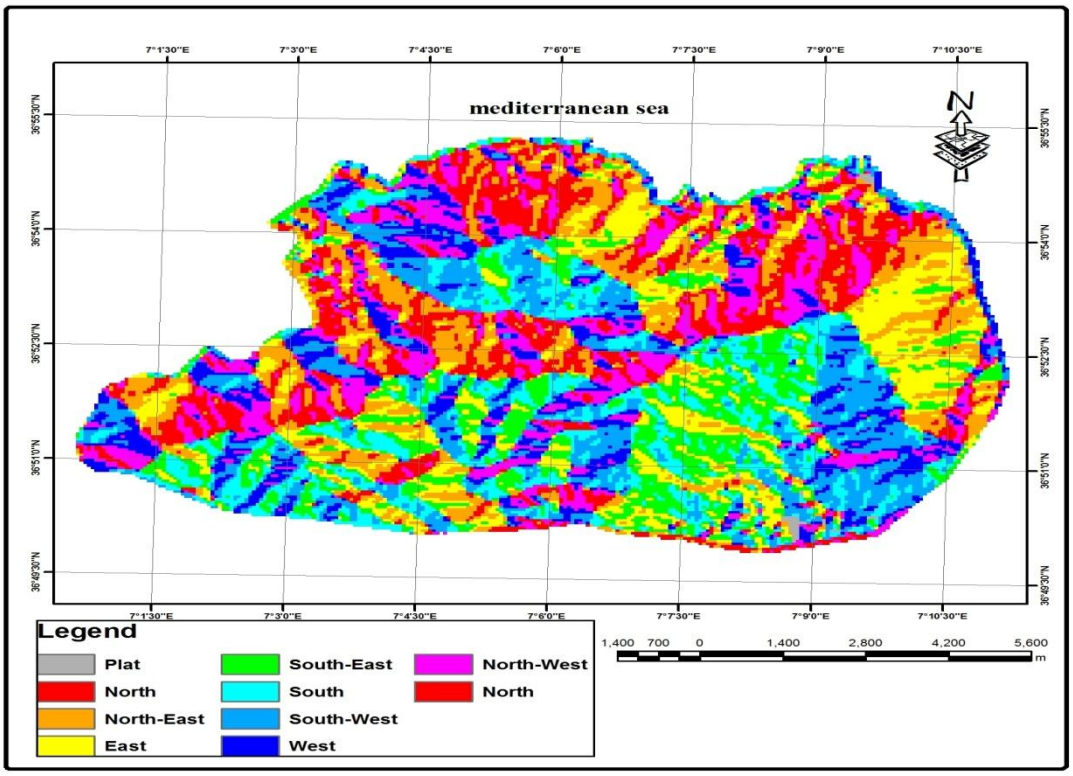

Figure 5: Exhibitions map

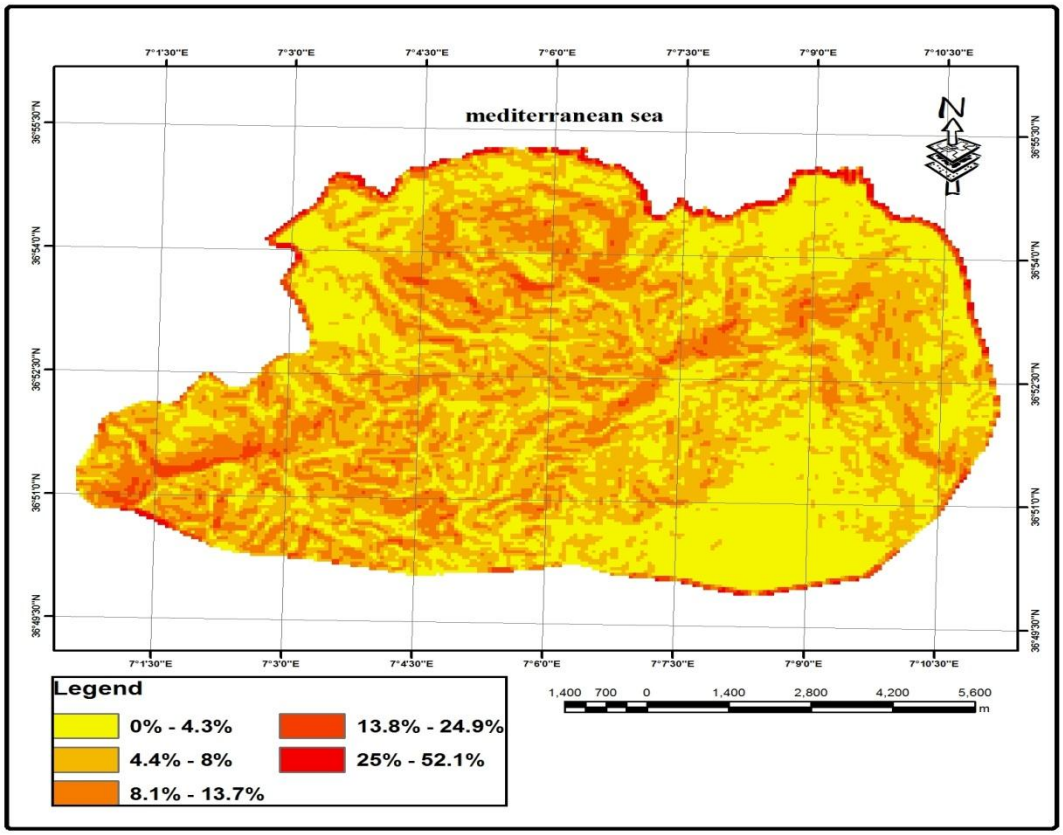

Figure 6: Slope map

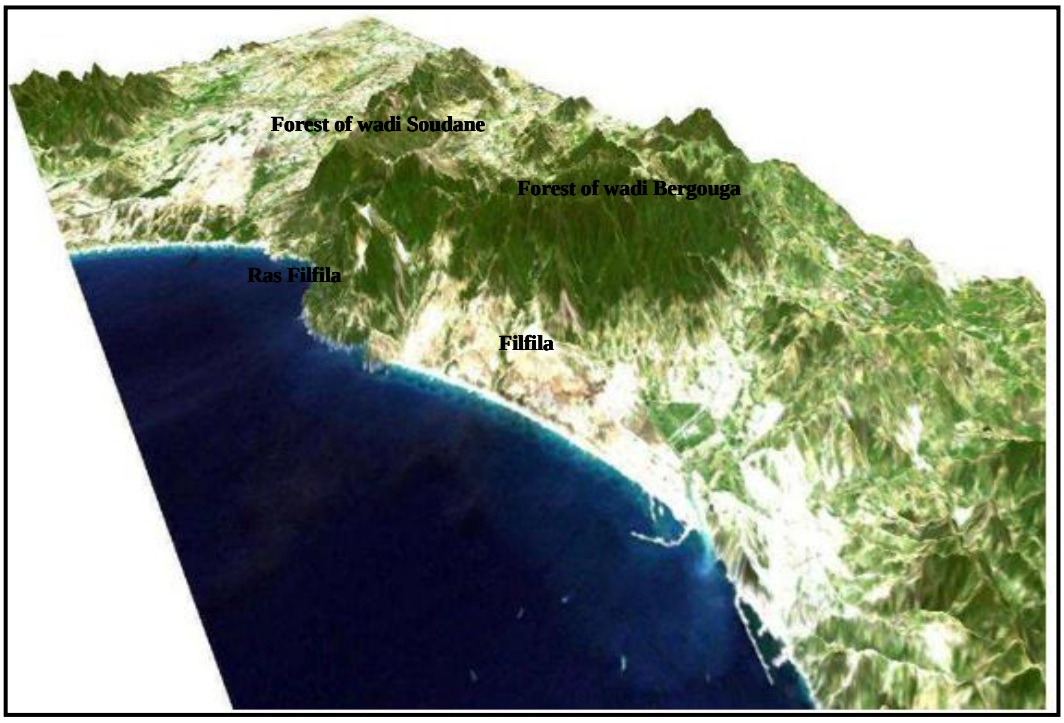

Figure 7: 3D Presentation

CONCLUSION

The techniques of geographic information system (GIS) used for the treatment of aerial photographs of the area Filfila, supplemented with data from the field, allowed to obtain a land use map the vegetation of this region. This region is characterized by a canopy which occupies almost the entire area; the grouping of the cork oak is answered in the zone. There are the dense scrub of oleo-mastic, heather and myrtle. There are also clear formations represented by degraded scrub. Besides the occupation of the ground units mentioned above, one could also locate the cultivated areas and urban areas. Thus, the processing performed by the techniques of GIS markings on SRTM data yielded the digital terrain model DTM, which was the basis for the achievement of various thematic maps of the study area (slope map, exhibition map, altitudes map and of the hydrographic network map). Finally,
we can say that the use of new techniques of mapping can make studying easier of vegetation and detect all changes are taking place.

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