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Use of Data of the Remote Sensing for Spatiotemporal Analysis Land Use Changes in the Eastern Aurès (Algeria)

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***Abstract*—**Aurèsregion is one of the arid and semi-arid areas that have suffered climate crises and overexploitation of natural resources they have led to significant land degradation.

The use of remote sensing data allowed us to analyze the land and its spatiotemporal changes in the Aurès between 1987 and 2013, for this work, we adopted a method of analysis based on the exploitation of the images satellite Landsat TM 1987 and Landsat OLI 2013, from the supervised classification likelihood coupled with field surveys of the mission of May and September of 2013.

Using ENVI EX software by the superposition of the ground cover maps from 1987 and 2013, one can extract a spatial map change of different land cover units. The results show that between 1987 and 2013 vegetation has suffered negative changes are the significant degradation of forests and steppe rangelands, and sandy soils and bare land recorded a considerable increase.

The spatial change map land cover units between 1987 and 2013 allows us to understand the extensive or regressive orientation of vegetation and soil, this map shows that dense forests give his place to clear forests and steppe vegetation develops from a degraded forest vegetation and bare, sandy soils earn big steppe surfaces that explain its remarkable extension.

The analysis of remote sensing data highlights the profound changes in our environment over time and quantitative monitoring of the risk of desertification.

***Keywords*—**Aurès, Land use, remote sensing, spatiotemporal.

I. Introduction

THE oriental Aurès is formed by a mountainous ecosystem of the Atlas Saharan and the steppe ecosystem of the south. The agro-ecosystem Mountains are almost in a state of advanced degradation of the effect of human pressing: deforestation in adapted plowing on steppe slopes, overgrazing, and overexploitation of groundwater [3], [8]. And high Algerian steppe plains regions are essentially pastoral vocation [6].

Gather information about land cover changes is fundamental for a better understanding the relationships and interactions between humans and the natural environment, remote sensing data have been one of the most important data source for studies of land cover spatial and temporal changes, in fact, multi-temporal remote sensing datasets, opportunely processed and elaborated, allow to map and identify landscape changes, giving an effective effort to sustainable landscape planning and management [2],

The studies on the change in the land occupation, are very important because they allow to now the current trends in processes of deforestation degradation desertification and loss of biodiversity of given region [4], [7].

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II. Area of Study

The part of Auras is distinguished by three geographic zones between: Talienscenery: zone of height mountain good aroused and boiled located in west it's an oriental part of mountains of Auras [5]. Pay sages of height heels: located in the north part of the study zone, they are semi-arid serialized height plains of pastoral activity they are mounts strip localize erode on mounts of NEMEMCHA IN THE EST Stepped pay sages: they are characterized by the predominance

Pre-Saharan pay sager: located in South region the oasis (SIAR.KHIRANE.ELOULDJA/ some remounts of Saharan Atlas, and low hills of ELMEITA and OUAZERN.

It is characterized by its pastoral agro forestry vocation where the agricol surface represents 23 percent, the forests represent 8percent and the steppe represents 22percent.

The climate of Aures oriental is continental type in north and almost in south; the winters are very harsh; the summers are hot and dry. The bioclimatic floors spread of subsumed to semiarid [1].

The soils are poor and less deep except in north where the ground is relatively deeper, also the rock sea outcrops.

The vegetation covert of the area is composed of two types the forest cover in north, its covered by upstream to downstream with the cedar, the green oak, the Aleppo pine, the Phoenician juniper, in the south area, the vegetation is formed by the steppe routes and Saharan, the principal species met are the Alfa and worm wood [1].

III. Material and Methods

Our approach is based on the use of remote sensing data to realize our diachronic analysis; we chose 4 satellite images, Lansat taken on 09 May 1988 and 16 June 1987 (sensor thematic mapper TM, the 17 April 2013 and the 15 June 2013 (Sensor operational Land imager OLI. They are all acquired during the dry season, or we can distinguish deferent kinds of land.

In order to use images of remote sensing in the treatment and analysis, we followed three principal stages: pretreatment

images, supervised classification and development of evidence of land used changes; this gait is represented by Fig. 2.

Fig. 1 Geographic situation of study region

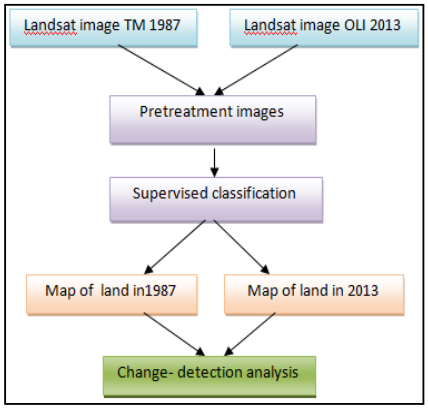

Fig. 2 Methodological flowchart

IV. Results and Discussion

The analyses of statistics data extract from the card of change of the occupation of land between 1987and2013, illustrate the evolution of each unity in time and in space by rapport with other units, and give pay sager dynamic of every unit of land occupation, which permits to determine the change in time and space of all units of land occupation.

A. Units of Forests

For the occupied surfaces by the dense forests (DF) had submitted to important changes, where they passed 44,681,31 ha in 1987 to 13612,5 ha in 2013,11,63 7ha remains without changes, and half of this surface (27,669 ha) had degraded because climate effects of clear forests, and 380 ha in form of steppes, the human involvement in the dense forests by works of fresh which transforms 3,483 ha and 1,276 ha into successfully gardening and cereal culture.

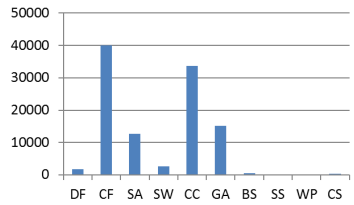

Fig. 3 Dynamic changes dense forests between 1987-2013

The surfaces occupied by clear forests (CF)were also submitted significant changes, the regression of clear forests operates under the effect of an increased human pressing, which degrades its surfaces from steppe to Alfa, steppe to worm-wood, gardening, cereal culture, bare land and sandy land successfully of 12,62 ha, 2608 ha, 3,3642 ha, 15,172 ha,

574 ha and 174 ha, and for the constant surface is represented in 39,995ha.

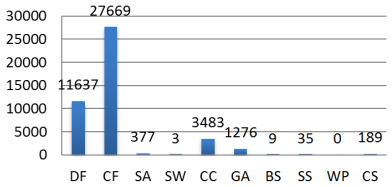

Fig. 4 Dynamic changes clear forests between 1987-2013

B. Units of Steppes

Steppe to Alfa (SA): The steppe zone of Alfa groups has registries a decrease over than from 11,59 percent in 1987 to 8,91 percent in 2013, a decrease of 2,68 percent. This degraded zone is divided to all the units of land occupation, where the unit of cereal culture represents the most important unit which appears by this degradation by a square of 57652 ha, and 18612 ha, 9942 ha, 6565 ha, successively degraded toward Sarm, Mar and bare soil and 66292 ha remains constants without changing, and 5082 ha changed to clear forests thought the last reforestations realized by the agents of forests and about changed surfaces into the dense forests represents the old reforestation.

Steppe to Worm-Wood (SW): The square covered by the steppe to worm-wood new a considerable regression about two times, a square of 124,180 ha remains without change, a square 4,108 ha in North of the study zone transformed to chott and sebkha square of 12455 ha became steppe to Alfa and square disappearance of 38,254 ha, 4,112 ha, 192,803 ha, 87,224 ha which transformed successively into cereal culture, gardening, bare soil and sandy soil.

C. Units of Bare Soils (BS) and Sandy Soils (SS)

The bare soil registries an important extension passed from 15,65 percent in 1987 to 26,73 percent in 2013,this extension is added by the degradation of the forester vegetation and stepped vegetation, squares of 583 ha as forests, 48,265 ha as cerealiculture, 6,565 ha as Alfa, 87,224 ha as worm-wood added to units of bare soils, a square 129,311 ha are not submitting to changes, a square of 3.225 ha is transformed to chott and sebkha and square of 16.950 ha, and 278 ha were changed to cultivable lands and50,400ha to bare lands become sandy zones which touch the south zone of commune of Babar. The unit of sandy soils new an important increase of 12,69 percent, squares of 48,265 ha as cereal culture, 12,786 ha in Chott and 87,224 ha in worm-wood are added during this period to sandy soils and a square of 98,797 ha sandy lands remains without changing and squares of 6,074 ha and 4,278 ha became successively cereal culture and Chott and Sebkha.

D. Units of Gardening (GA)

The occupation by the gardening had submitted to a change of 2 percent of increase between 1987 and 2013, a surface of 5,328 ha don't change, desperation of surfaces transformed to clear forests (3,425 ha), in steppe to Alfa (1,383 ha) in steppe to worm-wood (663 ha) in cereal culture (5,777 ha) in chott and sebkha (431 ha) surfaces added by the unit of cereal culture (11,174 ha) dense forests (1,276 ha) clear Forests (15,172 ha).

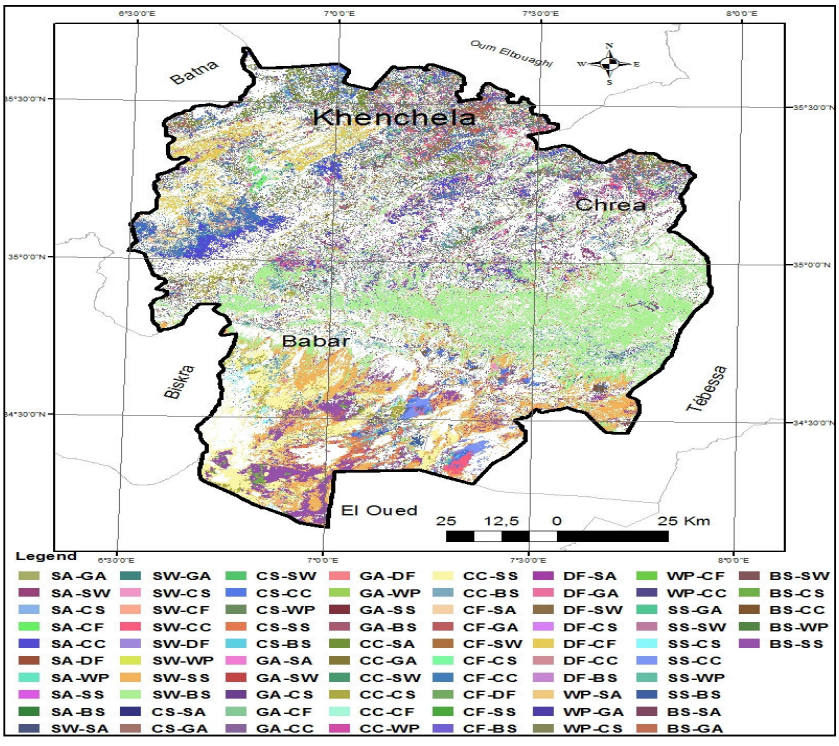

Fig. 5 Map of changing land cover units between 1987 2013

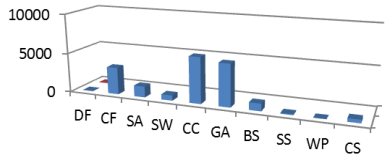

Fig. 6 Dynamic changes in gardening between 1987-2013

E. Unit of Cereal Culture (CC)

This unit has exposed to spatial changes by the principle of fallow, from one side and the other side the new lands exploited in the south of commune of Babar, the increase of this unit added by the bare soils (16.950 ha) the steppe to worm words (33 642 ha) dense forests (3 483ha) and clear (33642ha) a surface of 97183ha do not change from the anterior surface of cereal culture and a disappearance of the areas that transforms into 2.527 ha of woodlands in the form of reforestation 31.729 ha steppe alfa as protected steppes, gardening 11.174 ha, 32.048 ha of bare soil, 48.265 ha sandy soil and 14. 923 ha and Chott Sebkha.

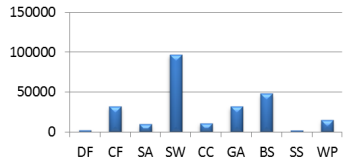

Fig. 7 Dynamic changes in gardening between 1987-2013

F. Unit of Water Plans (WP)

A surface of 02 ha remains without changing desperation of surface in clear forest (18 ha) in steppe to Alfa (1 ha) in cereal culture (2 ha) in gardening (19 ha) and as chott and sebkha (1 ha). Surfaces are added to 61 ha. Of bare soil 25 ha in steppe wormwood, .3 ha in steppe to Alfa and 134 ha in cereal culture.

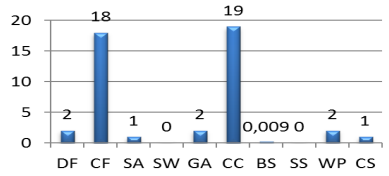

Fig. 8 Dynamic changes in water plans between 1987-2013

G. Unit of Chott and Sebkha(CS)

The unit of chott and sebkha new a square of 1.685 ha without changing and let the place 12.786 ha to sandy soils and win a square of 14.923 ha of the unit of cereal culture.

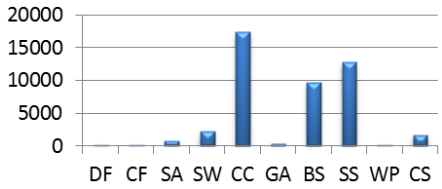

Fig. 9 Dynamic changes in chatt and Sebkhabetween 1987-2013

V. Conclusion

The issues of earth observation satellites by the radiometric characteristic of detected lands in the arid and semi-arid zones have a big importance in the quantitative follow of desertification by the quantification of the degraded zones.

Following those numbers, we can say that the detection of temporary and spatial changes of occupation units of soil between 1987and 2013 were beneficial to follow the land vegetation evolution, this detection was cartographic the zones touched by the deforestation the enablement and the anthropisation.

The obtained results constitute a contribution to the localization of degraded zones of vegetation and the zones touched by the hydro stress besides this the extension of sand and the bare soils those results give us on precede alert for the desertification.

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