



DIGITAL EMULATION OF VEGETATION CHANGE IN THE DISTRICT OF SAWIRA BETWEEN 1996 AND 2016 BY APPLICATION OF NDVI & TI IN RS & GIS TECHNIQUE IN IRAQ

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Abstract

The spatial classification and analysis of the Sawira region resulted in the identification of land cover species over two decades. And the identification of vegetation and the designation of the geographical area for extension in the region using Plant context index or vegetative directory (NDVI) And index the heat (TI) In the spectral thermal packets of bits t artificial (Landsat / Sensors TM5-7, ETM + 7, LC8), Which revealed a spatial change characterized by shrinking vegetation cover between the base year 1996 and the year 2016, which necessitates research into the factors that contributed to the occurrence of this change, especially the changes in climatic conditions, activities and human uses, which reflected negatively on the local environment of the study area and Adjacent to the regions, which requires working hard to develop effective solutions to address the decline of vegetation.

Keywords: Digital Emulating, vegetation change, Sawira district, NDVI, TI , RS, GIS.

Introduction

The study of vegetation in an area and the control of changes occurring within a specified period of time is a necessary to stand on the direction of those changes and consequent processors, if it was a negative trend pointing towards declining agricultural areas without an increase in the quantity of production and including the For every phenomenon on the surface of the earth is reflective and different emission energy so it can monitor radiations to see the direction of the changes in these phenomena, and the fact that geography is the most scientific interest in different land coverings, it was a great need to use modern technologies have the potential to collect And data collection on phenomena and uses In real time and provide accurate information their region, Which contributes to reducing the time, effort and cost and allows great accuracy in the work and the establishment of a digital database can be updated continuously, and these are the most important tasks of techniques the remote sensing geographic information systems so it has the initiative to be used In the study of all types of land cover, particularly vegetation by employing many of the indicators that provide those techniques and perhaps the most important indicators (NDVI & TI), and therefore the change of vegetation in the district of Sawira was chosen as a topic of application.

Research Purpose: The research aims to test the possibilities offered by technology Table in the conduct of the graver spatial modeling for that vegetation change in the district of Sawira between 1996 and 2016.

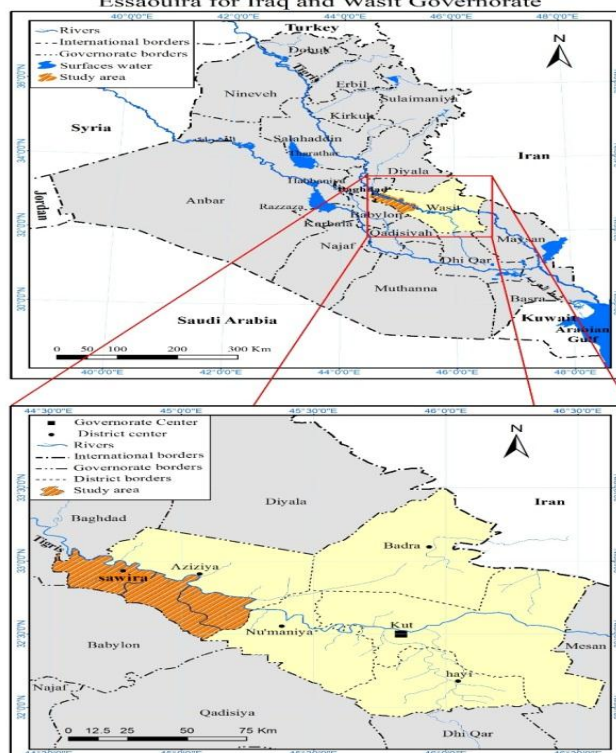
Research limits: Confined spatial boundaries to look to spend Sawira located in the north-west of Wasit province , eastern Iraq, bounded on the north - western province of Baghdad and the north-east and east and spend Aziziyah southeast spend Numaniya and from the south-west and west province of Babylon, The district of Sawira extends between two showrooms 32.25 – 33.10 North and arc length, 44.30-46.40 East, Map (1), consisting of three administrative units Sawira spend hand center Aahamah and hand Zubaydiah occupies an area (1480) km² and compose what proportions

rate (8.63%) of the total area of Wasit province, for the rate (17 153) km², And it occupies the ratio of (0.34 %) of the total area of Iraq (434128) km², Map (2) and Table (1), While the temporal boundaries of the research were represented by two years (1996 and 2016).

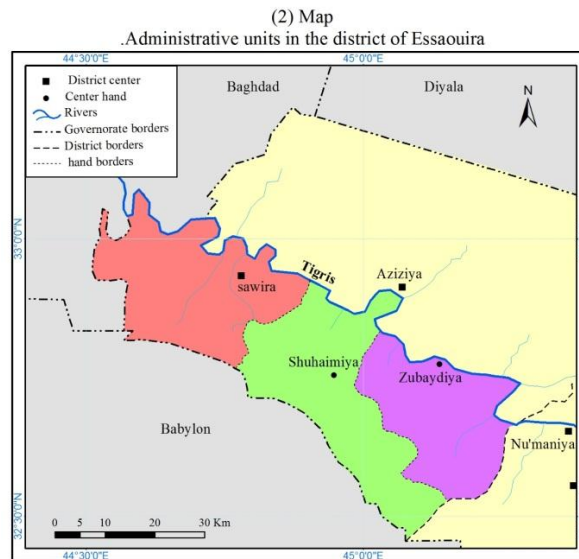
Material and Methods

It was approved research on the geographical descriptive approach enhanced way of quantitative analysis and drawing on statistical methods provided by Remote sensing techniques RS And geographic information systems GIS.

(1) Map
The geographical and astronomical location of
Essaouira for Iraq and Wasit Governorate



Source : General Authority for Survey, Digital Maps Production Division MPD, Administration Map of Iraq, Scale 1/1000000 And administration Map of Wasit Governorate , scale 1/500000 Baghdad , 2015



Source :Researcher, relying on General Authority for Survey,Digital Maps Production Division MPD, And administration Map of Wasit Governorate , scale 1/500000 Baghdad , 2015

Table 1 : Administrative units in the district of Sawira

Percentage %		Area 2 km	Administrative Units
34.3		508	Sawira District Center
36.5		540	Aahamah hand
29.2		432	Hand Zubaydiah
100%		1480	Total Judiciary
8.63 %	Percentage of the judiciary from the governorate	17153	Total of Wasit Governorate
0.34%	The percentage of the judiciary from Iraq	434128	Total Iraq

Source : map (2).

Software & Data Used in Research

I. Programs : tune from large winding techniques of remote sensing and GIS systems from T. digital folk As a whole on the survey and the registration and entry management, retrieval, analysis and processing The satellite data represented for terrestrial data , Can carry out all of these processes by the use of specialized software , The research was adopted two programs for this purpose are as the following steps :

1. Program ERDAS IMAGINE 14 : This provides the set of tools program for processing and analysis of satellite visualization artificial and classification of this visual classification prompt classification is not directed as well as the breakdown, has used this program to cut off the study area of the space visualization and image-building complex with conducting optimization and processing of digital classification with operations Identifying areas of each category, and then deriving Class vegetation of her and extraction spaces of all items and stored body tables Shape File Export For righteousness n the following program.

2. Program ARC GIS 10.4 : This program builds the data base Digital conversion and data space existing body Raster To a body Feature And the analysis of her B application of statistical treatments by then make the modeling of the mechanism And its mapping representation. II. Sources of information: The research relied on a number of sources and data which are all of the following :

1. Maps : T counting maps tributary the first to carry out work and make a comparison between the availability of space resources with what exists on the ground, has used a set of maps related to the topic of research, such as administrative maps and farmers yeh and another soil maps Table (2), contributed of administrative maps to locate the study area for Iraq and to shed light on the administrative divisions spaces, and used the agricultural maps to comparing the geographic distribution of agricultural areas with what is shown in the space views used in the research.

2. Climate data : Climate elements are the most important factors Affecting the plant cover through the ether to change the distribution of plant species and density (2), and indirectly affects perhaps through interaction with other geographical characteristics, and have been relying on the data station Aziziyah to learn about the nature of the climate in the study area, and shows the climatic data analysis contained in the table (3) A clear changes In the direction of climatic elements towards drought.

3. Space data : Two generations of US satellite imagery were adopted Landsat They are visible TM Landsat The sixth generation taken on 16/8/1996 specialist in thematic maps derivation, multi - spectral firmly and accurately discriminatory amounted to (10 meters) with the exception of sixth - resolution package (30) meters, visible LC Landsat Eighth taken generation on 16/8/2016, which was added to the spectral.

Table 2 : Maps used in search.

Scale	Year	Producer	Type	Title
1/1000000	2015	Ministry of Water Resources, the public has created its space, the production of the Cartographic Section, the digital unit MPD, Baghdad.	Administrative	Iraq Maps
1/500000	2015	Ministry of Water Resources, the public has created its space, the production of the Cartographic Section, the digital unit MPD, Baghdad.	Administrative	Wasit Governorate Maps
1/1000000	1968	Flayeh Hassan AL-Taie, Section of Soil Survey and Land Classification Ministry of Agriculture Baghdad, Iraq	Soil	Soil Assoclathons Map of Iraq
1/100 000	1996	Ministry of Agriculture, Wasit Governorate Agriculture Department, Department of Statistics, Wasit	Agricultural	Maps of Sawira

Source : From the work of the researchers.

Table 3 : The properties Aziziyah station Climatic conditions

2016	1996	Characteristics
32	26.1	Annual average temperature (m)
3.73.7	3.5	Annual rate of wind speed (m / s)
44	46.3	Annual Relative Humidity (%)
112	127	Total annual rainfall (mm)

Source : Iraqi Meteorological Organization, Climate Section, unpublished data.

packages working on measuring ground - looking three - dimensional with the spectrum package under the blue (violet) to measure humidity as well as division the thermal package to two packages, although the reason for choosing both visuals of the summer is that vegetation is more effective and activity in terms of the context of plant, the known that soil moisture interfere with the cover of the plant causing the lack of clarity in defining this cover, which reduced the accuracy of the classification.

Results and Discussion

Department of research on two subjects preceded by an introduction , Cared first topic to land cover classification to spend Sawira , And the second topic focused on the statistical application and spatial modeling of the index NDVI And TI , And concludes the research with a set of conclusions and proposals and a list of margins and sources .

The first topic : Classification of land cover for the Sawira district

The classification process is the first stage of the separation of land cover components, and by which the visual analysis of the principled Mvsolat that cover between the base and comparison, and it will support research oriented classification Supervised Classification For the space data for the two years as follows:

First: Classification of land cover for the Sawira district in 1996

The ground cover consists of the components of the geographical theater. The classification process for the study area produced four main categories, as in map (3) and table (4) are all of the following:

1. Water cover : Includes water bodies scattered in the study area of the River Tigris and its branches and irrigation and drainage projects , small lakes and areas flooded seasonally, as well as humid lands, and appeared in third place in terms

of area as occupancy amounted to (374) km² and represented (25.28 %) of the region's total land cover this year.

2. Vegetation cover : includes both natural and agricultural plants that are rich in the study area, and include trees, shrubs and grasses that extend along the banks of the Tigris River and its branches and cane and berry plants, as well as desert plants that spread in different areas, and plantations are located in the region, such as varieties of horticulture grains and vegetables and data and industrial crops and fodder have vegetation came in second place in general as (496) km² had most of the area and the percentage of (33.51%) of the total area of land cover in the region this year.

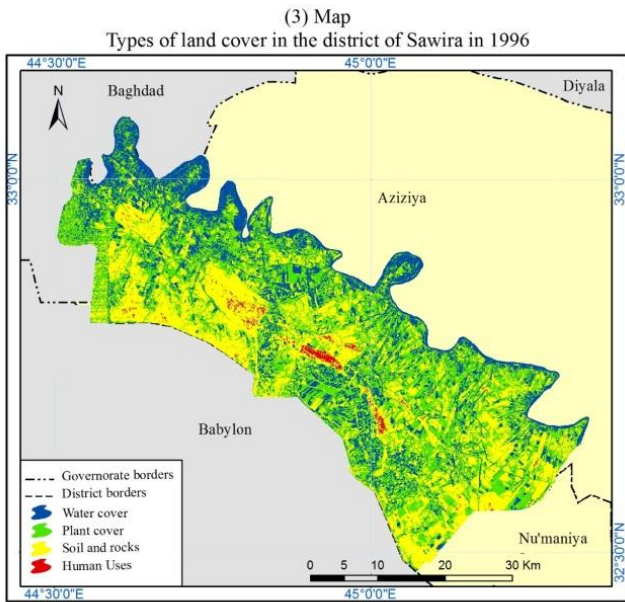
3. Soil and Rocks : This cover consists of land that is either arable or unsuitable, as well as rocky finds. It occupies the first place in terms of the covered area, which is estimated at (521) km², which constitutes 35.20% of the total land cover of the are in this year.

4. Human uses : All uses include the areas of settlement, road transport, administrative, industrial, commercial and service centers , and all the facilities related to human use. It was ranked fourth and final on a total area of (89) km² and (6.01%) of the total area of land cover in the region this year.

Second : Classification of land cover for Sawira for 2016

The classification of the area of study for this year has been carried out according to the previous classification procedures. The change in the areas of land cover types as shown in map (4) and tables (5) and (6) as follows:

1. Water cover : An obvious change in the area of this cover and rate dropping to (322) km² and (21.76%) of the total land cover for the region this year, and the record so negative change in an area of (-52) km² and by rate (- 3.52 %) than in 1996.



Source : Researcher based on satellite image Land Sat 6,Spatial Resolution 10 metar,1996

Table 4 : Osna land cover in Sawira to spend for the year 1996.

Percentage %	Area km ²	Product
25.28	374	Water cover
33.51	496	Vegetation
35.20	521	Soil and rocks
6.01	89	Human uses
100%	1480	Total Judiciary

Source : Map (3).

2. vegetation : an area of this cover dramatically decreased as the draw area (403) km² of (27.23%) of the total area of land cover in the region this year, showed the largest area of negative change on the level of the rest of the varieties of land cover in the region, which amounted to (-93) km² and (-6.28 %).

Table 6 : Categories of land cover change to spend Sawira between 1996 and 2016

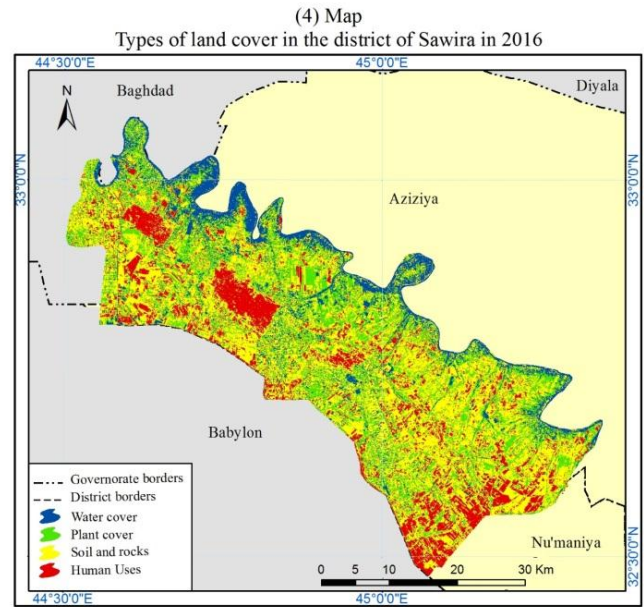
Percentage change	Area of negative change km ²	The class	Percentage change %	Area of positive change km ²	Product
6.28-	93-	Vegetation	6.56	97	Human uses
3.52-	52-	Water cover	3.24	48	Soil and rocks
9.8-	145-	Total	9.8	145	Total

Source : Tables (4) and (5).

4. Human Uses : Increased area of (186) km² and by (12.57%) of the total area of land cover in the region this year, consisting of a positive change in an area of (48) km² and the ratio (3.24%).

Can be seen from the above that human Alastamlat came in first place in 2016 in terms of the increase in the area shows that it jumped to more than double the area they were in 1996, followed by a land of black of soil and rocks in the second place as the cadastral increase of For both of these classes (145) km², which is quite equal to the area of lost vegetation and tow covers for the same period, which confirms that the population increase and urbanization comes the introduction causing the change factors in the areas of varieties of land cover, especially after 2003, as well as other climatic factors that oriented drought which affected the plant And the political situation in the nineties as Iraq was

3. Soil and rocks : total area of this category (569) km² of (38.44%) of the total land cover for the region this year, and thus experienced the highest increase among the rest of the items reaching to 97 km² percentage (6.56%).



Source : Researcher based on satellite image Land Sat 8,Spatial Resolution 10 metar,2016

Table 5 : Osna land cover in Sawira to spend for the year 2016.

Percentage %	Area km ²	Product
21.76	322	Water cover
27.23	403	Vegetation
38.44	569	Soil and rocks
12.57	186	Human uses
100%	1480	Total Judiciary

Source : Map (4).

suffering from an economic blockade, which made the state adopt an encouraging policy for agriculture.

The second topic : statistical application and spatial modeling of the index NDVI And TI

The classification of land cover for 1996 and 2016 determined the geographical distribution of vegetation cover and the amount of change in area between the two years, but did not explain the effect of this change on the characteristics of vegetation cover, especially the density and the impact of drought,

Using the techniques of (RS) and (GIS) and its applications for spatial modeling of this cover, providing a set of statistical indicators that are useful in assessing the safety and degradation of vegetation as the index of vegetative variation NDVI And dry indicators DI Such as thermal index TI , And the Plant Status Index VCI And

Phytosanitary Index VHI, and the biological cortex index CI And irradiation ratio IPVI And the modified vegetative index of soil OSAVI .

The index of variation The vegetable NDVI Most commonly used to measure plant mass, the spectral domains used for this indicator are the fourth red channel Red) And the nearby fifth infrared channel Near infrered), And the image resulting from the application of the equation of this indicator describes the condition of vegetation, showing high reflectivity in white, and the density of the plant and vitality of the value of the value NDVI* The index value is calculated according to a special formula TI P depends on the actual value of the scope of thermal radiation remote (BT) And the highest and lowest value and according to a certain equation ** shows the thermal stress of the plant (3) The two indicators were used and the result was as follows :

First: Measuring the condition of vegetation in the district of Sawira in 1996.

Clear from the map (5) and tables (7) and (8) plant coverage and density categories of vegetation cover in the study area as visible this year, as well as moisture content categories xerotica and stress suffered by the plant as it emerged in the region three categories as follows :

1. Rich vegetation cover : This category includes perennial trees of natural plant species, horticultural crops and vegetables of the agricultural variety, and is the most dense in terms of vegetation NDVI Which amounted to (more than 0.40) , but ranked second in terms of area it covered an area of (135) km² and percentage (27.22%) of the total vegetation cover in the region this year, and the content of moisture it is (more than 40%) They are therefore in the category of mild dry stress.

2. Average Plant cover : such Class B shrubs and grass that stretches on the banks of the Tigris River and its branches and reeds and papyrus plants as well as field crops on different types, A medium density amounted to (0.31 - 0.40), but ranked first in size that served t (274) km² and increase the amount of (55.24%) of the total area of the cover of Alan Patti in the region this year, while varied content of moisture between (20% - 40 %) And falls under the category of average dry stress.

3. Poor Plant cover : This category includes desert plants and some plantations that spread in different and scattered areas, and was less dense vegetative Bactltha which amounted to (0.20 - 0.30)

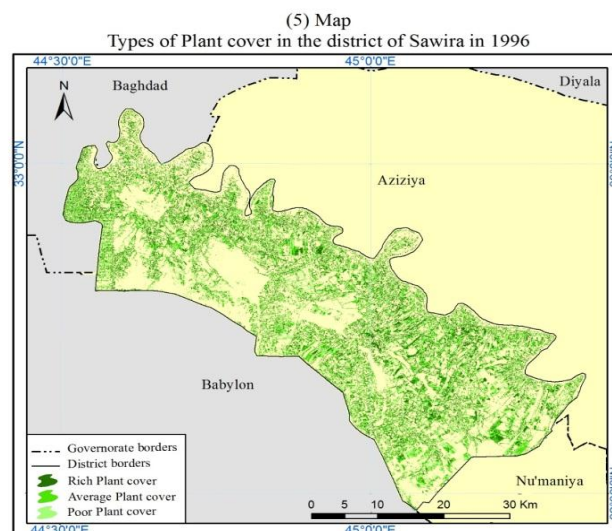
It also ranked third and final in terms of its spatial extension, which does not exceed (87) km² shareholder (17.54 %) of the total vegetation cover in the region for this year, and the moisture content was (less than 20 %) they are therefore in the category of acute dry stress.

Second: Measuring the condition of vegetation cover in the district of Sawira for 2016

It occurred in clear changes to the plant coverage and density categories of vegetation cover and moisture content categories xerotica and stress suffered by the plant In the study area according to this year's picture than it was in 1996, as shown in the map (6) and tables (9) and (10) It was limited The vegetation in the region is only two categories:

1. Rich vegetation cover : Decreased intensity Vegetative mass NDVI For this category than it was to (0.31-0.40), and

it jumped to an area of 142 km² and increased to (35.24%) of the total area of vegetation in the region this year, and yet She remained in second place, their moisture content P fell to (20% - 40 %) and so it moved to the category of stress xerotica the average.



Source : Researcher based on satellite image Land Sat 6,Spatial Resolution 10 metar,1996

Table 7 : Types of vegetation cover to Sawira according to index NDVI for 1996.

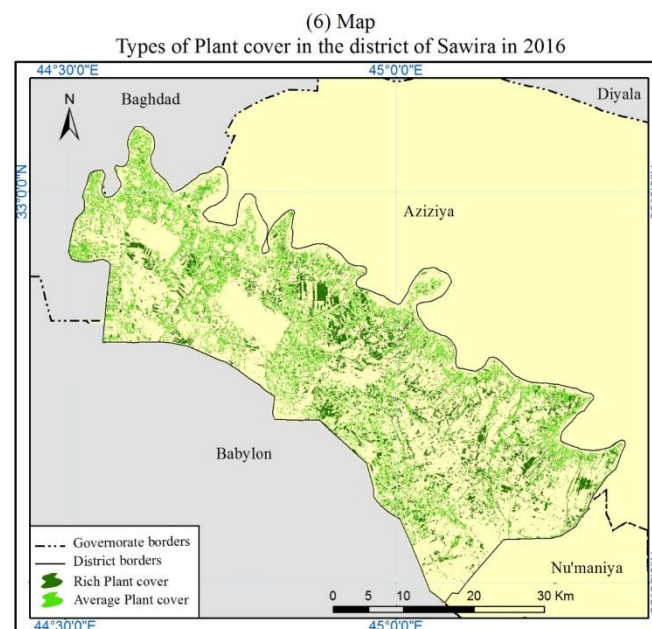
Percentage %	Area km ²	Vegetation Coverage	Density
27.22	135	Rich vegetation	more than 0.40
55.24	274	Average vegetation	0.31 – 0.40
17.54	87	Poor vegetati	0.20 – 0.30
100 %	496	Total	

Source : Map (5).

Table 8 : Types of vegetation cover to sawira according to index TI for 1996

Percentage %	Area km ²	The stress suffered by the plant xerotica	Moisture content
27.22	135	Light	more than 40%
55.24	274	Average	20% – 40%
17.54	87	Sharp	Less than 20%
100 %	496	Total	

Source : Map (5).



Source : Researcher based on satellite image Land Sat 8,Spatial Resolution 10 metar,2016

Table 9 : Types of vegetation cover to Sawira according to index NDVI for 2016

Percentage %	Area km ²	Vegetation Coverage	Density
35.24	142	Rich vegetation	0.31 – 0.40
64.76	261	Average vegetation	0.20 – 0.30
100 %	403	Total	

Source : Map (6).

Table 10 : Types of vegetation cover to Sawira according to index TI for 2016

Percentage %	Area km ²	The stress suffered by the plant xerotica	Moisture content
35.24	142	Average	20 % - 40 %
64.76	261	Sharp	Less than 20 %
100 %	403	Total	

Source : Map (6).

2. Average Plant cover : decreased the intensity of this category to reach (0.20 - 0.30), and dropped an area reaching to (261) km², as well as percentage (64.76) of the total vegetation cover in the region this year, but it remained the province ranked first And decreased content of moisture is the other (less than 20%) It was classified as a category of acute dry stress.

As shown above, the area covered by vegetation in the district of Sawira was reduced between 1996 and 2016, with the exception of rich vegetation. The density of vegetation and moisture content of all groups decreased from a higher level to a lower level in terms of dryness of the plant. increased is the perennial plant of natural and horticultural crops and vegetables from the agricultural product category trees, which confirms its importance for the population and be given great care, while decreased shrubs, grasses and reeds and papyrus plants and field crops due to low Elevations and shrinking water cover, the erosion of desert plants and other crops definitively attributable to climate

change flying towards drought, which threatens to a deterioration in the vegetation to the area during the duration of the search.

Conclusions

The research showed efficient use Technical data (GIS & RS) in the extraction of vegetation from land cover components and to identify the spatial changes that occurred during the base and comparison years. The research is effective Application Marker (NDVI & TI) in the detection of deterioration in the status of vegetation in the study area.

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