Estimation of the Normalized Difference Vegetation Index (NDVI) Variation for Selected Regions in Iraq for two Years 1990 & 2001

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Abstract: The Normalized Difference Vegetation Index (NDVI) is commonly used as a measure of land surface greenness based on the assumption that NDVI value is positively proportional to the amount of green vegetation in an image pixel area. The Normalized Difference Vegetation Index data set of Landsat based on the remote sensing information is used to estimate the area of plant cover in region west of Baghdad during 1990-2001. The results show that in the period of 1990 and 2001 the plant area in region of Baghdad increased from (44760.25) hectare to (75410.67) hectare. The vegetation area increased during the period 1990-2001, and decreases the exposed area.

Introduction:

Land cover / land use of Iraq and its changes have a great Impact on the natural environment and Economic activities of human beings. The surface vegetation index an important index in the monitoring of global changes. Therefore, many researches have been focused on the type of canopy, distribution and variation of the plants and trees. Meanwhile, the vegetation index can also be used in the evaluation of environmental issues, such as crop product assessments, land cover or land use surveys (1), (2) forest fire monitoring, deforesting, desertification. For example (3) used a set of the normalized differential vegetation index (NDVI) observed from 1990 and 2001 to analyze the forest fires that occurred over Alasks̊ s dely forested areas, and found that a sudden increase in the surface temperature may speed up the desertification,-of--forestlands,-- and increase the emission of carbon dioxide. Concerned with the desertification, (4) analyzed the composite NDVI values of the Sahara Desert during 1980 to 1992, hoping to understand the area's variation. Several research teams have made tremendous efforts in developing a so-

called mixing –pixel NDVI mapping technique of mixed pixels for land use and land cover classification, which are useful for areas of development. A monthly NDVI database was established through a supervised classification are mainly demonstrated in this study. In Iraq the results of The Normalized Difference Vegetation Index value show adverse pattern in comparison with digital value of spectral reflectance for all type of vegetation cover common in study area. Vegetation cover class shows lower value of NDVI (0.016) and the orchard cover class is (0.074). Where as the fodder crops class shows higher value of NDVI (0.135), whereof shows this the physiological nature for all classes and their ability to absorption the incident rays and reflects it. While make the chlorophyll material on absorption a larger amount of the light energy for visible portion (0.4-0.7) μm, and in the same time reflect a larger amount of the near infra red (0.8-1.1) μm, because using the visible rays in physiological actions. therefore it appears that plants in green color in the satellite image that captured in visible rays, while appears in red color in the satellite image that captured in near

infra red rays (5).

Methodology:
Area of study

The location of study area was in Iraq, west of Baghdad within longitude (38º33) (36º91) northwards and latitude (44º18) (36º37) eastwards, has area of (318846.8) hectare. Studied area has been dominated by agriculture, Irrigation channels, drainage, besides bare land influenced by salts (salt affected soils).

Data sources and NDVI analysis

Satellite image captured from Landsat-5 (TM) in march (1990) and Landsat-7 (ETM+) in march (2001) respectively with six bands ranging from first to the seventh except the sixth band in following wave length (0.45-0.515), (0.525-0.605), (0.63-0.69), (0.76-0.90), (1.55-1.75), (2.09-3.35) Micrometer, with pixel size (28.5 × 28.5) m. were used to monitor the patterns of annual changes in plant cover using ERDAS program V.9. Equation suggested by (6) has been used which depends on the third and fourth spectral bands. Also using ArcGIS V.9 Program Figure (1) to reclassify the value of NDVI analysis.

$$NDVI = \frac{B4-B3}{B4+B3} \quad \ldots\ldots... \quad 1$$

B4 = Reflectance in NIR band.
B3 = Reflectance in visible red band.

Results and discussion:

The range of value of NDVI is between (+1 and -1) (6), when it approaches the positive value, it indicates the increase of intensity and greenness of plant. The results refer to gradation in the value of NDVI and this index for different plant covers. For both years (1990 and 2001) Figure (2) and (3) respectively. Also the gradation in value of NDVI before reclassify it by ArcGIS program in 1990 was (0.1….to...0.7) which fewest comparing with 2001 it was (0.1-...…to…...0.9) Table (1). This increasing shows an existence of many types of plant covers. But the most important it increases the NDVI in value and area from (44760.25) hectare to (75410.67) hectare, Figure (4).-The results refer to the development the agricultural situation in that period (2001) which is associated with economical embargo which imposed on Iraq in the period (1990-1991) that made people step on toward for agricultural grazing and foresting also Using techniques of processing bad water (saline water) in irrigation and reclamation the bare land. The study emphasize that is entity be different in types of vegetation cover depend on the vary of Normalized Difference Vegetation Index value, the dominate was the vegetation cover which the range of value of NDVI is between (0.1-0.4) while the range of value of NDVI is between (0.6-0.9) was fewer. The database of monthly NDVI value gathered from 1990 and 2001 covering region of Baghdad was established under our procedure. The variations of NDVI have been used for analysis in relevant researches. The data period of the NDVI dataset is constantly increasing as more application is made to monitor the surface land use change, especially for vegetation lands in region of Baghdad. It is worthy of developing another satellite, or perhaps trying to fuse together different satellite images, to obtain more accurate NDVI mapping and application. Such methods may help us to construct more accurate and practical applications, especially for Iraq's growing complex land use and utilization in precision farming.

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5- نجيب، أحمد أسعد زعين (**2008**). إستخدام وسائل الاستشعار عن بعد لدراسة إنعكاسية الاغطية الارضية السائدة والعوامل المؤثرة عليها في مشروع أبي غريب. رسالة ماجستير – جامعة بغداد- كلية الزراعة – قسم علوم التربة والمياه.

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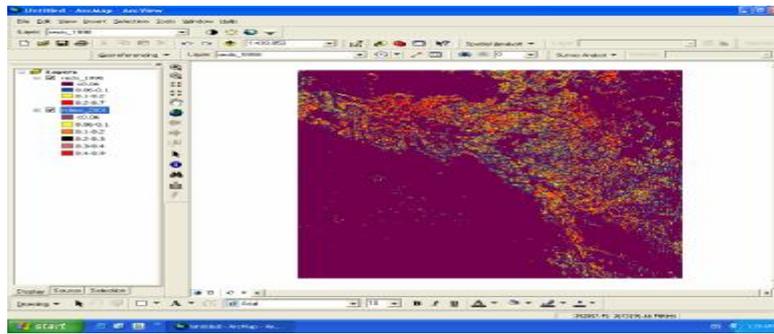
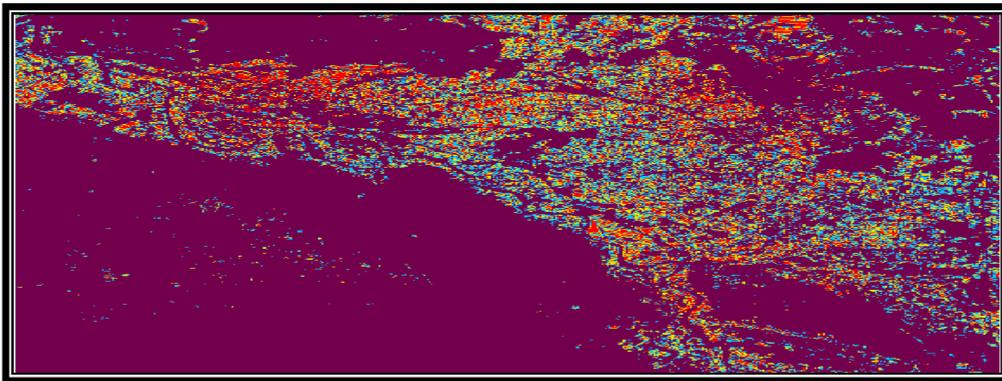**Figure (1) window of ArcGIS program which used to reclassify the value of NDVI**

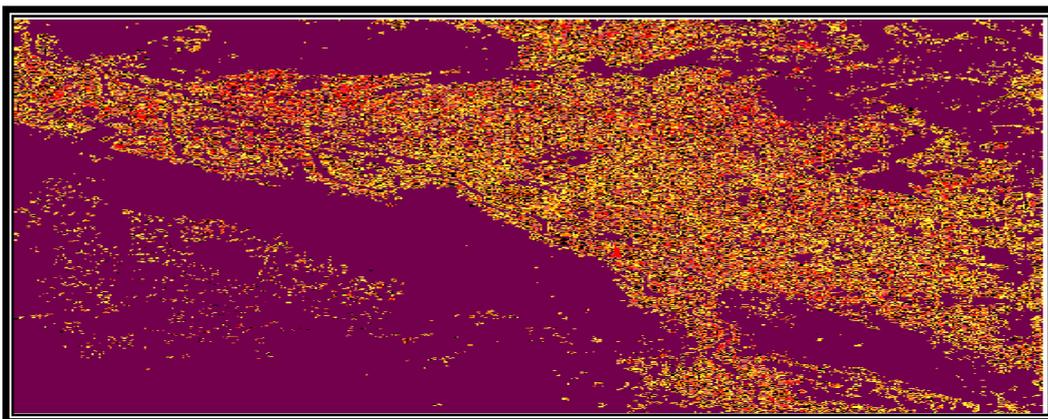**Figure (2) satellite image (1990) after apply NDVI analysis.**

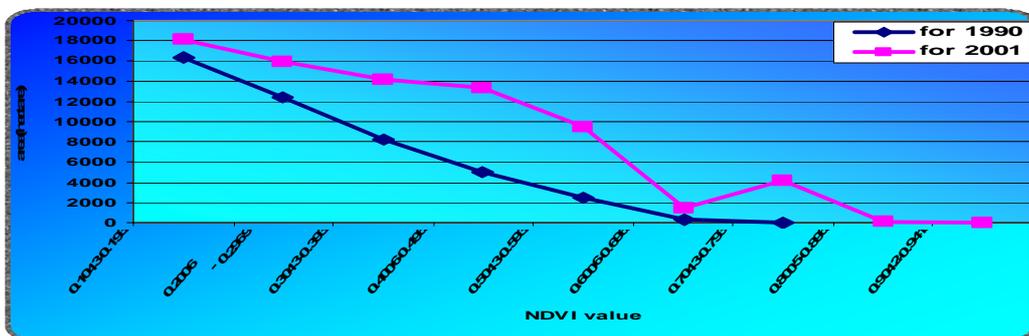**Figure (3) satellite image (2001) after apply NDVI analysis.**

Figure (4) Relationship between the NDVI value and the area of study

Table (1) Relation ship between the value of NDVI and its area			
The period (1990)		The period (2001)	
Range of NDVI	Area (hectare)	Range of NDVI	Area (hectare)
0.1029-0.1945	16344.99	0.1043-0.1932	18160.61
0.2006- 0.2984	12350.34	0.2006- 0.2969	15947.88
0.3045-0.3961	8182.444	0.3043-0.3932	14192.55
0.4022-0.4938	4992.576	0.4006-0.4969	13312.45
0.5000-0.5977	2528.778	0.5043-0.5932	9429.329
0.6038-0.6954	359.177	0.6006-0.6968	1487.38
0.7015-0.7199	1.95	0.7043-0.7931	4200
		0.8005-0.8968	55
		0.9042-0.9413	1
Total Area	44760.25	Total Area	75410.67

تقدير دليل تغاير الغطاء النباتي المعدّل (NDVI) لمنطقة مختارة من العراق وللعامين 1990 و2001

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الخلاصة:

أن دليل تغاير الغطاء النباتي المعدّل يستعمل غالباً كمقياس لكثافة الغطاء النباتي لسطح الارض المبنية على أفتراض أن قيم دليل تغاير الغطاء النباتي المعدّل تتناسب أيجاباً مع كمية أو كثافة الغطاء النباتي في مساحة عنصر الصورة (pixel) للقمر الصناعي الامريكي لاندسات من معلومات التحسس النائي التي تستخدم لتقدير مساحة الغطاء النباتي في منطقة غرب بغداد خلال الفترة 1990 و 2001. بينت النتائج أن في الفترة من 1990 الى 2001 انخفضت مساحة الأرض المكشوفة (الجرداء) وازدادت المساحة الخضرية من (44760.25) هكتار الى (75410.67) هكتار.