STUDY OF LANDCOVER/LANDUSE IN SHARAZUR PLAIN BY USING REMOTE SENSING TECHNIQUES

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ABSTRACT

The study area, is forming a part of the Sulaimani Governorate, in the North-east part of Iraq approximately between latitude 35° 10′- 35° 28′ N and longitude 45° 35′-46° 20′ E. , The objective of the study is to determine the dominant landuse/landcover types in Sharazur plain by using remote sensing techniques.

The results indicated that there are 12 classes of landuse/landcover, class (9) which represented canals and ditches was the smallest area (306.41ha) form the 0.072% of total area, while class (6) represents vegetation 3 is the largest part from Sharazur plain with about (114590.88ha) form the 26.85% of total area. Also the research showed that the most abundant landcover in studied area was vegetation which consists about 38.11% of Sharazur area. The bare soils followed after vegetation by consisting of 35.11% of studied area. Water is a third landcover in Sharazur which consists of about 4.2% of the studied area with about (17940.14)ha. Also the distribution pattern of urban group which includes roads and residential in the study area represents (2.35%) of the total areawith an area of (10033.82)ha, While the distribution pattern for of agricultural group which includes vegetation1, vegetation 2 and vegetation 3 consists of the highest part of Sharazur plain with an area of (162639.8)ha with about 38.11% of total area,but group 4 represents different soils represents about (35.11%) with total area of (149850.66)ha

INTRODUCTION

Landuse is obviously constrained by environmental factors such as soil characteristics, climate, topography, and vegetation. But also reflects the importance of land as a key and finite for most human activities including agriculture, industry, forestry, energy production, settlement, recreation, and water catchments and storage (Nagamani and Ramachandran,2003). Land is a fundamental factor of production, and through much of the course of human history, it has been tightly coupled with economic growth. Often improper landuse causes various forms of environmental degradation. For sustainable utilization of the land ecosystems, it is essential to know the natural characteristics, extent and location, its quality, productivity, suitability and limitations of various landuses.

Landuse is a product of interactions between a society's cultural background, state, and its physical needs on the one hand, and the natural potential of land on the other (Balak Ram and Kolarkar-1993).The term landcover relates to the type of feature present on the surface of the earth such as lake, maple trees, high ways, while landuse relates to the human activity or economic function associated with a

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specific piece of land. Landcover is a fundamental parameter describing the earth's surface. This parameter is a considerable variable that impacts on and links many parts of the human and physical environments (Foody, 2002).Although the terms landcover and landuse are often used interchangeably, their actual meanings are quite distinct. Landcover refers to the surface cover on the ground, while Landuse refers to the purpose of the land serves. Landuse describes how a parcel of land is used (such as for agriculture, residences, or industry), whereas landcover describes the materials (such as natural vegetation, rocks, or buildings) that are present on the surface. The landcover of an area may be evergreen forest, but the landuse may be lumbering, recreation, oil extraction, or various combination on land use and cover is essential for many planning activities.

Remote sensing is the science and the art of obtaining information about an object, area, or phenomenon through the analysis of data required by a device that is not contact with the object, area or phenomenon under investigation (Lillesand and Kiefer, 1994). The properties measured with remote sensing techniques relate to landcover, from which land use can be inferred (Levin,1999).Williams (1992) performs a unique vegetation classification, using remote sensing in Peter Lougheed Provincial Park of the Kananaskis Valley. Spectral data from Landsat - 5 Thematic Mapper (TM) with (7-band data) is used in the provincial park. His goal was to determine the best set of classification variables to map the vegetation communities in the mountainous region.Coleman *et al*.(1993) found that six types of landcover are identified with 100% accuracy, and two identified with 88.9% by using T.M. while, Hamdi et al. (1991) divide soils of Alinebra-Egypt into soil orders (Aridisol and Entisols) using images of Landsat-4 for MSS sensor and Spot.

Remote sensing technique has ability to represent of landcover categories by means of classification process. With the availability of multispectral remotely sensed data in digital form and the developments in digital processing, remote sensing supplies a new prospective for landcover/landuse analysis (Bektas and Goksel, 2004).Within the framework of their study for the detection of possible landcover in Gökceada using Landsat TM data Bektas and Goksel(2004) showed that the remote sensing was found to be effective in evaluating urbanization impact for future land development project of study areas. To study the interrelationship between landuse/landcover change and land degradation over two different Mediterranean sites are investigated using remotely sensed and ancillary data (Symeonakis et al., 2005), showed increased susceptibility to runoff and erosion mostly for those areas are forest fires, urbanization, and/or overgrazing are the main causes of change and suggest that mitigation measure should be taken for the prevention of further degradation.

MATERIALS AND METHODS

Location Area: The study area, forming a part of the Sulaimani Governorate, in the North-east Iraq which is located between latitude 35° 10′-35° 28′ N and longitude 45° 35′-46° 20′ E. The total area of Sharazur Plain is 76500 ha (Fig.1) .

Climate: The Sharazur area lies at an elevation of 742 to 853m above the m.s.l. and is characterized by a series of NW-SE trending ridges which become progressively

higher towards the NE. the ridges force the cyclonic storms from the west to rise thus causing a large increase in precipitation in this area as compared to the central and southern sectors of Iraq .The mean annual precipitation in the area varies from about 700mm in the NW to about 900mm in the SE.

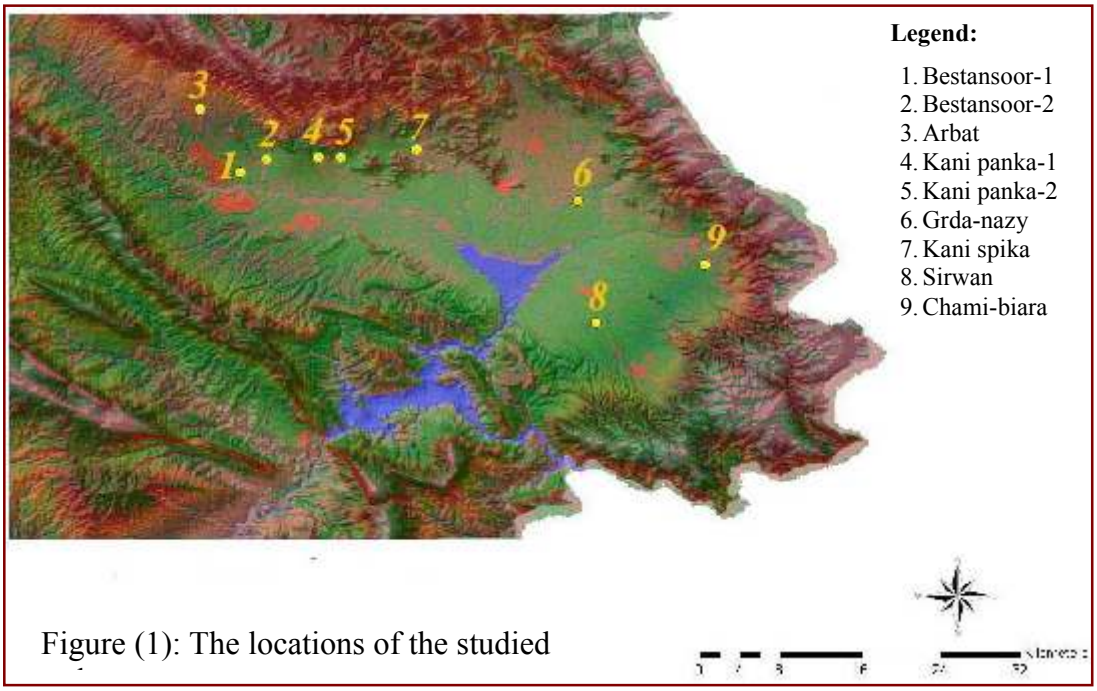


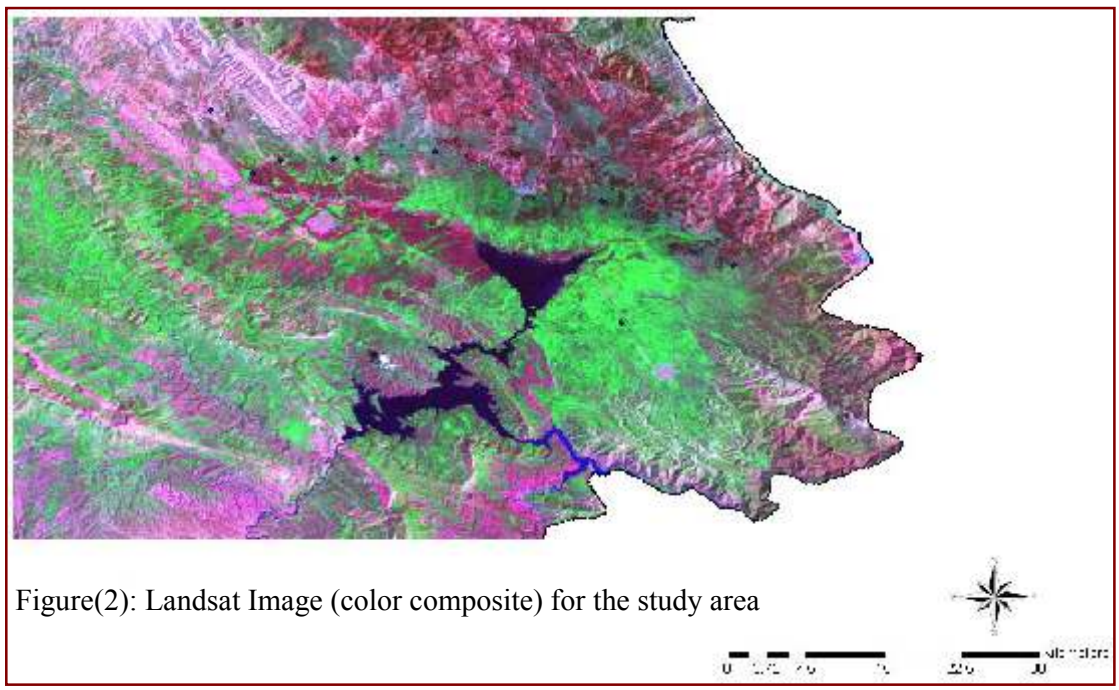
Figure (1): The locations of the studied

Image source: Image of Landsat-7 taken by Thematic mapper sensor (TM) in 13/9/2000 covering an area of (426785.7)ha including the study area with resolution 30m×30m, is used for visual and digital interpretation in this study. Image interpretation and analysis are done by using false color composite of band blue with wave length (0.45-0.52)µm, green (0.52-0.60) µm and red (0.63-0.69) µm (Fig.2),and image classification by using ERDAS V-9.0 program.The study area is divided in to 12 classes including the most dominant landuse/landcover variations. The variation in the image characteristics like tone, texture, pattern etc. is used to identify various landuse classes. The information obtained from the imagery is transferred to base map prepared from topographical map.

RESULTS AND DISCUSSION

Image classification and interpretation: Image interpretation refers to the examination and the transformation of remote sensing raw data into usable information. It involves the detection, identification and classification of the earth's surface characteristics for the purpose of collecting the needed information about certain phenomena and judging their significance.

The results of supervised classification using ERDAS V-0.9 recognized seven classes represent different types of landuse/landcover in the study area (Fig.3). These classes represent the most dominant landuse/landcover including water body, different types of vegetations, land bare and different soil types (Tab.1). The results indicated that the dominant land cover was (class 2) which represents of soil 2 class. These soils were investigated by there high amount of $CaCO_3$, silty clay



Figure(2): Landsat Image (color composite) for the study area

- color composite of band blue (0.45-0.52) µm, green (0.52-0.60) µm and red (0.63-0.69) µm
- image dated in 13/9/2000

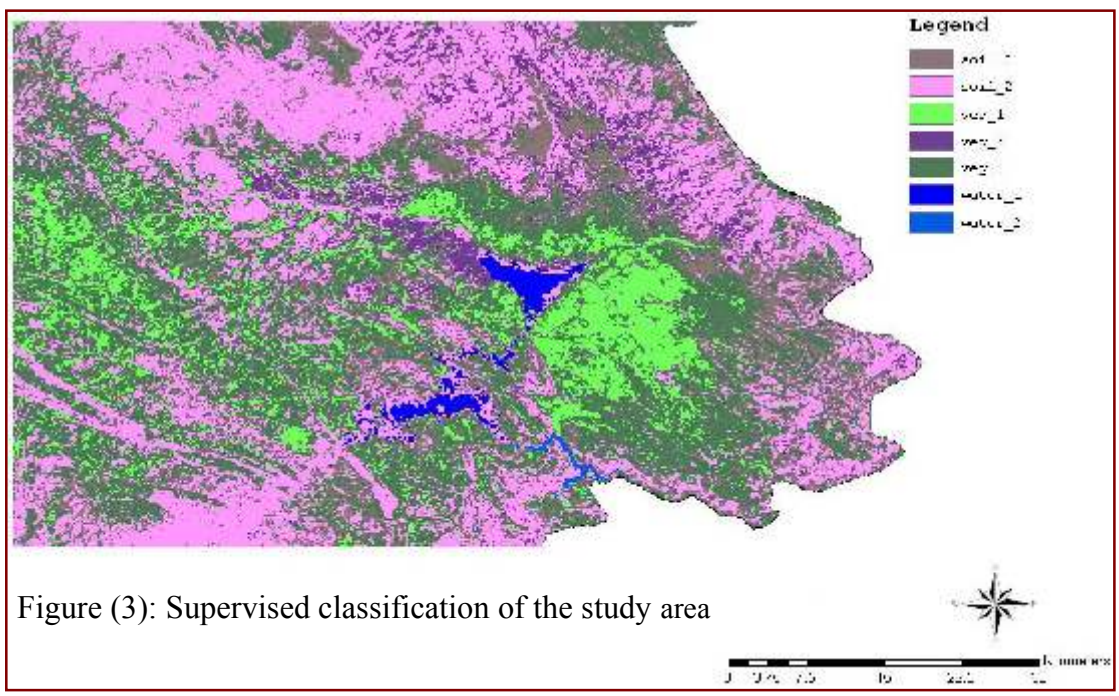


Figure (3): Supervised classification of the study area

texture of surface horizons, indicated that these soils are cultivated during all the seasons of the year. Class 3 which includes vegetation1 followed this class is a pasture area. The (class 5) which represents landuse/landcover of vegetation 3 which is the cultivated area vegetated by *(Sinapis arvesis, Carthamus oxycanthus,*

Table (1) : The dominant landuse/landcover in the studied area

No. classes	Type of land cover
1	Soil1 (soils with low amount of $CaCO_3$ (4.6%), stoniness, clayey texture, low vegetation cover less than 10%)
2	Soil2 (soils with high amount of $CaCO_3$ (13.97%), silty clay texture, the soil is cultivated all of the seasons during the year)
3	Veg1 (pasture area)
4	Veg2 (natural vegetations, forests, cereal crops, leguminous)
5	Veg3 (natural vegetations, cereal crops, leguminous)
6	Water1
7	Water2

Lathyrus vinealis, Medicago hispida, Ammi majus, Lagonychum farctum, Convolvulus arvensis, Heliathus annus, Triticum aestinum, Hordeum vulgare, Cucumis dodaria) then (class 4) which includes vegetation 2 which is the cultivated area vegetated by (Silybum marianum, Sinapis arvesis, Ammi majus, Carthamus oxycanthus, Hordeum spoutaneum. Cicer arietinum, Triticum aestinum, Hordeum vulgare, Lens eseulenta, Cucumis dodaria, Platanus orientalis) then fallowed by bare soil (class1) which is characterized by the low amount of $CaCO_3$, stoniness, clayey texture, low vegetation cover less than 10% of the area, then (class 6) which includes water 1, while water 2(class 7).

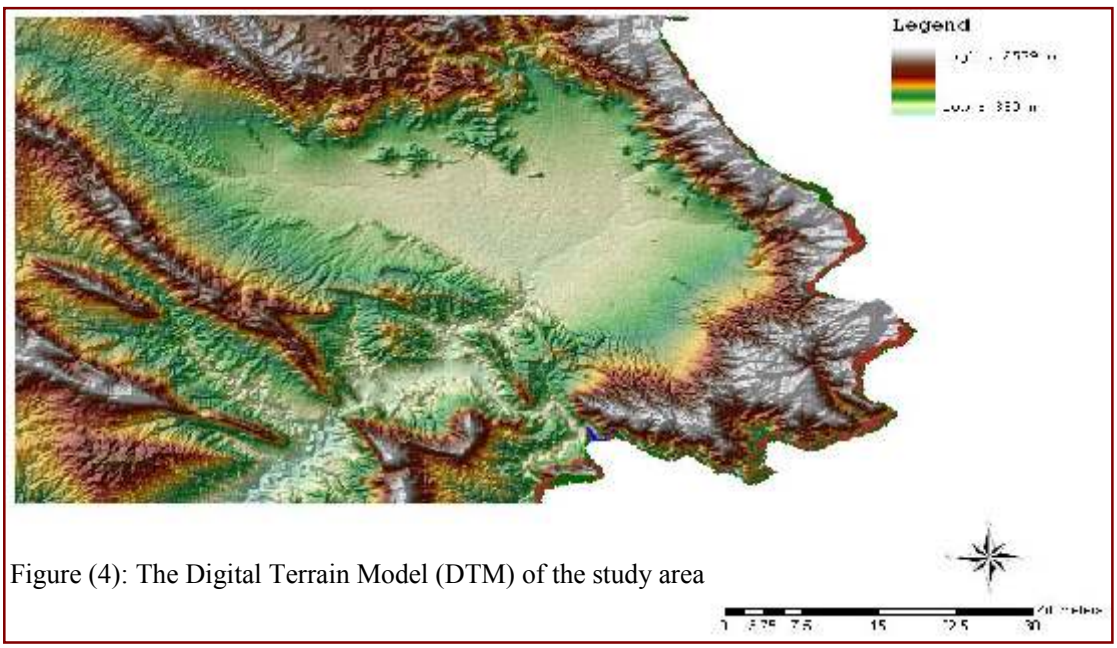


Figure (4): The Digital Terrain Model (DTM) of the study area

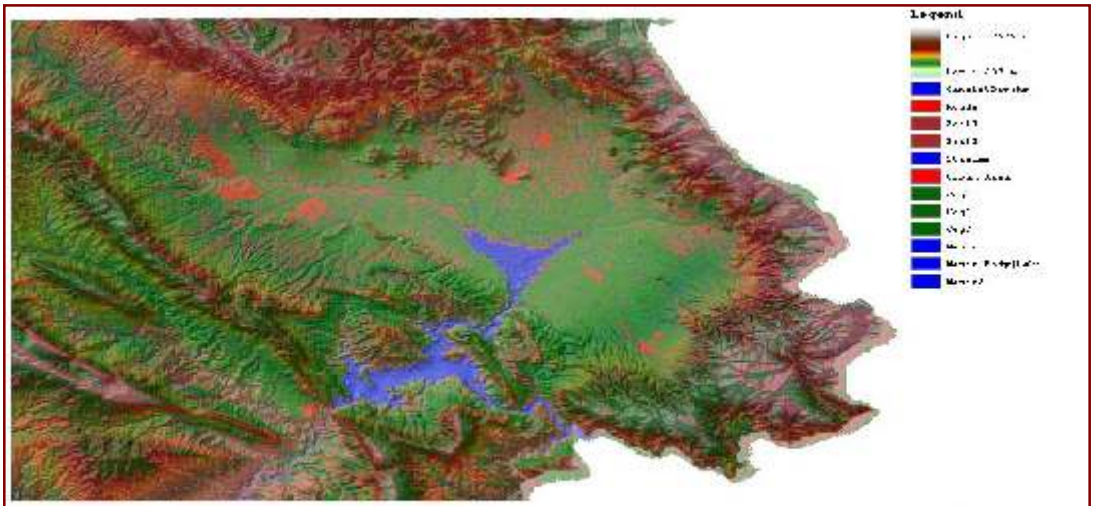


Figure (5): Supervised classification after using shadow effect for the study area

Consists the lowest percentage from total area.To make the results more accurate representative for all types of landuse/landcover present within Shahrazur plain, other layers of information including streams, canals, roads and shadow effect (Fig.4,5) are used in analyzing and classification of image by using ERDAS programsThe results of supervised classification by using ERDAS program show that there are 12 classes of landuse/landcover (Fig.6 and Tab.2).

The results indicate that class (9) which represents canals and ditches consists the smallest area (306.41)ha from the 0.072% of total area, while class (6) represents vegetation 3 consists the larger part from Sharazur plain with about (114590.88)ha from the 26.85% total area.

As mentioned in (Tab.2) and (Fig.6) the most abundant land cover in studied area is vegetation which consists about 38.11% (vegetation1, vegetation 2 and vegetation 3) of Sharazur area. The bare soils followed after vegetation by consisting of 35.11% (soil 1 and soil 2) of studied area. This means that most parts of Sharazur still last years is important to cereal production or pasture. Water is a third landcover in Sharazur which consists of about 4.2% (water1,water2,canales, streams and Lake) of the studied area, the highest area of water is due to Darbendi-khan lake which includes 37.89% from the water land cover.

Grouping of landcover/landuse classes : USGS system as described by Anderson et al.(1976) was used to classify Landuse/landcover. Fig.(7) shows the distribution patterns of water bodies area within Shahrazur plain including lake, streams, canals and ditches. All related water areas are represent (4.204%) from the total area with about (17940.14)ha. Also (Fig.8) shows the distribution pattern of urban group which includes roads and Residential in the study area. Roads and urban consist of (2.35%) from the total area with an area of (10033.82)ha,while (Fig.9) shows the distribution pattern for parts of agricultural group which includes vegetation 1, vegetation 2 and vegetation 3. The results indicate that the agricultural

Table(2): Landuse/landcover classes in the study area

Class No.	land use/land cover type	Area (ha)	%
1	Water1	395.95	0.09
2	Vegetation 1 (pasture area)	33391.44	7.82
3	Vegetation 2 (natural vegetations, forests, cereal crops, leguminous)	14657.48	3.43
4	Soil 1 (soils with low amount of $CaCO_3$ (4.60%), stoniness, clayey texture, low vegetation cover less than 10%.	43206.98	10.12
5	Soil 2 (soils with high amount of $CaCO_3$ (13.97%), silty clay texture, the soil is cultivated all of the seasons during the year)	106643.68	24.98
6	Vegetation 3 (natural vegetations, cereal crops, leguminous)	114590.88	26.85
7	Water 2	396.92	0.09
8	Urban Area	2669.48	0.62
9	Canals/Ditch's	306.41	0.07
10	Lake	6797.61	1.59
11	Roads	7364.34	1.72
12	Streams	10043.25	2.35
Unclassified are		86321.26	20.22
Total area		426785.7	

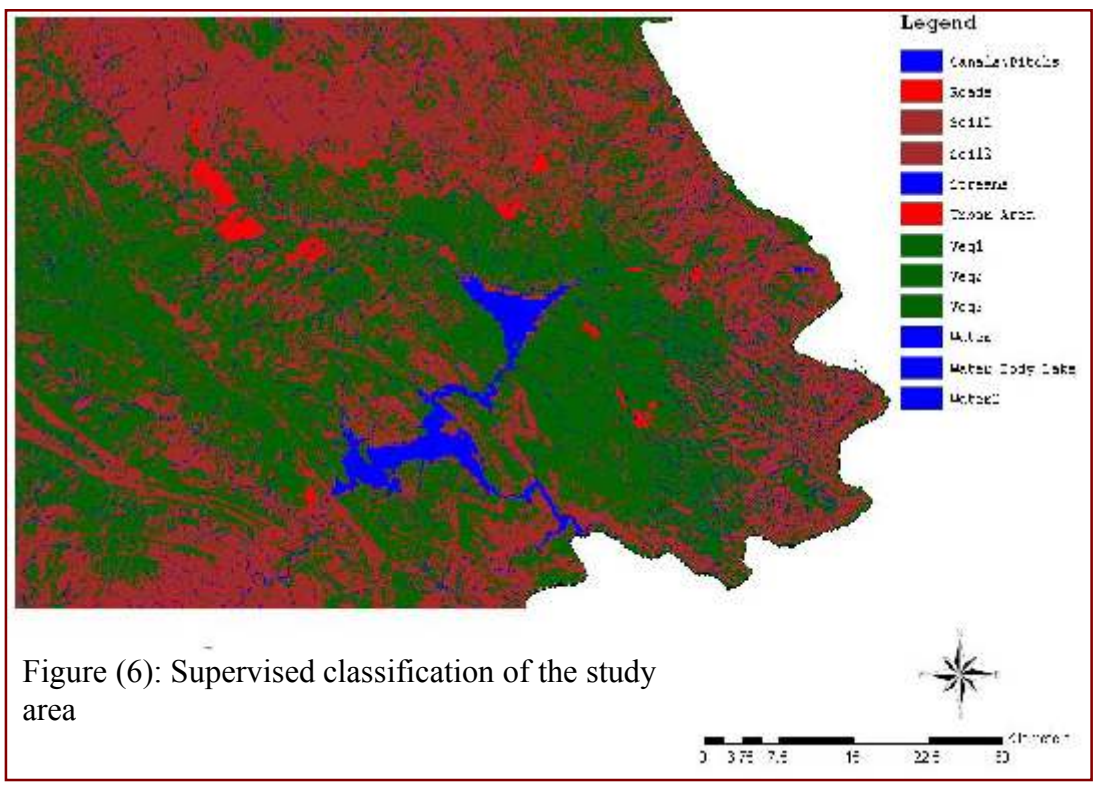


Figure (6): Supervised classification of the study area

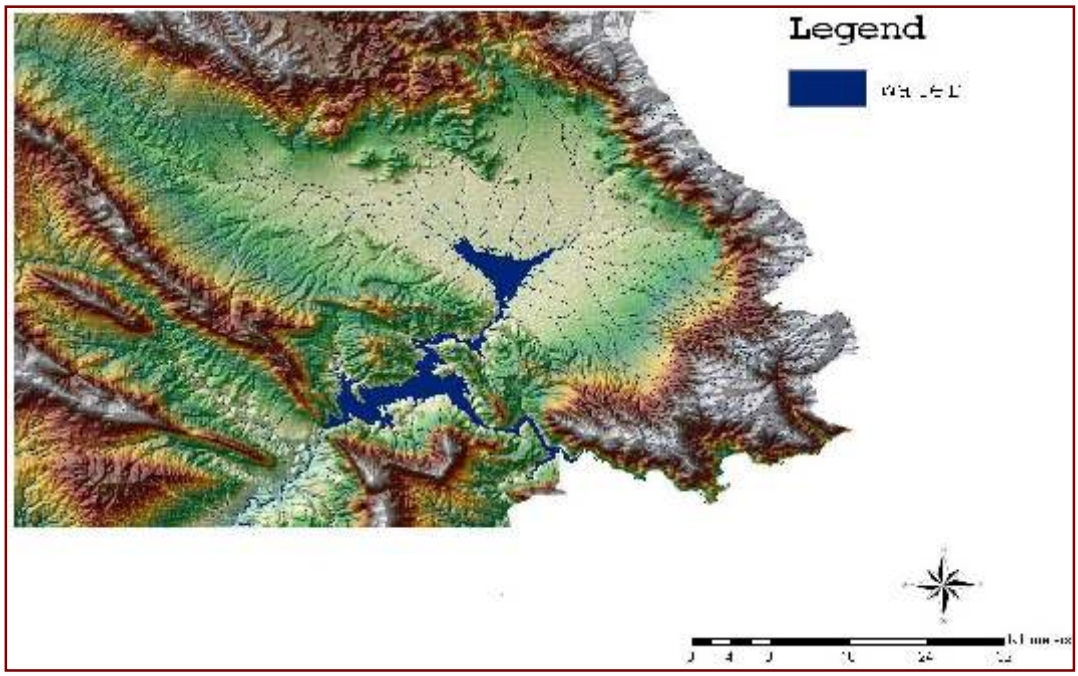


Figure (7): The distribution of water body within study area, and perspective view showing clear distinction of mountain and drainage pattern by using shadow effect method.

group includes the highest part of Sharazur plain with an area of (162639.8)ha with about 38.11% of total area.while group 4 represents different soils consist about (35.11%) with total area of (149850.66)ha (Fig.10) .According to our field visiting we detected differences between classes in the area and there is human activity for civilization that is indicate it was affected by human activities .

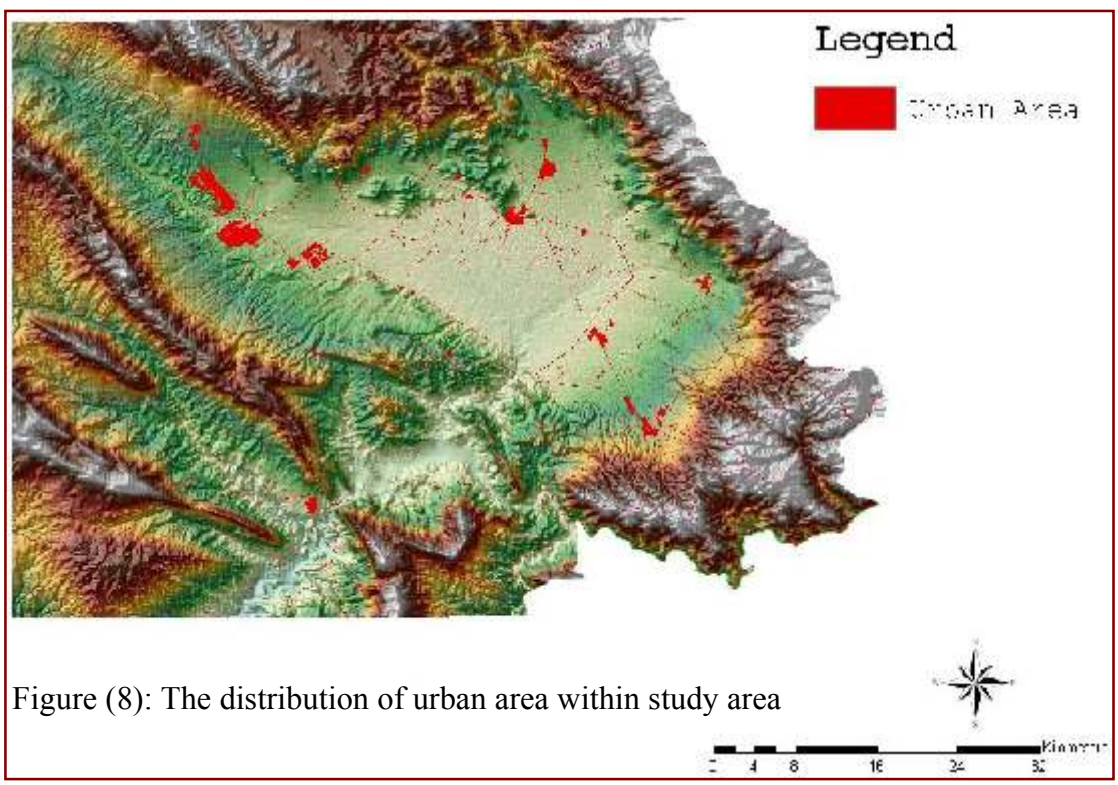


Figure (8): The distribution of urban area within study area

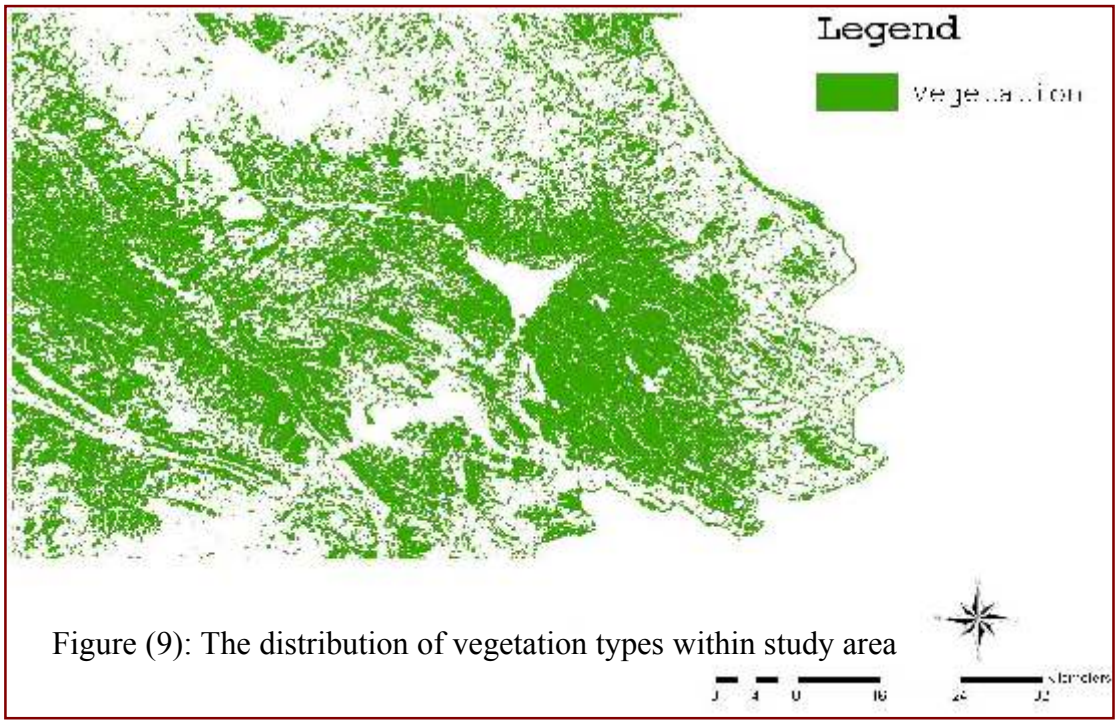


Figure (9): The distribution of vegetation types within study area

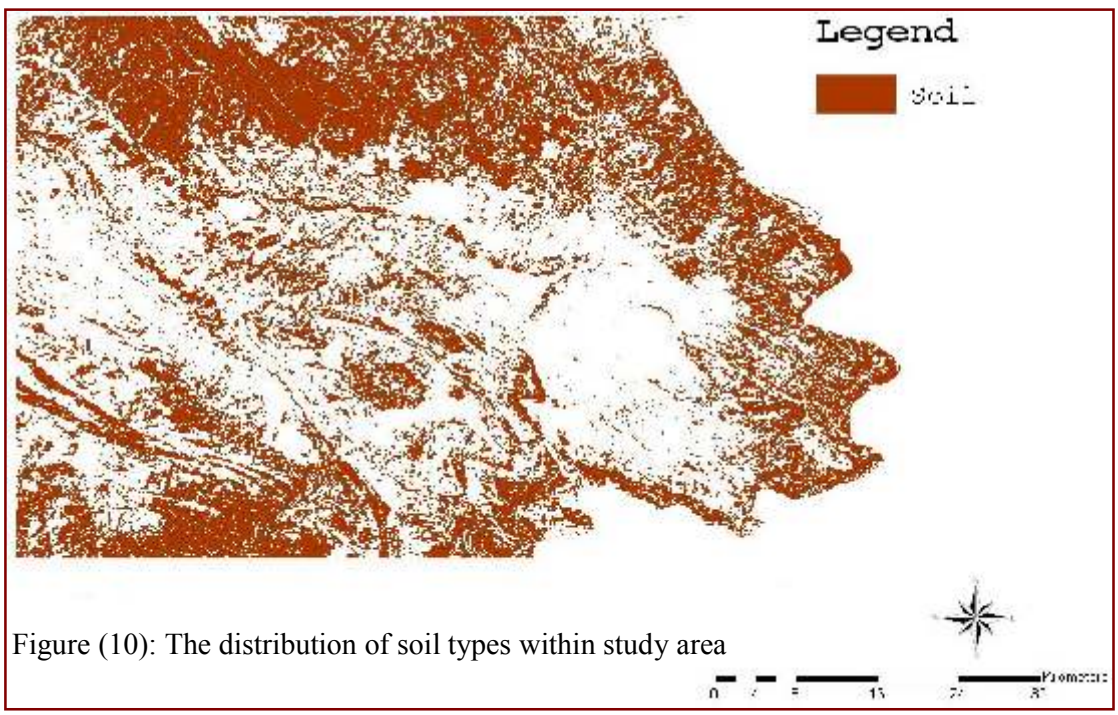


Figure (10): The distribution of soil types within study area

دراسة غطاء الأرض/إستخدام الأرض في سهل شاره زور بإستخدام تقنيات التحسس النائي

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الخلاصة

تشكل منطقة الدراسة جزء من محافظة السليمانية الواقعة في شمال شرق العراق بين خطي عرض (١٠´ ٣٥° و ٢٨´ ٣٥°) شمالاً وخطي طول (٣٥´ ٤٥° و ٢٠´ ٤٦°) شرقاً. تهدف الدراسة تحديد أصناف أستخدام الأرض/ غطاء الأرض السائدة في منطقة الدراسة بأستخدام تقنيات التحسس النائي.تبين لنا بعد إستخدام التصنيف الموجه بأن هناك (١٢) صنفاً من إستخدام الأرض/غطاء الأرض، صنف (٩) يمثل قنوات وهي أقل مساحة (٣٠٦.٤١)هكتار تشكل (٠.٠٧٢%) من المساحة الكلية ، بينما الصنف (٦) يمثل الغطاء الخضري٣ وهي أكبر مساحة حيث تبلغ (١١٤٥٩٠.٨٨) هكتار من سهل شهرزور و (. %) من المساحة الكلية.كما تبين من خلال النتائج بان أغلبية الغطاء الأرض السائد في المنطقة المدروسة مكونة من الغطاء النباتي والتي تشكل (٣٨.١١%) من سهل شاره زور. والتربة الجرداء تأتي بعد الغطاء النباتي وتشمل (٣٥.١١%) من المساحة المدروسة.كما تحتل المياه المرتبة الثالثة من غطاء الأرض للمنطقة وتشكل نسبة (٤.٢%).إن توزيع أنماط المساحة الكلية للأجسام المائية لسهل شاره زور والمتضمنة (بحيرة ،جداول، قنوات و كل ما يتعلق بالمساحة المائية) تحتل (. %) من المساحة الكلية والبالغة (.) هكتار.بينمانمط توزيع المجموعة الـ ضرية والمتضمنة طرقا ومناطق سكنية تشكل (. %) من المساحة الكلية البالغة (١٠٠٣٣.٨٢) هكتار، في حين نمط توزيع المجموعة الزراعية تتضمن (نباتات١، نباتات٢، نباتات٣) وشكل أكبر مساحة من السهل والبالغة (.) هكتار أي (. %) من المساحة الكلية.بينما المجموعة الرابعة تمثل ترب مختلفة التي (. %) من المساحة الكلية البالغة (.) هكتار.

REFERENCES

Anderson, J.R., E.E. hardy, J.T. Roach, and R.E. Witmer (1976). A land-use and land-cover classification system for use with remote-sensor data. U.S. Geological Survey. Reston, va. Professional Paper 964, 28pp.

Balak Ram and Kolarkar A.S., (1993). 'Remote Sensing application in monitoring land use changes in arid Rajasthan'.Int. J. Remote sensing,14.(17):3191- 3200

Bektas, F. and C.Goksel(2004).Remote sensing and GIS integration for land cover analysis, A case study: Gokceada Island. ITU, Civil Engineering Faculty, 34469Maslak Istanbul, Turkey Istanbul Coleman, T. L., P. A. Agbu, and O. L. Montgomery(1993).Spectral Differentiation of Surface Soil And Soil Properties: Is It Possible From Space Platforms? Soil Science 155(4): 283-291.

Foody, P.M.(2002). Status of land cover classification accuracy assessment. Remote Sensing of Environment, 80: 185-201.

Hamid, A.A.; F.M Hawela and H.M. EL- Khattib (1991). Detection of surface soil variation using different resolution satellite data. Egyp J. soil Sc. 31:483488.

Levin, N., November(1999). Fundamentals of Remote Sensing.

Lillesand, T.M and Kiefer R.W.(1994).Remote Sensing and Image Interpretation, Third Edition: John Wiley and Sons Inc, Inc.: Toronto.

Nagamani, K and S.Ramachandran(2003). "Landuse/Land cover in pondicherry using remote sensing and GIS" in Martin J. Bunch, V. Madha Suresh and T. Vasantha Kumaran, eds.,Proceedings of the Third International Conference on Environment and Health, Chennai, India, 15-17 December.

Symeonakis, E., S. koukoulas, a Calvo-Casses, E. Arnau-Rosalen and I.Makkris(2005). A landuse change and land degradation study in Spain and Greece using remote sensing and GIS. Dept. of Geography, University of the Valencia, Valencia 46010, Spain.

Williams, J.A. (1992). "Vegetation Classification Using Landsat TM and SPOT- HRV Imagery in Mountainous Terrain, Kananaskis Country, .W. Alberta".