Remote Sensing Technology to Study and Monitor The Land Cover in North-Eastern Al-Muthanna, South-Iraq

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Abstract. A comparison was made between the different phenomena of the land cover using satellite images imaged at multiple wavelengths from electromagnetic energy sources, where the spectral reflectivity curves of the terrestrial phenomena in the research area were obtained by analyzing the data using the (ERDAS) program to obtain spectral reflectivity charts. It was found that there is a relationship between the binary coordinates and the three-dimensional coordinates with the spectral reflection coefficient of the phenomenon. Satellite images (T.M & M.S) were used in this research. The main spectral groups of natural phenomena that represent (soil, water and plants) and the overlap between them, which affects the spectral reflectivity values of those phenomena, were studied. They differ in their basic components, in addition to the units of vegetation). The study also showed that many of the Earth's surface phenomena under study can be distinguished, located and studied based on their spectral characteristics. In addition, some land covers cannot be separated using a single wavelength, so the concept of multiple wavelengths using more than one wavelength was used to determine the types of land features prevailing in the region, as shown in the attached figures at the end of the research.

Keywords: wavelengths, land cover, desert, ratings, satellites

I. Introduction.

Soil, plants and water are essential phenomena for agricultural projects. These phenomena are characterized as important phenomena, especially water, which necessitates a balance between human needs and the natural resources provided by that environment. To preserve the integrity of the elements of the environment from pollution and deterioration and finding a state of balance between the elements of the environment is very important and requires study. The use of remote sensing techniques, including the IRDAS program, is considered one of the modern and effective means to study natural resources, which include (soil, water, and vegetation cover), determine their characteristics and locations, then monitor them and develop plans to exploit them, in addition to their applications in monitoring and studying environmental variables that affect development processes. Agricultural factors such as drought, soil degradation, desertification, erosion and salinity increase. After that, remote sensing programs are used to enter, store and analyze data, information and maps, which leads to the extraction of geographic information about terrestrial phenomena, results and indicators that are useful in predicting the conditions of the region and managing its resources properly. Soil characteristics play an effective role in the reflectivity values, and the reflectivity values differ as a result of the different chemical and physical properties of the soil. Studies have confirmed that the use of remote sensing techniques has a high discriminatory ability in the field of studying different natural resources through the possibility of identifying and diagnosing the types of water and wet areas. And the analysis of the landscape of the Earth, it was shown that it is possible to isolate the different phenomena of the Earth as a result of the different geomorphological characteristics in the Samawa desert, depending on the Landsat satellite images. And it was also shown that through the use of remote sensing technology, it is possible to conduct photometric studies and adopt the spectral reflectivity values in identifying and diagnosing the phenomena of the Earth's surface. That this topic is used in various fields, including environmental pollution, desertification, drought, agricultural pests, degradation of vegetation cover, soil degradation, salinity, humidity, and other variables that lead to diminishing natural resources. Reference (style and behaviour of the researcher).

II. Materials And Methods of the work.

An area of 3000 km2 was determined west of Lake Sawa in the Samawa desert within Al-Muthanna Governorate, which lies between longitudes (45˚03′ E - 44˚ 56′ E) and two latitudes (31˚ 20′ N - 31˚ 17′ N), as shown. Fig. (1) uses a satellite image of the Landsat 2 satellite, taken on January 26, 2015, using the Multi-Spectral Scanner System (M.S.S) as in Fig. (2) and the second image was taken from the Landsat satellite image (5) with a sensor Thematic mapping (T.M), photographed on January 19, 2016, as shown in Fig. (3). The digital analysis method was used to determine spectral patterns using the special ERDAS program in analyzing, interpreting and improving satellite images depending on the wavelength of electromagnetic radiation and the spectral reflection of light, as the program works on analyzing the image data used and works on drawing diagrams that help the researcher to interpret and identify the phenomena of the cover. land for the study area. The land covers with different spectral behaviour were identified by the TM and MSS sensors. By using multiple methods to manipulate spectral reflectivity values, including multispectral channels. And the coefficient of brightness and spectral ratios on a spectral pattern that is more representative of reality, with operations to evaluate and restore the visuals by conducting image correction and restoration, improving it, then classifying it and conducting field classification surveys (for terrestrial phenomena). The surface of the soil as shown in Table No. (1). This is in the light of calculating the reflectivity values of the light beams and according to the spectral channels chosen from the sensors. TM and MSS. To draw the relationship between the mainland covers and the reflectivity values using the ERDAS program.

The idea of this scientific research was carried out due to the lack of sufficient information about the phenomena of the land cover of the Samawah desert, and the fact that this area is important and can be invested in the agricultural and environmental fields. The ERDAS program was used from other remote sensing programs due to its ease and is available in the researchers' workplace.

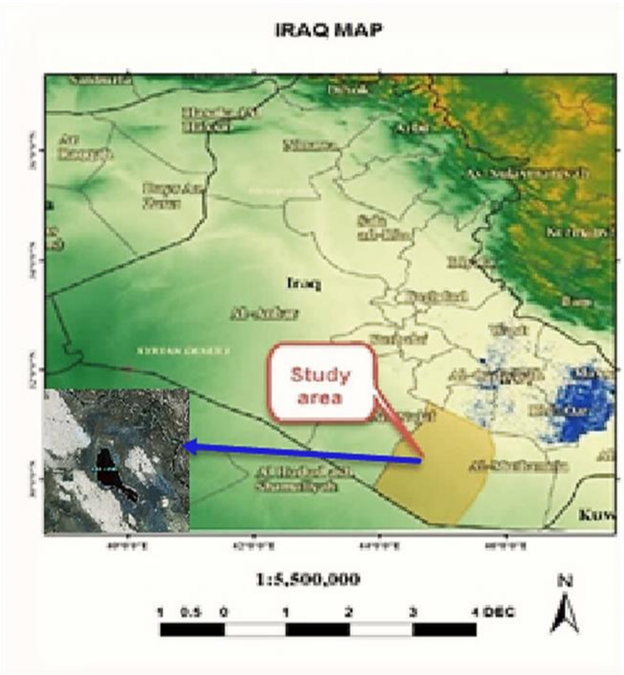


Fig. 1 . study area

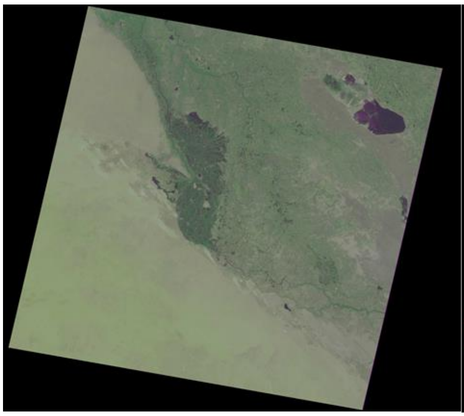
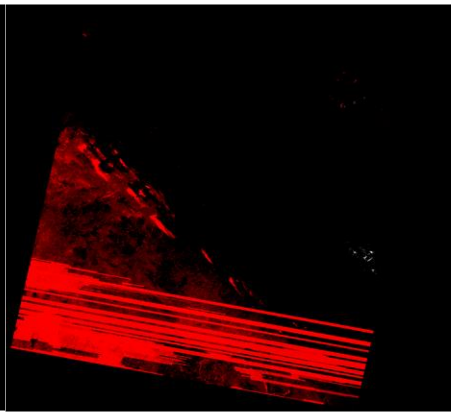


Fig.2.imge by M.s.s



Fiq .3. image by T.M

Table (1:Properties morphological and physical and chemical to the soil surface deeply (zero– 20) cm

Soil classification	Soil colour	Soil texture	Salinity DSM-	Gypsum %	lime %	Organic Matter %
calcareous soil	10YR 6/4	SiCL	6	2.4	29	0.8
Saline soil	10YR 4/3	SiCL	56	1.6	23	1.2
Gypsiferous soil	7.5YR6/5	SiL	4	2.8	12	0.6
Alluvial soil	10YR 5/4	L	8	1.0	25	0.9

III. Results and discussion.

The results of the spectral analysis of terrestrial phenomena indicate that there are three main spectral categories representing land covers (water, soil, and vegetation). These spectral categories were classified into (water, vegetation cover, calcareous soil, saline sedimentary soil according to changes in soil salinity, gypsum and sandy soils, and rocky outcrops). The ground covers showed different reflectivity values and different spectral behavior as a result of the different chemical and physical properties of the terrestrial phenomena, and by conducting classification and analysis of the images using the ERDAS program to obtain spectral reflectivity charts of the land cover phenomena for the spectral channels (band 1, band 2, band 3, band 4) according to The reflectivity values shown in Table No. (2) where the gypsum, calcareous and sandy soils showed high reflectivity values as shown in Fig. (4). While the water showed lower reflectivity values as we approached the infrared spectral channels. The plants also showed spectral curves with topographic shapes according to the wavelengths affected by the vegetation density and plant type. This behavior is related to the ability of plants to absorb and reflect the spectral rays that fall on them, as shown in Fig. (5). As for the calcareous soil, it reflected medium values of reflectivity, which varied according to the proportion of lime, the colour of the surface layer, and the percentage of vegetation covering the surface. As for sedimentary soils and saline soils, the values of different reflectance curves were reflected as a result of the difference in the concentrations of salts in the study area. Dry, non-saline soils, which have good water drainage and contain gypsum salts, showed high levels of spectral reflectivity. The reflectivity of the soil is affected by the type of soil texture and the content of moisture and salts in the soil. The results also indicate that soils with different physical and chemical properties reflect different forms of spectral reflectance diagrams as shown in Fig. (6) and Fig. (7), where the desert gypsum soil, classified according to the US Department of Agriculture, showed high reflectance values compared to the sedimentary soil and for all wavelengths. The results shown in Fig. (8) also indicate that the spectral response of the terrestrial phenomena under study that were imaged by the TM sensor and for the spectral channels in (Band 2 and Band 7) was different as the values changed due to the overlap between the moisture content. And the density of vegetation cover is a low percentage of the density of vegetation cover in (desert soils). The drier the soil, the higher the spectral reflectivity values, as in dry desert soils, which gives a clear spectral impression, unlike wet soils, whose reflectance values are affected by moisture content. The results showed in Table (3) that the spectral reflectivity values of the terrestrial phenomena in the study area using the T.M sensor and for the spectral channels (Band 2, Band 4, and Band 7) and through the non-wave digital classification that there are ten different terrestrial phenomena of the spectral reflectivity value as a result of the difference in surface properties to these phenomena. The clear results in Fig. (9) also showed that the gypsum soil has high reflectivity values for the three spectral channels used, followed by the dry calcareous gypsum soil, as well as the rocks and sandy soils. On the other hand, wet and saline soils showed low reflectance values close to the water reflectance. The results also showed that the use of the digital method serves the study of desert soils with low moisture content, good water drainage and low-density vegetation cover, while the digital interpretation of satellite image data showed that sedimentary soils with poor water drainage and high moisture content and contain high salinity affect the classification of And know the earthly phenomena clearly. As a result of the interaction between soil, water and vegetation, which affects the reflectivity of other phenomena.

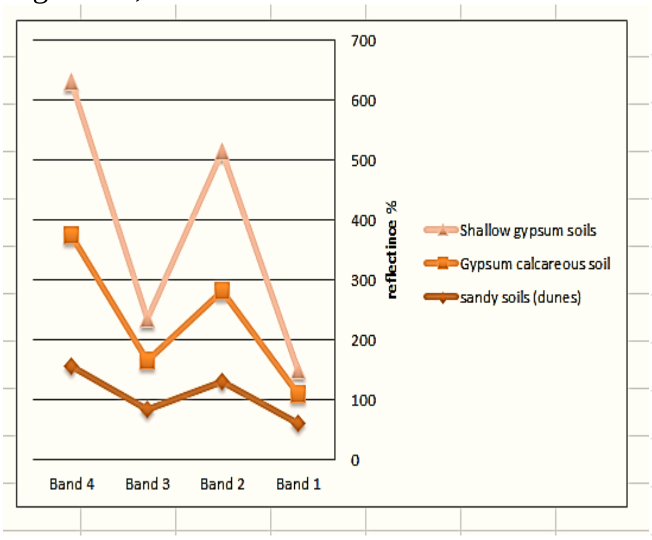


Fig. 4. Scheme of gypsum, calcareous and sand soils using MSS

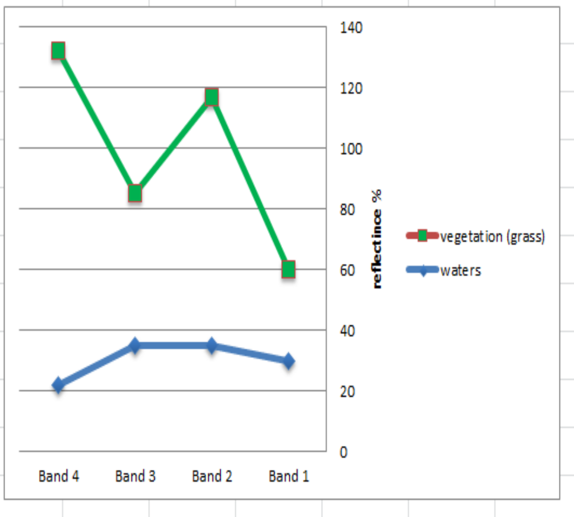


Fig. 5. Reflectivity diagram of water and vegetation using MSS

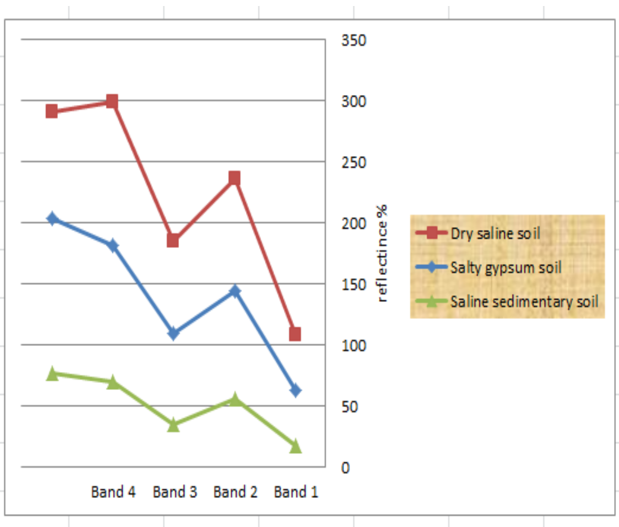


Fig. 6. Reflectivity diagram for saline soils using MSS

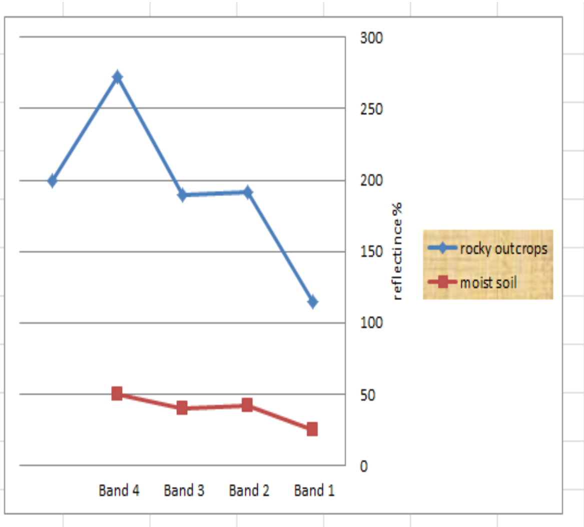
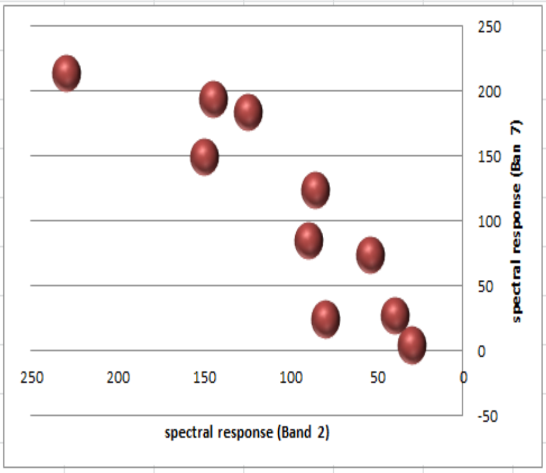


Fig.7. Wet soil and rock diagram using MSS



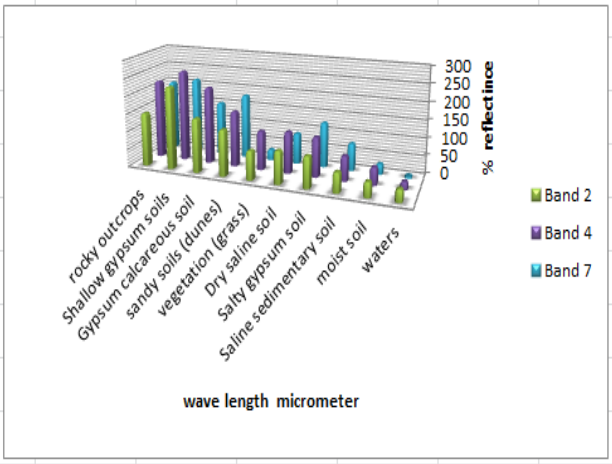


Fig. 8. spectral response to terrestrial phenomena using TM *Fig. 9. Reflectivity of terrestrial phenomena using TM*

Table 2. Reflection values for phenomena in the study area using MSS

T	phenomenon type	Band1	Band2	Band3	Band1
1	Water	25	30	30	21
2	moist soil	25	45	45	50
3	Saline sedimentary soil	15	50	30	70
4	Salty gypsum soil	65	145	110	175
5	Dry saline soil	105	240	190	300
6	Vegetation cover	60	118	82	130
7	Sand dunes	75	125	93	175
8	Gypsum calcareous soil	110	290	180	385
9	Shallow gypsum soils	140	500	215	610
10	rocky outcrops	118	195	195	270

Table 3. Reflection values for phenomena in the study area using TM

T	phenomenon type	Band2	Band4	Band7
1	Water	35	22	6
2	moist soil	42	50	30
3	Saline sedimentary soil	56	70	77
4	Salty gypsum soil	88	112	127
5	Dry saline soil	92	117	87
6	Vegetation cover	82	110	30
7	Sand dunes	130	157	182
8	Gypsum calcareous soil	152	217	152
9	Shallow gypsum soils	232	257	215
10	rocky outcrops	150	222	200

IV. conclusions and recommendations.

The most important results obtained through the research paper can be presented:

1- The results showed that the TM sensor gave more detailed and accurate reflectance measurements than the MSS sensor, due to the difference in spectral amplitude and spatial discrimination of terrestrial phenomena.

2 - The research showed the possibility of isolating natural resources with high efficiency by identifying the types of phenomena that cover the earth based on the properties of spectral reflectivity of the terrestrial phenomena and using satellite images.

3 - We recommend and emphasize the importance of the role of remote sensing in studying the agricultural environment and identifying pollution areas and their risks, with the possibility of isolating the problems facing the agricultural environment, especially those related to salinity, increasing gypsum soil and desertification, and studying the soil and predicting the environmental factors surrounding it. Remote sensing studies are the best. means. To follow up, monitor and control environmental changes on the ground.

V. Reference.

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