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Land Use Classification of Al-Rifai City Manually and Using Google Earth

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Abstract

The research dealt with a manual classification of land uses in Al-Rifai area using (220) satellite images taken from Google Earth and captured at an altitude of 831 m. Each image was divided into squares with dimensions of 2 cm x 2 cm, which equals to 0.2 km2 as an actual area. Red color represents to residential (urban) lands, green color represents agricultural lands, and brown color represents barren lands, while water areas were colored blue. Through the manual classification of land uses in the areas located within the administrative boundaries of Al-Rifai city, with a total area of 1610 km^2, it became clear that the areas of residential areas were approximately (763) km^2 with a percentage of (47.39%), agricultural areas were approximately (555) km^2 with a percentage of (34.47%), barren areas were approximately (263) km^2 with a percentage of (16.33%), and water areas were approximately (29) km^2 which equals about (1.80%). Using the drawn color map, it can be predicted that the agricultural areas (green), located in scattered patches between residential areas (red), could shrink due to population growth and family division.

Keyword: Land use, Image, Google Earth, Al-Rifai, Classification.

I. INTRODUCTION

Land use phenomenon is one of the spatial phenomena that has occupied many researchers as it represents human activities and interactions with human and natural variables, the organization of resources and land uses within the city and studying them for the purpose of employing available capabilities in the best possible way Al-Humeiri (2019), Al-Yaqoubi (2010). The contemporary city is a city with a complex life due to the intertwining and multiplicity of functions and the multiplicity of needs resulting from economic, social and life changes...etc., which necessitated the practice of various city activities, some of which are traditional and others unconventional, as uses have diversified between residential, commercial, agricultural, health, educational and entertainment uses in addition to many other uses, each of them is linked to the other as a result of these mutual signs, where a set of variables have emerged that indicate the growth of the city, some of which are negative and others positive Hannad (2016), Al-Akeedi (1990).

Land use encompasses several concepts, but they are linked in that they reflect direct human interest, activity, and interaction with the surrounding environment. It is defined as the activities carried out by humans on a given area of land, exploiting its natural resources by making the most of the environment's potential saleem (2018). It is also

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defined as the human requirements for land for subsistence and its use for other purposes in addition to housing. Or it is the means used by a group of people to meet their basic needs. Also, it is the human activity on the land associated with it and determines its use within a specific area, whether urban or rural. In the urban cities there are many functions of its Use such as, residential, transportation, entertainment, Commercial, industrial, Educational, Health, and Cultural Land Uses and more Abu Nuqta and Habib (2010).

This research aims to manually classify land uses in Al-Rafai area and produce a land use map that includes the percentage of residential, agricultural, barren and water lands in order to make it a ready map for comparison with old and future maps and old and future land use percentages. This can help in establishing infrastructure based on current use percentages as well as predicting future land use percentages.

II. MATERIALS AND METHODS

Study area

The study area includes the city of Al-Rifai, located north of Dhi Qar Governorate/southern Iraq. This city is considered one of the largest cities in the governorate in terms of area, Fig. 1. The city is about 90 km north of Nasiriyah (the center of Dhi Qar Governorate) and about 300 km south of Baghdad (the capital). Five thousand years ago, the first human civilizations in the world arose on this land, namely the Sumerian civilization (Mesopotamia) in Lagash (Telu) 15 km southeast of Al-Rifai and the Kingdom of Umma (Jokha) 23 km to the west of Al-Rifai and other small Sumerian cities affiliated with it spread around the city of Al-Rifai Chlaib et al. (2019).

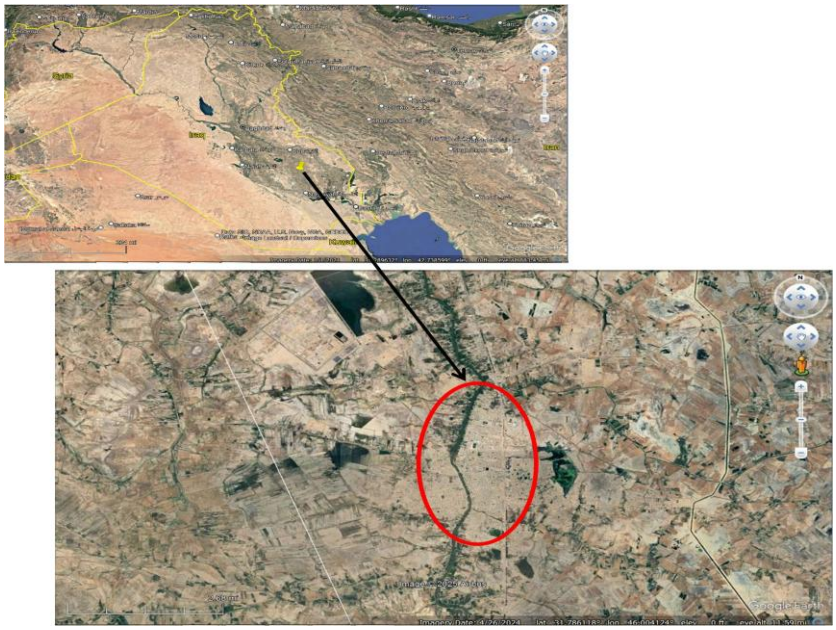

Fig. 1. Google Earth map representing the location of the study area (Al-Rifai City) on the map of Iraq

Drawing Scale

One of the most important steps in this research is obtaining images with a uniform drawing scale. Drawing scale is the fixed ratio between the dimensions on the map and their corresponding actual dimensions on the ground (the actual dimentions). The scale may be small, such as 1:10,000,000, resulting in a small map with limited detail. It

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may be large, such as 1:100,000, resulting in a larger map with more detail. It may also be larger, such as 1:50,000, resulting in more detail. Choosing the appropriate drawing scale depends on the details and features required to be displayed within the area being mapped. Drawing scale is divided into proportional (fractional) and linear scales.

Data preparing

This research relied mainly on ready satellite images from Google Earth program, where (220) satellite images were taken covering the administrative borders of Al-Rifai city. The images were taken at an altitude of (831) m, Fig. 2, and a single, fixed scale was determined for all images, which is (1/223600), each image was divided into squares with dimensions of (2*2 cm) which equals to (4 cm^2), this map area equals an actual area of (0.2) km^2, Fig. 3.

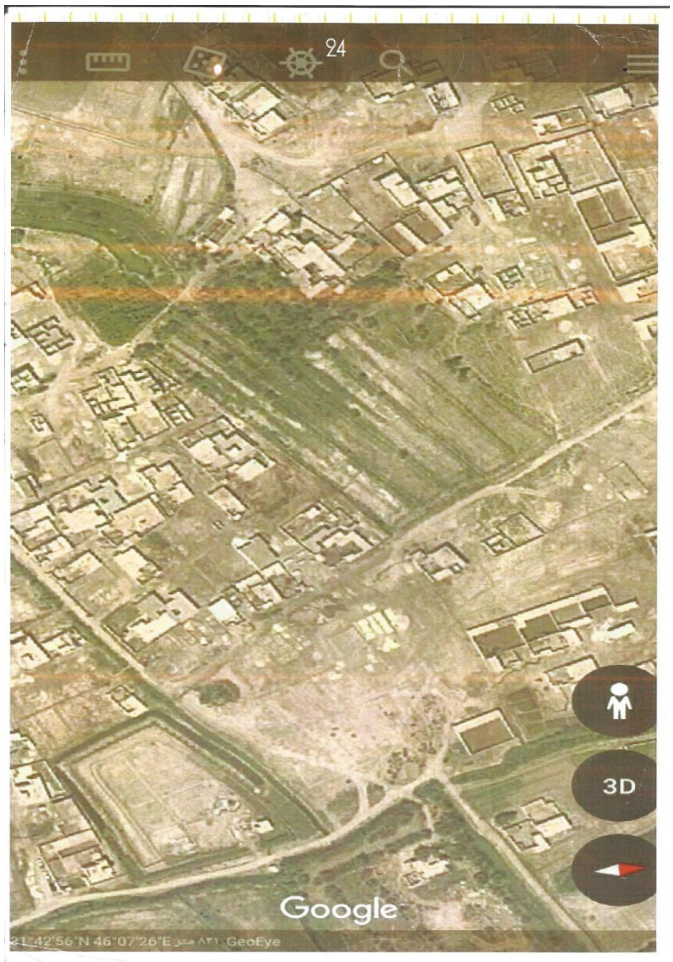

Fig. 2. One of the images taken from Google Earth for classification purposes

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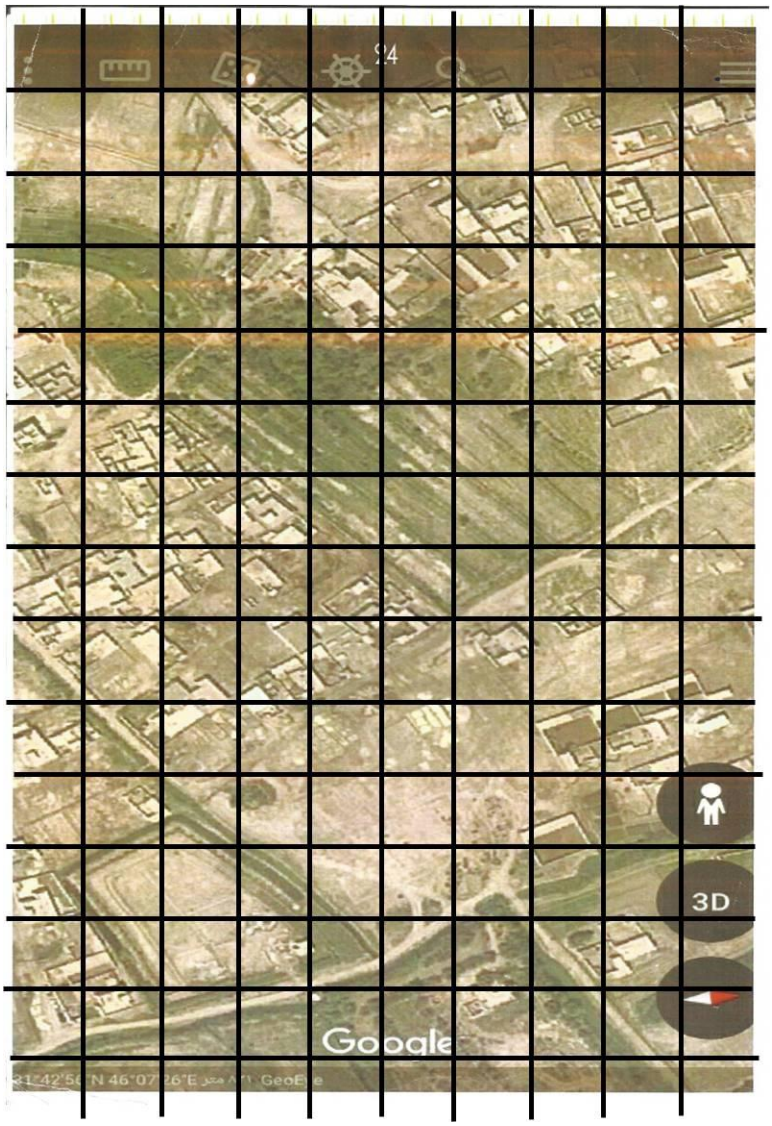

Fig. 3. Google Earth image of a part of the Al-Rifai area divided into squares with dimensions of 2 cm x 2 cm and a real area of 0.2 km^2

The images were arranged and numbered in rows and columns, each image was given a number consisting of two parts. The first part represents (the image row) and the second number represents (the image sequence) within the row. For example, the image with the number 32 means that it is the second image within the third row Fig. 4. It was also confirmed that there was a front and side overlap between the images to cover the entire study area.

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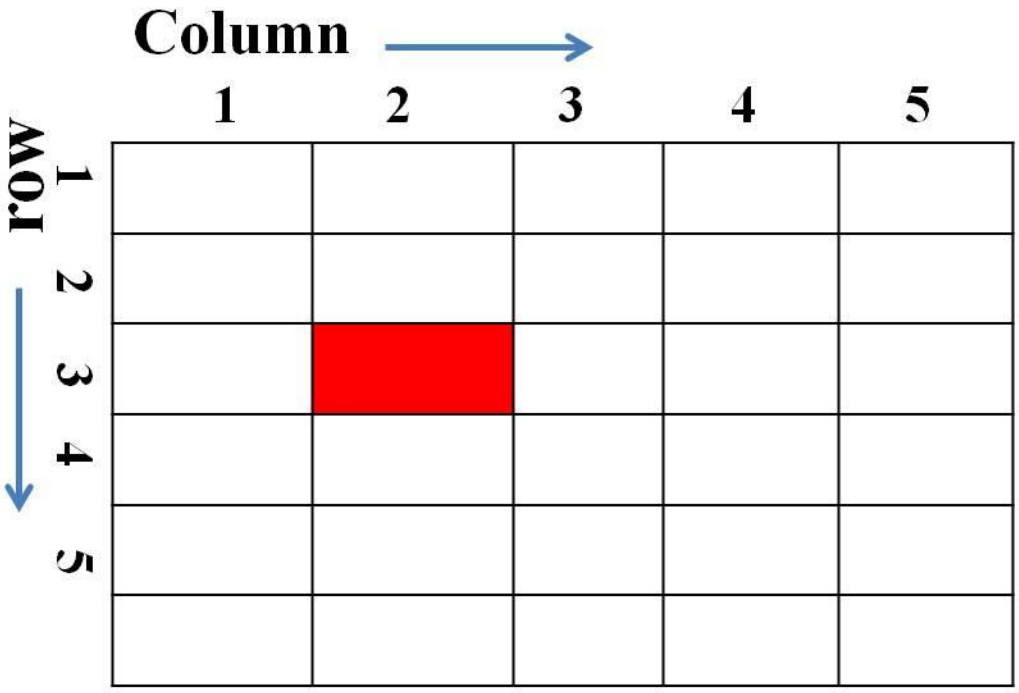

Fig. 4. The location of the image number 32, meaning that its location and order in the images are within the second column, third row

The images were classified manually using colors as in Table 1, Fig. 5 shows one of the images classified by color. The total areas of land use in Al-Rafai City in square kilometers and their percentages are shown in Table 2.

TABLE I. The color classification of the images

Color	Land use
Green	Agricultural lands
Red	Residential lands
Blue	Water areas
Gray	Barren lands

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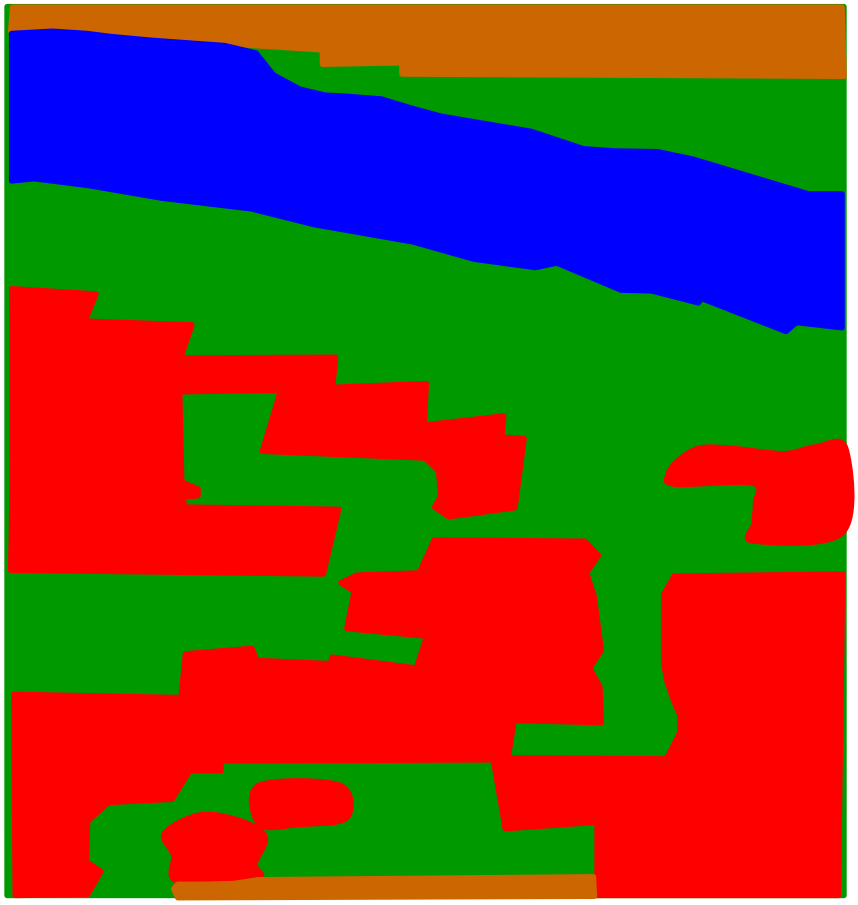

Fig. 5. Google Earth image of a part of the Al-Rifai area, classified by color, red color represents residential areas, green color represents agricultural areas, blue color represents water, and the grey color represents the barren lands

TABLE 2. Total areas of land uses in Al-Rafai area and their percentages

Land use	Area (km^2)	Percentage
Agricultural lands	763	47.39%
Residential lands	555	34.47%
Barren lands	263	16.33%
Water areas	29	1.80%

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III. RESULTS AND DISCUSSION

When observing the results in Table 2, it is clear that the residential areas (red color) took the largest proportions, as the housing area covered approximately (763) km^2. This percentage is expected because Al-Rifai area is a large district within Dhi Qar Governorate, and this percentage was concentrated in the center of the city. The agricultural areas or green areas (green color) occupied the second place and covered an area of (555) km^2 distributed on the outskirts of the residential areas and along Al-Gharraf River, which is the real distribution of agricultural areas, as palm groves are located on the banks of the river. As for the unused areas, i.e. the barren areas (brown color), they occupied the third place in area, as they covered (263) km^2, which were scattered patches between the agricultural lands and on the outskirts of the city. It was also noted that there was a large area on the eastern side of the city, and these areas are considered desertified or salty areas due to their distance from Al-Gharraf River. As for the water areas (blue color), they occupied the last place with a total area of (29) km^2, which is the area of Al- Gharraf River and its streams that pass through the city, in addition to other isolated spots. The total sum of these four classifications was about (1610) km^2. Fig. 6 represents the final deduced map of the manual classification of the city of Al-Rafai according the land use.

Fig. 6. The final map derived from the manual classification of land uses for the city of Al-Rafai

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IV. VI. CONCLUSIONS

By manually classifying the land uses of the areas within the administrative boundaries of Al-Rafai City/ north of Thi-Qar Governorate, southern Iraq, using 220 satellite images taken from Google Earth program, with a total area of 1610 km2, it became clear that the residential areas were approximately (763) km2, the agricultural areas were approximately (555) km2, the barren areas were approximately (263) km2, and the water areas were approximately (29) km2.

From the resulting color map, it can be predicted that the agricultural areas (green), which are confined in the form of scattered patches between the residential areas (red), may shrink due to population growth and family division. Furthermore, the residential areas are concentrated in the city center, while the agricultural areas are concentrated around Al-Gharraf River.

V. RECOMMENDATIONS

The researchers recommend the following:

1. Comparing this simplified classification with previous classifications to study land use development.

2. Using the final classification map to determine future urban planning visions for Al-Rafai City.

3. Comparing this simplified classification with advanced classifications using software such as GIS and others.

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