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The use of Geographic Information System to select best location for Oasis in west of Iraq.

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ABSTRACT

The study area was selected in Al-unbar governorate occupies an area 417906.7 ha, located in the West of Iraq, Al-unbar province , All the remote sensing process and geographic information systems carried out at the college of agriculture – University of Baghdad- desertification combat, the Digital Elevation Model (DEM) was used to investigate the lower lands in study area; Normalized difference vegetation index was used to detect vegetation in the study area, The range of NDVI values started from - **0.33617** to **0.258883**, no vegetation referred to negative numbers, poor vegetation, moderate vegetation, dense vegetation, very dense vegetation, These classes covered the study area about **42256.6** ha, **100282** ha, **109966** ha,**104371** ha, **61041.1** ha respectively, Three classes for location of Oasis were presented in the study area, suitable class occupies an area 122782.6 ha about 29.38%, Moderate suitable class occupies an area 130347. 1 ha about 31.19%, No suitable class occupies an area 164777 ha about 39.42%.

Keywords: DEM, GIS, NDVI, Oasis.

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INTRODUCTION

Remote sensed information of growth, vigor, and their dynamics from terrestrial vegetation can provide extremely useful insights for applications in environmental monitoring, biodiversity conservation, agriculture, forestry, urban green infrastructures, and other related fields. Specifically, these types of information applied to agriculture provide not only an objective basis (depending on resolution) for the macro- and micromanagement of agricultural production but also in many occasions the necessary information for yield estimation of crops **[6].**

A GIS is a system of hardware, software and procedures to facilitate the management, manipulation, analysis, modeling, representation and display of georeferenced data to solve complex problems regarding planning and management of resources **[7].**

All of these applications consider the location of certain features on the landscape in relation to other features. For instance, in assessment, the location of soil types relative to property parcels is considered, whereas in planning and zoning, the location of animal confinement facilities relative to residential areas might be relevant. A geographic information system (GIS) allows the user to examine and visualize these relationships **[9].** a DEM can be represented as a raster (a grid of squares, also known as a height map when representing elevation) or as a vector-based triangular irregular network (TIN), The TIN DEM dataset is also referred to as a primary (measured) DEM, whereas the Raster DEM is referred to as a secondary (computed) DEM **[8].** The DEM could be acquired through techniques such as photogrammetric, lidar, land surveying, etc. **[5].** DEMs are commonly built using data collected using remote sensing techniques, but they may also be built from land surveying. DEMs are used often in geographic information systems, and are the most common basis for digitally produced relief maps. While a DSM may be useful for landscape modeling, city modeling and visualization applications, a DTM is often required for flood or drainage modeling, land-use studies, **[2]** . Salinity and sodality are widespread in soils Most of these soils suffer from sever to very sever deterioration. Unsuitable management of soil and irrigation applied by traditional farmers was the main reason for this problem **[1]**.An oasis is a lush green area in the midst of a desert, centered around a natural spring or a well. It is almost a reverse island, in a sense, because it is a tiny area of water surrounded by a sea of sand or rock. Oases can be fairly easy to spot — at least in deserts that do not have towering sand dunes. In many cases, the oasis will be the only place where trees such as date palms grow for miles around. The sight of the speck of green of an oasis on the horizon has been a very welcome one for desert travelers for centuries **[4].**

MATERIAL AND METHODS

The study area was selected in Al-unbar governorate occupies an area 417906.7 ha, located in the West of Iraq, Al-unbar province of 33°00´ 00" , 34° 30´ 00" N and 43° 00´ 00", 41° 00´ 00" E (fig.1).

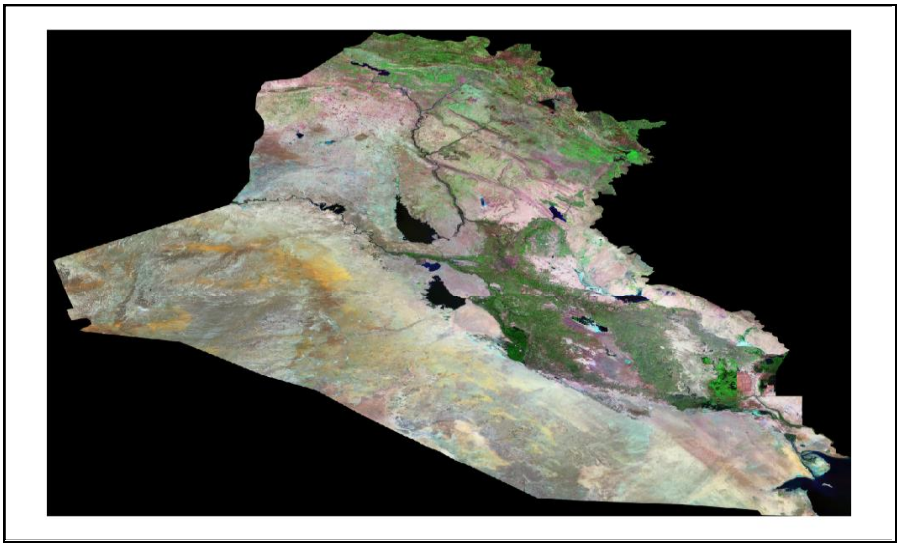

Figure 1: study area

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Data collection

Remote sensed dataset. All the remote sensing process and geographic information systems carried out at the college of agriculture – University of Baghdad- desertification combat, the Digital Elevation Model (DEM) was used to investigate the lower lands in study area; Normalized difference vegetation index was used to detect vegetation in the study area (equation1).

NDVI=NIR-RED/NIR+RED……1 . [3]

Where
NIR= Near Infra Red Band
R= Red Band

All data were used after processing in GIS by arc map program (v.10.3). According to suitable class DEM was reclassification from 1 (high lands) to 10 (lowlands), NDVI was reclassification from 10 (very dense vegetation) to 1(No vegetation), finally the suitable map for Oasis was produced in GIS.

RESULTS AND DISCUSSION

The figures 2, 3 referred to five vegetation classes(NDVI values) in the study area , The range of NDVI values started from **- 0.33617 to 0.258883**, no vegetation referred to negative numbers, poor vegetation, moderate vegetation, dense vegetation, very dense vegetation, These classes covered the study area about **42256.6 ha, 100282 ha, 109966 ha,104371 ha, 61041.1 ha** respectively. The results also indicate the presence of vegetation in the study area, which encourages the establishment of oases in the study area because the availability of vegetation refers to the presence of factors that encourage the cultivation of plant species, such as desert plants or other plants are tolerated to live in desert areas.

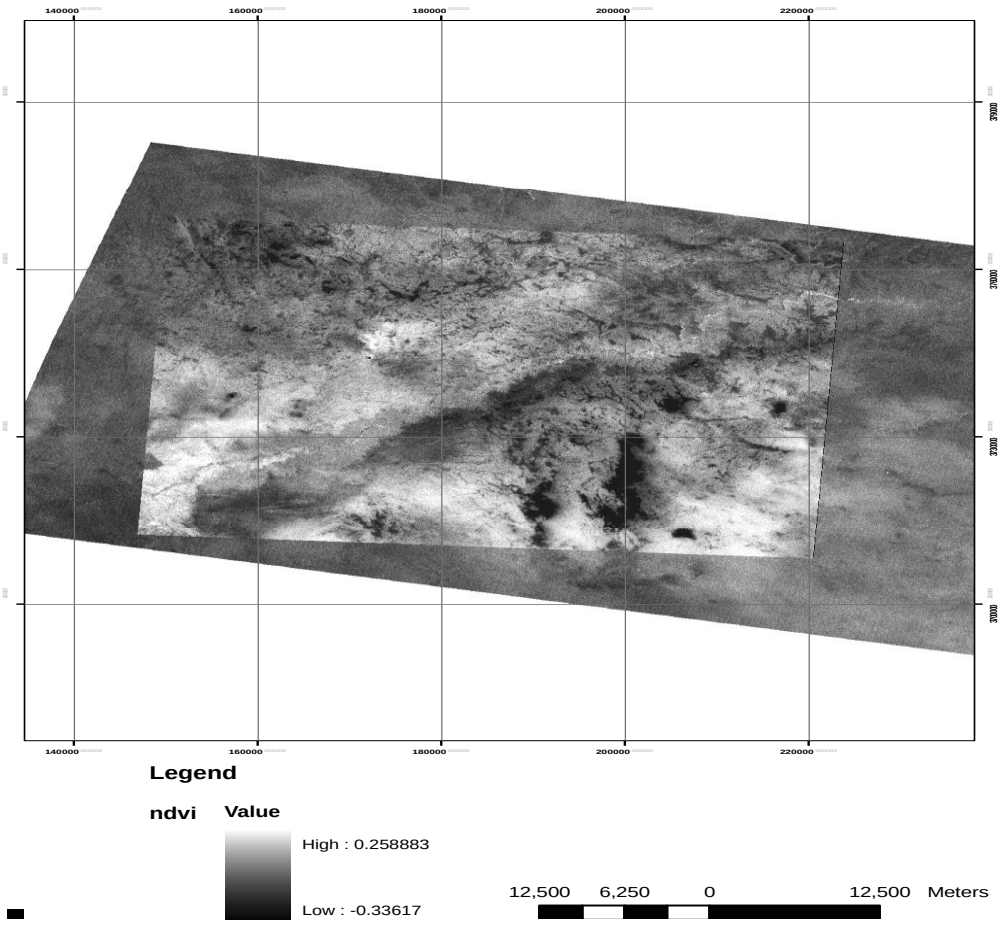

Figure 2: Normalized vegetation index in study area

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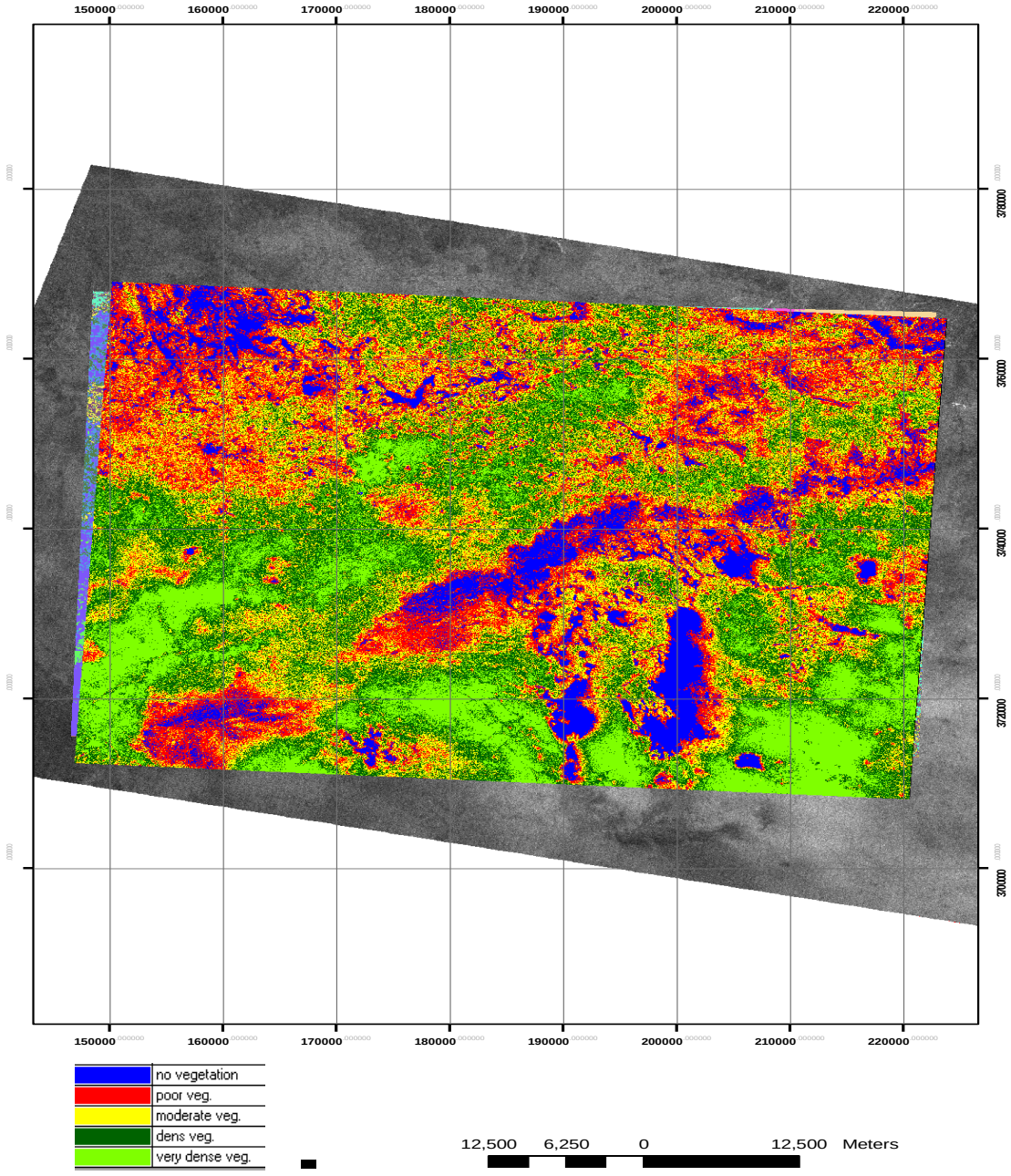

Figure 3: vegetation classes in study area

Figure (4) refers to the types of vegetation according to the weights used to obtain the best place for the establishment of oases. The number 1 indicates that there is no vegetation on the study area, while number 10 indicates the very dense vegetation in the study area so it occupies a larger weight in the requirements of the oases.

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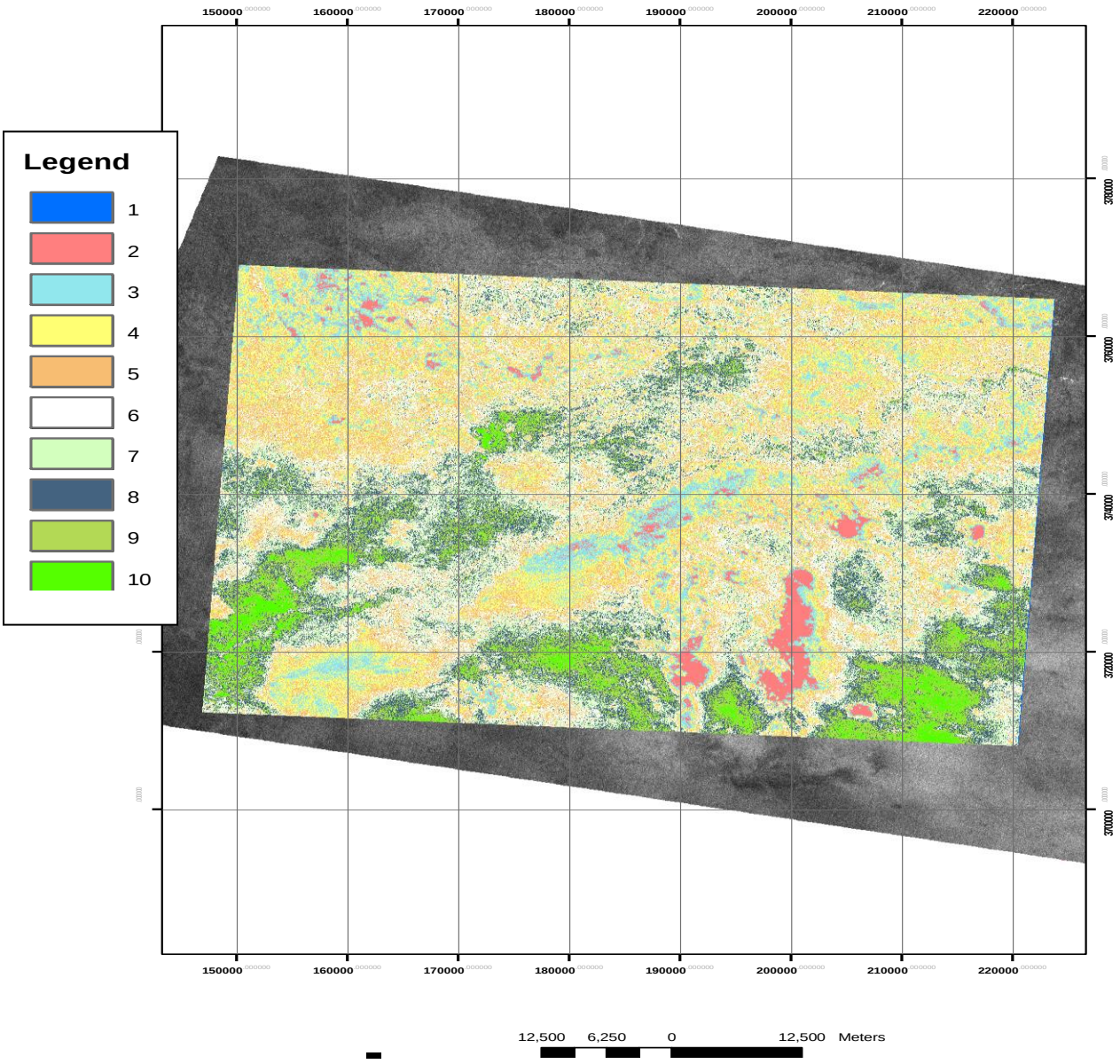

Figure 4: vegetation classes after reclassification in study area

Figure (5) shows the digital elevation model, with white indicating higher places than the other places in the study area, while gradients ranging from gray to black indicate medium- to low-sea-level areas, respectively. The results also indicate the presence of low-lands from the sea level in the study area, which encourages the establishment of oases in the study area because low areas indicate the presence of water rafting to help the establishment of oases compared to other areas in the study area

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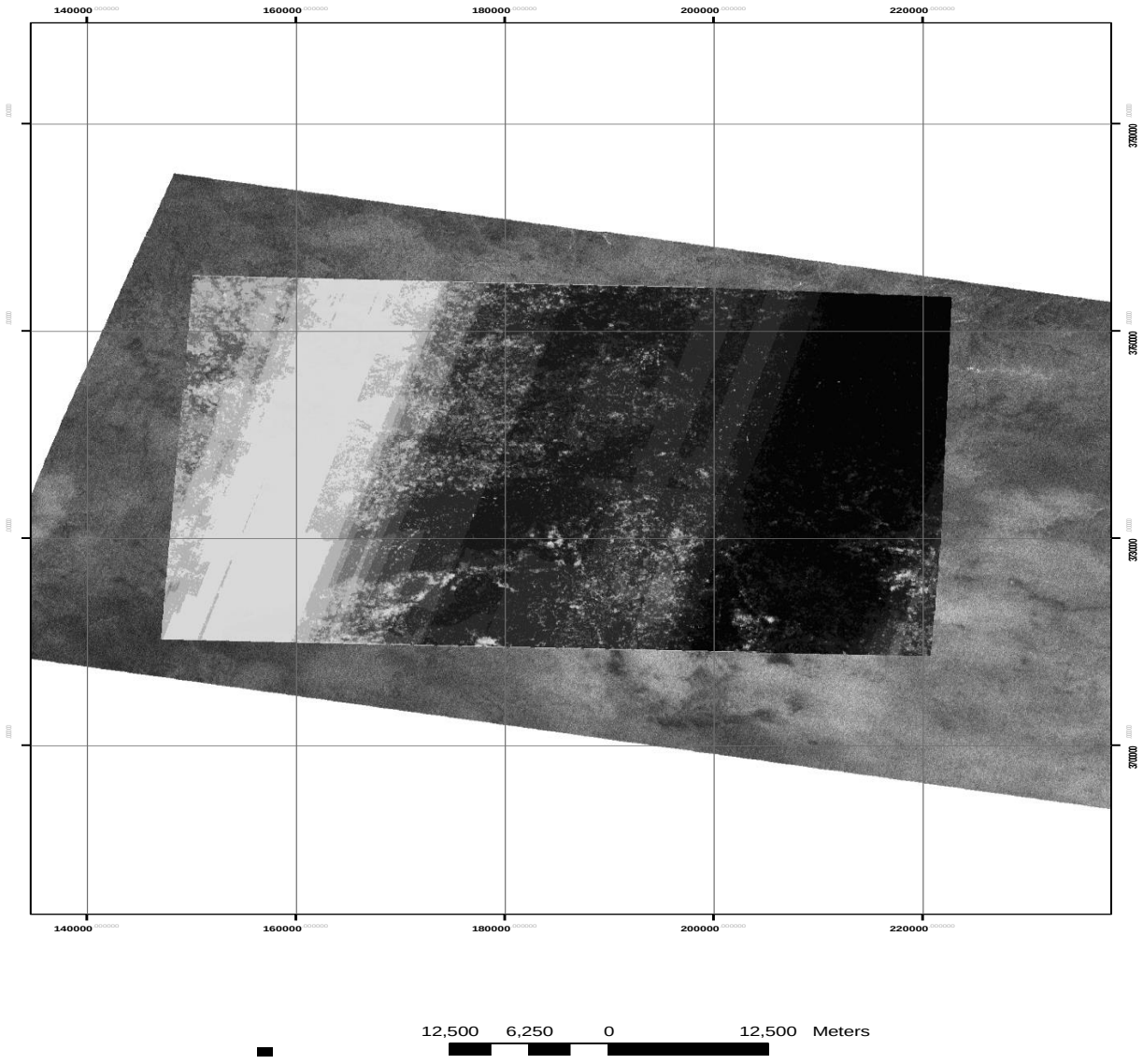

Figure 5: Digital Elevation Model in study area

Figure (6) refers to the types of DEM according to the weights used to obtain the best place for the establishment of oases. The number 1 indicates that there is highest land on the study area, while number 10 indicates the lower land in the study area so it occupies a larger weight in the requirements of the oases.

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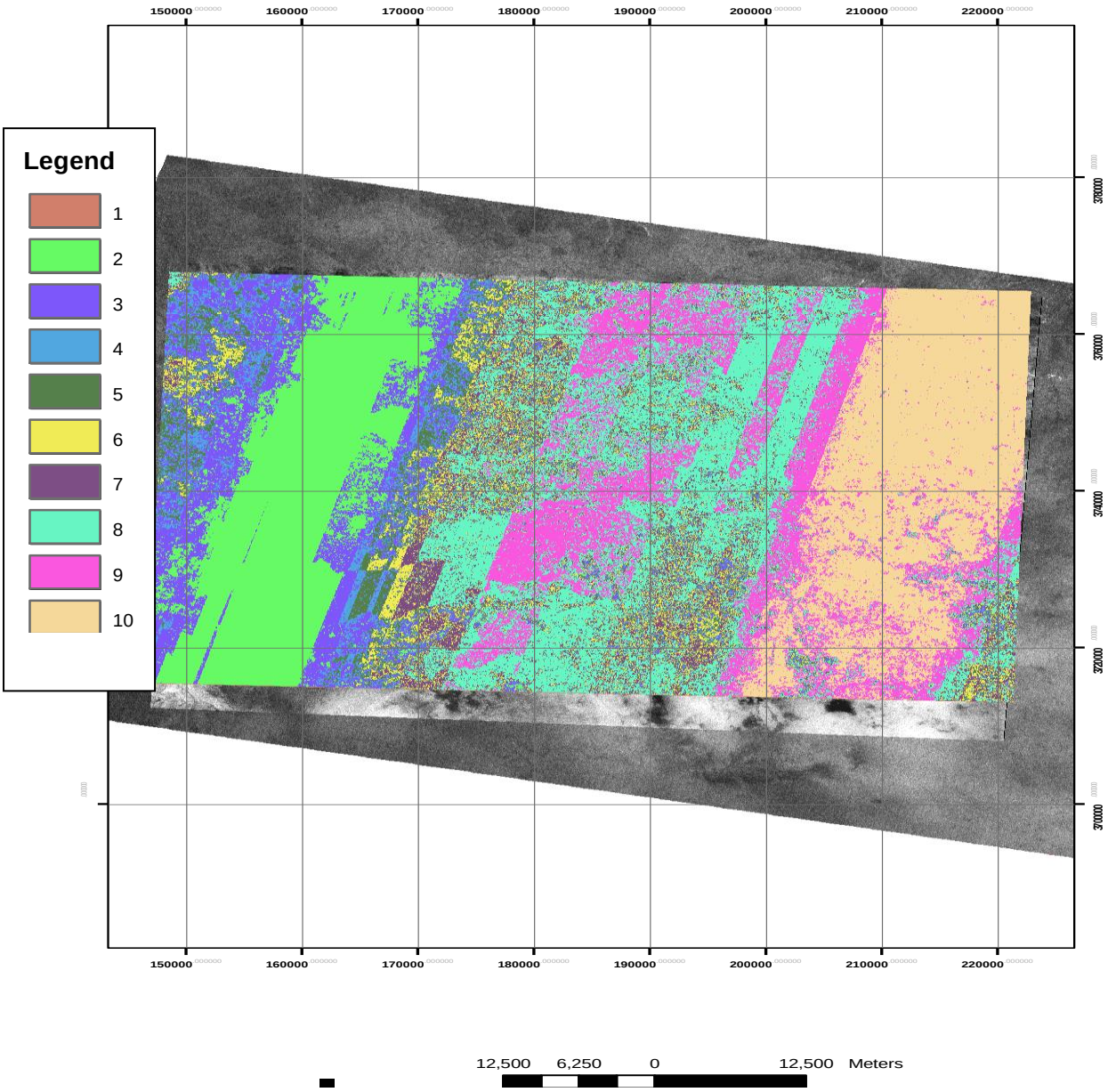

Figure 6: DEM classes after reclassification in study area

Suitable map

Figure (7) indicates the suitable degrees of study area for the establishment of oases when using a fuzzy logic after giving the weights of the vegetation classes and the digital elevation model as white indicates the suitable places for the establishment of oases, while the gradients of gray to black color to moderate suitable and other no suitable places respectively.

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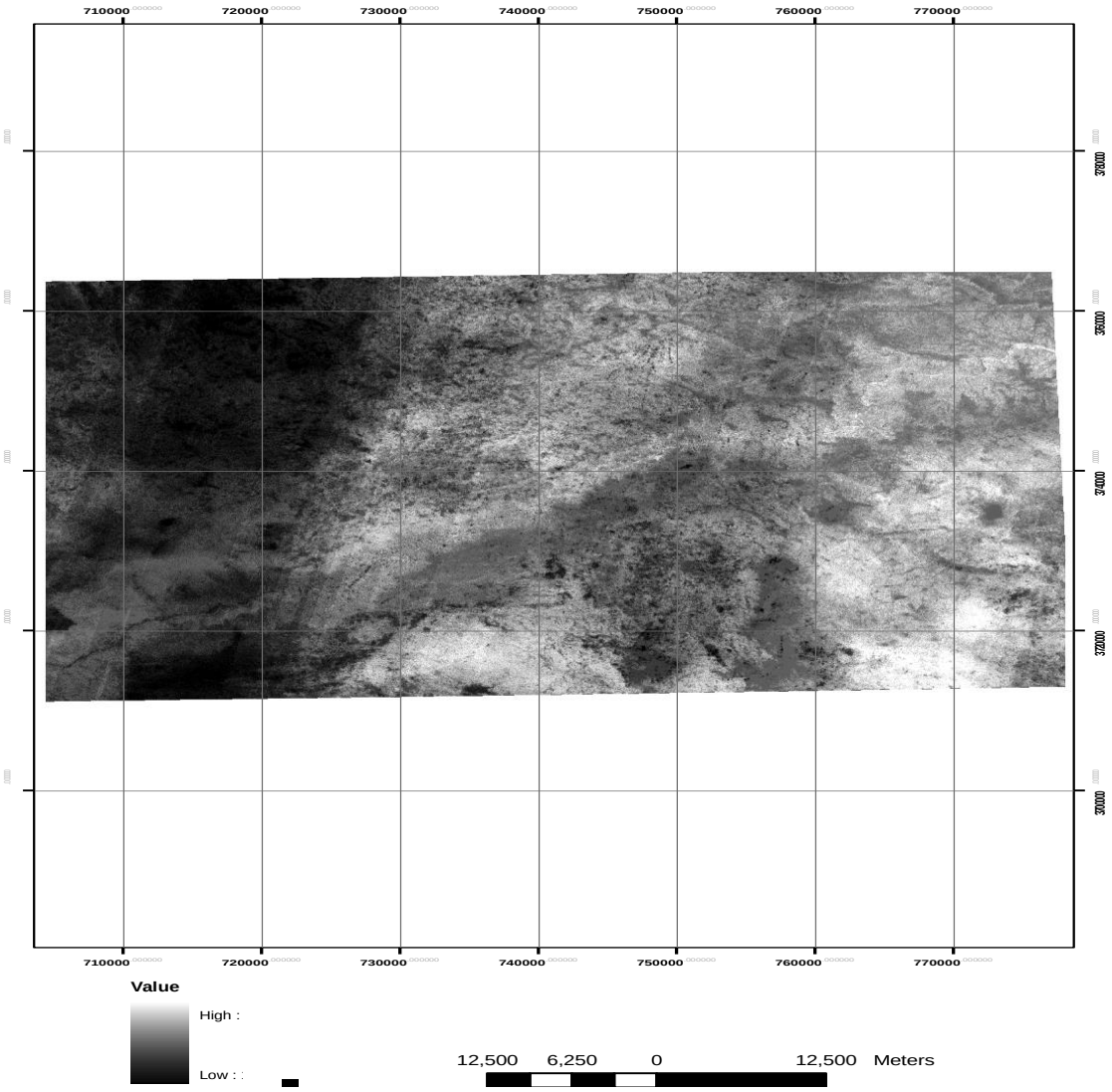

Figure 7: suitable map in study area

According to our recent poll, Three classes were present in the study area, suitable class occupies an area 122782.6 ha about 29.38%, Moderate suitable class occupies an area 130347. 1 ha about 31.19%, No suitable class occupies an area 164777 ha about 39.42% figure (8), Our research indicates that only three classes of suitable location (No suitable, Moderate suitable, suitable) Red, Blue, Green respectively.

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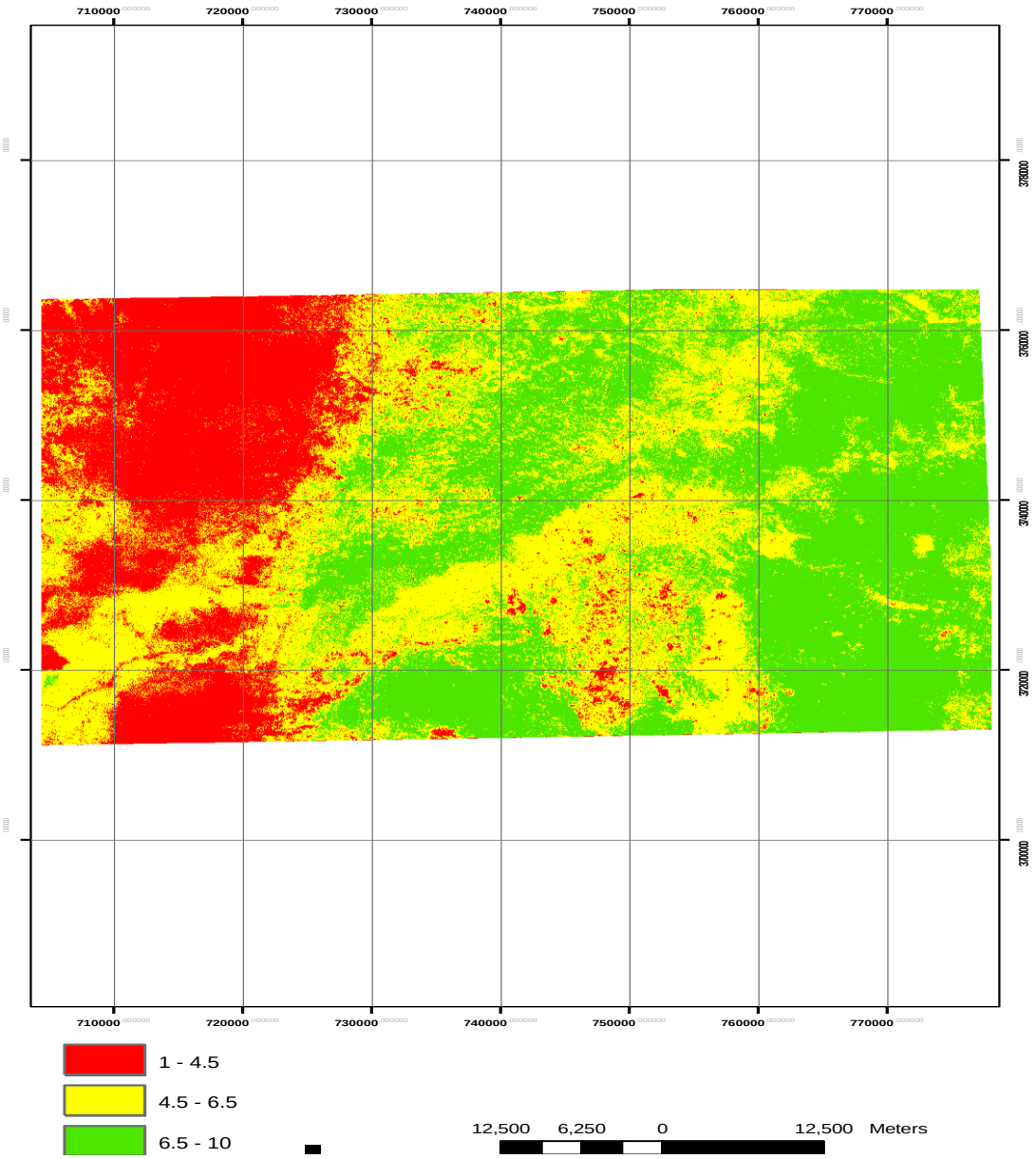

Figure 8: suitable map degrees in study area

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